



FEEDING FUNDAMENTALS

Hand Book on Infant & Young Child Nutrition

by IYCF Subspecialty Chapter of Indian Academy of Pediatrics



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FOREWORD

*“Give to the world the best you have, and
the best will come back to you”*

-Madeline Bridge

What a pleasure it is to see so many colleagues contributing to this important publication! I am delighted.

What pleases me even more is the revelation that many younger pediatricians are joining the crusade to protect, promote and support breastfeeding. As I pen this, the following song from the film ‘Kohraa’ comes to mind. It indicates that as you came along, the obstacles kept falling behind, while the journey itself became the goal:

*“Rah Bani Khud Manzil, Piche Reh Gai Mushkil;
Sath Jo Aye Tum, Rah Bani Khud Manzil.”*

In this book, you will find relevant and yet almost complete material presented under one cover. For this the ‘Infant and Young Child Feeding Chapter of IAP’ deserves a special pat on the back.

I understand that for present, this book shall go only into the hands of those who attend Pedicon 2011. The editors shall welcome both bouquets as well as brickbats and more suggestions from the readers for the final version that will be published later for wider circulation.

In the end, I must stress that all of us have to remain alert about the likely obstacles – the influence of the infant formula industry, the myths among the general public and the misinformation promulgated by certain health workers. We must continue to support mothers to make informed choices about feeding their children. Whether it is breastfeeding or home-made complementary foods, we must keep emphasizing that “YEH HI HAI RIGHT CHOICE BABY.”

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PREFACE

Optimal IYCF is an evidenced based preventive measure for improving child nutrition and child survival. This is of utmost importance for India and all other developing countries. For proper growth, development, and health, infants should be exclusively breast-fed with no other food or drink—not even water—for their first 6 months of life, they should then receive nutritionally adequate and safe complementary foods while breast-feeding continues up to 24 months of age or beyond. Special efforts are being undertaken by the WHO and partners to promote it in all countries. The Global Strategy for Infant and Young Child Feeding recommends critical interventions such as the implementation and monitoring of the International Code of Marketing of Breast-milk Substitutes and the subsequent relevant World Health Assembly resolutions; the adoption and monitoring of maternity entitlements consistent with the International Labour Organization and the expanded implementation of the WHO/UNICEF Baby-Friendly Hospital Initiative

It is essential that we should be able to implement all these recommendations on a large scale. To make this possible we need to fill many knowledge gaps, overcome practical problems, create a well oriented workforce with the support of the family, community, health workers and private and government organizations

New knowledge is emerging on the importance of feeding infants and children. There are a myriad of potential frequently asked questions on optimum feeding fundamentals which remain unanswered or are wrongly represented thus causing more harm than good. It is with the intention of addressing all these issues in a single publication that with the inspiration of the Central IAP body and the IYCF subspeciality chapter, the untiring work of the members of editorial board and the contributing authors that this book has been written. This Publication is a compilation of articles by many contributors and there is some overlap of information in various articles. This has been kept as such so that it reinforces the crucial concepts in different words by different authors.

Many new topics which are important in achieving the goal of optimum IYCF have been addressed in this publication. Nutrition myths, growth and development in relation to feeding, HIV and infant feeding, IMS act, paternal leave, father support groups, ethical issues, capacity building for effective improvement, IYCF in medical curriculum, building public awareness and involvement, role of various organizations are only some of them.

We feel this book will fill the long felt need for all medical personnel including medical and nursing students dealing with the nutrition of infants and young children. Though most are aware of the basic principles of good infant nutrition but in practice lots of doubts, if's and but's, do's and don'ts exists, which create hurdles in implementation. Going through this publication we feel they will be more confident to deal with difficult situations which they may face in their practice of optimum infant and young child nutrition and thus contribute in achieving the Millennium Development Goal- commitment in reducing mortality by 2/3 in children aged younger than 5 years.

-The Editorial Team

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INTRODUCTION & INDIAN SCENARIO

Dr. Balraj Yadav, Dr. Vishesh Kumar

India is home to more than a third of the world's undernourished children. India's under-nutrition statistics are worse than much of Sub-Saharan Africa. In 1999, the National Family Health Survey (NFHS) found that 47 percent of all children under age three were under weight. Data from NFHS survey 2006 shows only a very small decline, with under-nutrition level remaining around 45 percent for children below three. In many of the poorer states, rates have deteriorated in the past five years. India's child under-nutrition figures are behind where they would be expected to be at the current level of per capita income-illustrating that other factors beyond income poverty are equally critical. The underweight prevalence in India is much higher among Schedule Castes and Schedule Tribes and has increased over the last seven years. Despite vast improvements in the country's economy, under-nutrition remains a challenge in India. Malnutrition in India has been called "*The Silent Emergency*". The proportion of under nutrition among children and women in India is one of the highest in the world.

The Tenth Five year Planning Commission had set up the National Nutritional Goals which were to be achieved by 2007. The major goals were:

- 1) Intensify nutrition and health education to improve infant and child feeding and caring practices so as to:
 - i) Bring down the prevalence of under-weight children under three years from the current level of 47 per cent to 40 per cent;
 - ii) Reduce prevalence of severe Under nutrition in children in the 0-6 years age group by 50 per cent;
- 2) Enhance Early Initiation of Breastfeeding (colostrum feeding) from the current level of 15.8 per cent to 50 per cent;
- 3) Enhance the Exclusive Breastfeeding rate for the first six months from the current rate of 55.2 per cent (for 0-3 months) to 80 percent.
- 4) Enhance the Complementary Feeding rate at six months from the current level of 33.5 per cent to 75 per cent.

India is also committed to halving the prevalence of underweight children by 2015 as one of the key indicators of progress towards the Millennium Development Goals (MDG).

By the end of 2007 the Nutritional Achievement goals did not make for happy reading. Reasons for this high prevalence include the inadequate knowledge of caregivers concerning correct infant and young child feeding, frequent infections worsened by bad hygiene, high population pressure, the low status of women and girls, suboptimal delivery of social services and probably lack of more viable guidelines. The sound practice of breastfeeding suffered a setback because of aggressive media campaign of the multinational companies producing baby milk powder and infant foods. The WHO in late 70s recognized the seriousness of the declining trend in breastfeeding and introduced an International Code for Protection and Promotion of Breastfeeding in 1981. The Indian Government adopted a National Code for Protection and Promotion of Breastfeeding in 1983. The Infant Milk Substitutes, Feeding Bottles and Infant Foods (Regulation of Production, Supply and Distribution) Act 1992, is being implemented by the Department of Women and Child Development since 1993.

Despite the tremendous efforts of the department of Woman and Child Development (Food and Nutrition Board), there has been a dismal improvement in achieving the Nutritional goals by 2007. Children have been the chief victims of the interplay of nutrition, socio economic factors that causes malnutrition. The Nutritional status of the children under 5 years has been taken as the most sensitive indicator of the development of a particular country. The various efforts have been done in the country to combat a National problem, "Malnutrition". Its eradication deserves beyond the present guidelines.

With a population of over 1 billion people, India has one of the fastest growing economies in the world. Annual economic growth has averaged about 8 percent to 9 percent in recent years; however, India is still very much a country in development transition, with over 700 million of its people living on less than \$ 2 a day. Routed in this poverty, India's under 5 mortality rate of 74/1000 means that all most 2 million young Indian children still die each year i.e. $\frac{1}{4}$ of all the world's infant and young child deaths. According to recent estimates, more than a third of all deaths in children aged five years or younger is attributable to the under nutrition. 8.3 million Babies are born low birth rate (Less than 2500 grams), nearly half (46 percent) of children under 3 years of age or 31 million children are under weight (low weight for age). This number of malnourished children is equivalent to the entire population of Canada, 25.5 million or 1 in 3, children under 3 years of age are stunted (low height for age) as a result of poor nutrition, 13 million, or 1 in 5 children below 3 years of age are wasted (low weight for height), Eight in ten children 6 to 35 months of age are anemic. Only 23 percent of children below three years of age in India initiated breastfeeding within one hour of birth, less than 46 percent of children under six months of age are exclusively breast feed, only half

(56 percent of children were provided with the recommended semi-solid complementary foods and breast milk, only 1 in 4 children aged 12 to 35 months receive the six monthly Vitamin-A supplement.

THE VICIOUS CYCLE

The nutrition situation of the children is largely due to the situation of the women. NFHS-3 data indicates that 36 percent of Indian women are chronically under nourished and 58 percent are anemic. There is a clear cut correlation that child under nutrition is very much a matter of gender biased because it affects women more than it affects men due to the specific nutrition needs of women during adolescence, pregnancy and lactation. Widespread nutrition deprivation among women perpetuates and intergenerational cycle of nutrition deprivation in children. Undernourished girls grow up to become undernourished women who give birth to a new generation of undernourished children. Early marriages and inadequate health care of women adversely affect the survival of their children. NFHS-3 shows that 46 percent of women is 20-24 who were married before age of 18, currently 1 in 3 women aged 15-49 has a Body Mass Index (BMI) less than 18.5 Kg/m² indicating severe nutritional deficiency and under nutrition. Under-nutrition puts a woman at a greater risk of pregnancy related complications and death (obstructed labor and hemorrhage). Malnutrition amongst women is one of the prime causes of low birth-weight babies and poor growth. Low birth weight is a significant contributor to infant mortality. Moreover, low birth weight babies who survive are likely to suffer growth retardation and illness throughout their childhood, adolescence and into adulthood, and growth retarded adult women are likely to carry on the vicious cycle of malnutrition by giving birth to low birth weight babies. This intergenerational cycle of under-nutrition transmitted from mothers to children greatly imparts on India's present and future.

Undernourished children are much more likely to suffer from common childhood illness (Measles, Pneumonia and Diarrhea). Most of the infants are fed by the mothers, care givers and attendants. Over 1.5 million children under 5 die each year with diarrhea. Unsafe water and inadequate sanitation are often the major causes of lost work and missed school days, perpetuating the cycle of economic and social stagnation in the country. The rates of hand washing before handling food and after using the toilet ranges from 0 per cent to 34 percent around the world and are much lower in India. It has been shown that hand washing with soap by birth attendants and mothers significantly increased newborn survival rates by up to 44 percent. Hand washing with soap represents a cornerstone of public health and can be considered an affordable, accessible "do-it-yourself" vaccine. It is also known that undernourished boys and girls do not perform as well in school as compared to their well nourished peers, and as adults they are less productive and make lower wages. Widespread

child under-nutrition greatly impedes India's socio-economic development and potential to reduce poverty.

Preventing under-nutrition has emerged as one of the most critical challenges to India's development planners in recent times. Mahatma Gandhi's statement, "For the hungry, bread is God," is relevant for vast sections of the Indian population today.

THE ECONOMIC COST

Malnutrition also has a high economic cost; productivity losses related to poor nutrition are estimated to be more than 10 per cent of lifetime earnings for individuals and 2-3 per cent of GDP to the nation. Malnutrition and micronutrient malnutrition were estimated to have reduced the country's GDP between 3-9 per cent in 1996. A 1997 report of the National Strategies to Reduce Childhood Malnutrition revealed that the cost of treating malnutrition is 27 times more than the investment required for its prevention.

INDIAN RATIFICATION OF CRC

India ratified the Convention on the Rights of the Child (CRC) in 1989, which is the first legally binding international instrument to incorporate a range of human rights. Article 6 of the CRC states that children have the right to live and governments should ensure that children survive and develop healthily. The convention placed a high value on the children's right to survival and states that "Children have the right to the good quality health care, to safe drinking water, nutritious food, a clean and safe environment and information to help them stay healthy.

THE CRITICAL WINDOW

The critical window of opportunity, when nutrition interventions offer children the best chance for survival and development to their full potential is girl's adolescence, women's pregnancy and children's first two years of life. After the age of two, the window closes and the opportunity for the child is lost.

IYCF chapter had adopted ten proven, high impact intervention that can halve child under-nutrition rates if delivered at national scale. Indian Academy of Pediatrics along with its 18 thousand members throughout the country would be instrumental in universally delivering the package of ten proven, high impact essential nutrition interventions which will lead to unprecedented reduction in child under-nutrition. Improvement of girl's nutrition during adolescence, improvement of children's nutrition in the first two years of life and improvement of maternal nutrition during pregnancy and lactation should be taken up at priority. Indian Academy of Pediatrics has the huge resources to

scale up an inspirational national response to address the challenge child under-nutrition. Now it is the time to combine the existing technical knowledge with the political will to change the lives of millions of children and women in India. We need to stand ready to support the government in this endeavor, and unite for children.

Section I

BASICS

NUTRITIONAL REQUIREMENTS

Dr. P. K. Gupta

All children need to be well nourished to achieve their full potential and deficiencies as well as excesses of various nutrients are undesirable from short term as well as long term perspective. Recommended or reference intakes of most nutrients have been established to fulfil the unique nutritional needs of the infant and young child and act as guide to attain good nutritional status.

DIETARY REFERENCE INTAKES CONCEPTS

Estimated Average Requirement (EAR) are average nutrient requirements of a specific nutrient for a population group. It includes needs for growth and development

Recommended Daily Allowance (RDA) of a specific nutrient is the intake deemed to meet the requirements for almost all healthy members of the population. RDA is EAR (mean requirement) plus two standard deviations.

Dietary reference Intakes. In infants, a valid RDA is often difficult to establish and Dietary Reference Intakes (DRIs) are recommended. These include RDAs as well as “other reference intakes” which may be Adequate Intake (AI) and Tolerable Upper Intake Level (UL).

AI of a specific nutrient is based on the observed or approximated intake of that nutrient by a group of healthy individuals. As an example, the content of a specific nutrient in the average volume of milk consumed by healthy breast fed infants is considered an adequate intake of that nutrient for infants up to 6 months of age.

Tolerable Upper Intake Level (UL) is the highest daily intake of a specific nutrient that is likely to pose no risk.

WATER & ELECTROLYTES

Fluids in diet are the principal source of water but oxidation of food also provides water (about 12 gm of water per 100 kcalories). Water requirement is related to the calorie consumption and the specific gravity of the urine and, in healthy children, and can be calculated as 100ml per 100

calories metabolized. Infants need to consume much larger amounts of water per unit of body weight (10-15%) as compared to adults (2-4%).

Water balance depends on fluid intake, protein and mineral content of diet, solute load for renal excretion, metabolic and respiratory rates and fecal losses. Urine and evaporation (from lungs and skin) account for 40-50% each while stool for 3-10% of fluid losses in normal infants.

Sodium and potassium. The main determinants of sodium requirements of infants are rate of growth, composition of feces and losses through skin.

Age	Sodium mg/d [#]		Potassium mg/d
	RDA	Safe Limit (UL)	
0-12 months	407 (for formula fed babies)		628
1-3Y	589	5 g cooking salt /d + natural food.	1100
4-6Y	1005		1550
7-10			
11-18			

#1 gm sodium chloride (table salt) has 39% Na

ENERGY

Unit of heat in metabolism is Large Calorie (C) or Kilocalorie (kcal) which is equal to 4.1855 Kilo Joule. **Energy requirements** are based on energy needed to balance total energy expenditure (**TEE**) and growth. Energy is spent for basal metabolism (50%), physical activity (25%), growth (35-3%), specific dynamic action or thermic effect of food (5-10%) and fecal losses (5%). Energy requirement recommendations avoid energy intakes exceeding requirements to prevent under as well as over nutrition.

Basal metabolism is required to maintain essential physiological functions of a living organism. Basal requirements in preterm babies are about 60 kcal/kg/d; in term infants 55 kcal/kg/d and gradually decrease to 45 kcal/kg/d by 4 years, 38-40 kcal/kg/d by 8 years and 25-30 kcal/kg/d at maturity. For each degree change in core body temperature (rectal temperature) above or below 37.8°C or 100°F, add or subtract 12% or 8% respectively.

Specific dynamic action (SDA) or Thermic effect of food (TEF) refers to increase in the basal metabolism as result of assimilation of food. Growth requirements to build body tissues decrease from 35% at one month to 3% - 4% by 12 months. The requirement for physical activity is 15-25 kcal/kg/d and is lifestyle dependent.

New FAO/WHO/UNU expert group recommendations of energy requirements (2004) are 10-20% less as compared to 1985 recommendations (Table2). ICMR² recommendations (2010) are almost identical to the present WHO recommendations. Breast fed infants have lesser requirements than those of formula fed. Human milk has a calorie distribution of 55%from fat, 38% from carbohydrates and 7% from proteins. Average distribution of calories in older child is proteins 10-35%, fats 20-35% and carbohydrates 45-65%.

Age	Energy Intake kcal/kg/d			
	2004 Estimates		Estimates1985	
	Boys	Girls	Boys	Girls
0-3mo	113-95.	107-95	124-109	124-109
4-6mo	95-80	95-80	103-96	103-96
6-12 mo	79-81	79-81	95-104	95-104
1-3 yrs	80-82	80-81	104-95	104-95
4-6 yrs	74-77	72-77	95-90	95-85
7-9 yrs	69-73	64-69	90-80	86-67
10-12 YRS	67-62	61-55	80-64	67-54
13-15 YRS	60-56	55-47	55-48	45-42
15-18 YRS	53-50	44-45	48-45	40-42

PROTEINS –TABLE 3

Proteins are organic nitrogenous compounds made up of amino acids (AA) and nine of these cannot be synthesized in the body, must be supplied in food and are called **indispensable (essential) amino acids**. They are methionine, threonine, tyryptophan, valine, isoleucine, leucine, lysine, phenylalanine and histidine. Infants and children cannot adequately synthesize arginine, cysteine,glutamine, glycine, proline and tyrosine and these are considered **conditionally indispensable (semi essential)**. Additionally, taurine and carnitine are needed in infants on total parenteral nutrition. New tissues cannot be formed unless all the essential amino acids are present in the diet simultaneously - absence of even one essential AA will result in negative nitrogen balance.

Dispensable AA-alanine, aspartic acid, asparagine, glutamic acid and serine -can be synthesized in body in desired amount.

Age	Total RDA ² (g/kg/d)	Safe Level ⁴ (g/kg/d)
0-6 mo	1.43	1.69
6mo-1yr	1.18	1.47
1-2 yrs	1.04	1.33 -1.25
2-10 yrs	0.95-0.85	1.1-1.2
Girls-		
11-15yr	0.90-0.85	1.15-1.09
16-18	0.83	1.07-1.05
Boys-		
11-15	0.90	1.16-1.13
16-18	0.86	1.12-1.09

FATS

Lipids are esters of fatty acids (FA) with various alcohols. Naturally occurring fats contain both saturated as well as unsaturated fatty acids. Saturated FA are palmitic and stearic; monounsaturated FA oleic and polyunsaturated FA Linoleic & linoleinic acid.

Dietary Fat Requirements

Dietary fats with an equal distribution in proportion of saturated, monounsaturated and polyunsaturated FA are considered desirable. Restriction of the total fat intake in children below 3 years of age or an average fat intake below 30% of energy in older children is not advisable.

Essential Fatty Acids (EFA)

Human beings do not synthesize them endogenously and must be supplied in the diet. They include Linoleic acid (LA), α -linoleinic acid (ALA), Arachidonic Acid (ARA) and docosahexaenoic acid (DHA). Arachidonic acid (ARA) and DHA can be synthesized in the humans from the diet containing LA and ALA respectively. Infant formulas should have a LA content of 2.7% - 35% of total fatty acids and a LA: ALA ratio between 5-15. Adequately breast fed infants receive about 70 g fat per day of which LA is 8-20% and ALA about 0.5 - 1%.

Long chain polyunsaturated fatty acids (LCP or LCPUFA)

Long chain polyunsaturated fatty acids (LCP or LCPUFA) are arachidonic acid (AA) and docosahexaenoic acid (DHA). Breast milk contains adequate LCPUFA and meets all EFA needs but LCP are conditionally essential in very low birth weight infants because they do not receive maternal LCP in the last trimester and individual variability in conversion of ALA to DHA and LA to ARA. Usefulness of LCP supplementation in pregnant or lactating mothers; term infants and healthy older children is not clear.

Trans fatty acids

Trans – fatty acids do not have any advantage and rather may have undesirable health effects; their content in infant foods must not exceed 4% of total fatty acids.

Medium chain triglycerides (MCT)

Dietary MCT are frequently used as energy sources in the feeding of preterm infants. Feeding formulas with high (40-50%) or low (< 5%) MCT does not affect energy balance or growth.

CARBOHYDRATE AND DIETARY FIBER

Carbohydrates meet the greatest portion (45-65%) of calorie needs of body and provide the necessary bulk of the diet. Unlike proteins or fats, there are no essential carbohydrates.

Fiber

Fiber is the material of plant source which humans do not digest. It contributes to bulk or roughage. With predominance of cereals, Indian diets have sufficient fiber and there are no dietary fiber recommendations². In western diets, a general recommendation of fiber is '5-10 g + age' as daily requirement⁵.

CALCIUM, MAGNESIUM, PHOSPHORUS & FLUORIDE

Calcium, phosphorus and magnesium are essential nutrients for energy and transport and as integral components of the skeleton. A milk intake of 200 ml per day on cereal + legume diet is sufficient to meet daily Ca requirements. Fluoride is required for dental enamel.

Age	Calcium mg/d	Magnesium mg/d	Fluoride mg/d [@]
0-6 mo [*]	210	25-55	0.01
7-12 mo ^{**}	270		0.5
1-3 yrs [#]	500	60-100	0.7
4-8 yrs [#]	800		1.0
9-18 yrs [#]	1300	220-230	2.0
Adults [#]	1000-		3-4

* Exclusively breast fed. On cow milk formulas-400mg/d
 ** On part solid food and part breast feeding. On cow milk formulas-400mg/d
 # ICMR (2010): Ca & P: 1-9 year 600 mg/d, 10-18 years 800mg/d, Mg: similar to AAP.
 @tolerable upper limit- 0-12mo:1 mg, 1- 8 yrs: 2 mg, older children and adults: 10 mg

IRON

Dietary intake, as well as status of iron stores at birth, determines iron needs for older infants and young children. Full term, exclusively breast fed, infants have sufficient iron for 4-6 months. An average of 2 servings of 15 g dry cereal per day is needed to meet the iron requirements after 6 months. If infant is unable to consume sufficient diet, 1 m/kg/d of elemental iron should be given after 6 months of age as iron drops, in exclusively as well as partially breast fed infants. Breast fed preterm and low birth weight infants need an oral iron supplementation as drops (2 mg/kg/d elemental iron) from 1 month until 12 months of age due to poor iron stores.

All infants not on exclusive breastfeeding should be fed with iron fortified formula. Full term infants fed on iron fortified formula do not need iron supplementation while preterm infants on formula should receive additional iron 1mg/kg/d.

Age	Iron intake mg/d (RNI/RDA)
0-6 mo	No supplementation for exclusively breast fed / fortified formula fed infants
7-12 mo	6-18 mg/d depending on bioavailability
1-6yrs	4-12 mg/day
7 - 9yrs	6-18 mg/day
11-14 yrs	10-30mg/d in males / pre-menarche females. 20-60mg/d in post menarche
15-17 yrs	12-36mg/d in males. 20-60 mg/d in females

MICROMINERALS

An element is considered to be a trace element or micro mineral if it constitutes less than 0.01% of total body weight. They include copper, iodine, zinc, manganese, selenium, chromium, molybdenum. (Table6).

VITAMINS

Vitamins are organic nutrients essential for body functions and are needed in small amounts. They are fat soluble vitamins (A, D, E, K) or water soluble vitamins (thiamine (B1), riboflavin (B2), pyridoxine (B6), folic acid, vitamin B12, ascorbic acid (vitamin C). Water soluble vitamins are not stored in body except some storage for folic acid and vitamin B12 in liver. Any surplus intake is excreted in urine. Fat soluble vitamins are stored in body and surplus intake beyond safe limit is harmful. (Table7).

Age	I mcg/d*	Zn mg/d*	Cu mg/d**	Mn mg/d**	Se mcg/d**	Cr mcg/d**	Mo mcg/d**
0-6 mo	90	Breast fed- 1-3 Formula fed 2-4	0.2	0.003	15	0.2	2
7-12 mo	90	Breast fed-1-3 Formula fed 2-4	0.22	0.6	20	5.5	3
1-6 yrs	90	2.5-9	0.35-0.45 (1-8 yrs)	1.2-1.5 (1-8 yrs)	20-30 (1-8 yrs)	11-15 (1-8 yrs)	17-22 (1-8 yrs)
7- 9 yrs	120 (7-12 years)	3-11	0.7 (9-13 yrs)	1.9/1.6 (9-13 yrs)	40 (9-13 yrs)	25/21 (9-13 yrs)	34 (9-13 yrs)
10-18 yrs	150 (13-18 years)	5-17	0.9 (14-18 yrs)	2.2/1.6 (14-18 yrs)	55 (14-18 yrs)	35/24 (14-18 yrs)	43 (14-18 yrs)

*Adapted from WHO,2004
**adapted from AAP recommendations 2006

Age	Vit. A mcg retinol equi- valent /d*	Vit. D** mcg/ d	Vit. E# mg/ d	Vit. K## Mcg -/day	Vit B1 mg/ d	Vit. B2 mg/d	Vit. B6 mg/d	Niaci n mg/d	Folat e mcg/d	Vit B12 mcg/ d	Vit . C mg/ d
0-6 mo	375	5	4	5	0.2	0.3	0.1	2	80	0.4	25
7-12 mo	400	5	5	10	0.3	0.4	0.3	4	80	0.7	30
1-3yrs	400	5	6	15	0.5	0.5	0.5	6	150	0.9	30
4-6 yrs	450	5	7	20	0.6	0.6	0.6	8	200	1.2	30
7 -9yrs	500	5	7	25	0.9	0.9	1.0	12	300	1.8	35

Table 7- Recommended adequate dietary vitamin intake⁶

Age	Vit. A mcg retino l equi- valent /d*	Vit. D mcg/ d	Vit. E# mg/ d	Vit. K## Mcg -/day	Vit B1 mg/ d	Vit. B2 mg/d	Vit. B6 mg/d	Niaci n mg/d	Folat e mcg/d	Vit B12 mcg/ d	Vit . C mg/ d
10- 18yr s	600	5	11- 15	35- 55	1.1	1.3/1. 0	1.3/1. 2	16	330	2.4	40

* body converts β -carotene from fruits and vegetables into retinol. β -carotene yields 50% retinol and only 50% of dietary β -carotene is absorbed. Thus, 1 mg of β carotene in diet provides 250 mcg of retinol. Vitamin A activity is expressed as retinol activity equivalent (RAE). 1 RAE=3.3 IU.
 ** 5 microgram cholecalciferol=200 IU
 # 1mg D- α -tocopherol=1 tocopherol equivalent (TE) = 1 IU.
 ## all neonates should receive 0.5 mg (preterm) / 1.0 mg (term) vitamin K as single intramuscular dose at birth.

Table 8- Recommendations for nutritional needs of LBW infants^{2,10}

Element	Element	Consensus recommendations
Energy	Intake	110-165 kcal/kg/d
	Density	65-85 kcal/dl
Fluid		130-200 ml/kg/d
Protein	Intake	2.9-4.0 g/kg/d
	Density	2.25-3.1 g/100 kcal
	Whey : casein ratio	Whey predominant
	Amino acids	Should not fall below human milk content
Fat	Intake	4.0-9.0 g/kg/day
	Density	3.6-7.0 g/100 kcal or 40-50% of total energy
	Linoleic acid	>3% of total energy or 0.46 -1.3g/100 kcal
	Linoleate: linolenate	5-15
	Docosahexaenoic acid	> 21 mg/kg if <1000g and > 16 mg/kg if >1000 g
	Arachidonic acid	\geq 28 mg/kg if <1000g and \geq 24 mg/kg if >1000 g
	MCT	< 40% of total fat
Carbo- hydrates	Intake	<15 g/kg/day of lactose
	Type	Lactose; glucose polymers and lactose (50:50); starch hydrolysates; sucrose; glucose
	Density	Lactose <8 g/dl, total carbohydrates <11g/dl
Minerals	Sodium	1.3-3.5 mmol/kg/day
	Chloride	2.0-3.5 mmol/kg/day
	Potassium	2-5 mmol/kg/day
	Calcium	90-250 mg/kg/d

Element	Element	Consensus recommendations
	Phosphorus	65-125 mg/kg/d
	Ca : P ratio	1.4-2.0
	Magnesium	8-15 mg/kg/d
	Zinc	1.0-3.0 mg/kg/d
	Copper	110-150 mcg/kg/d
	Iron	2-4 mg/kg/day
	Iodine	10-60mcg/kg/day
	Selenium	1.3-4.5 mcg/kg/day
	Chromium	0.1-2.25 mcg/kg/day
	Manganese	0.7-7.75 mcg/kg/day
	Molybdenum	0.3 mcg/kg/day
Vitamins	Vitamin A	700-1500 IU/kg/day
	Vitamin K	0.5-1.0 mg at birth
	Vitamin E	4.0-11 IU/100 kcal/day
	Vitamin D	150-400 IU/kg /day
	Ascorbate	18-24 mg/kg/day
	Thiamine	180-240 mcg/kg/d
	Riboflavin	250-360 mcg/kg/d
	Niacin	3.6-4.8 mg/kg/day
	Pantothenate	1.2-1.7 mg/kg/day
	Biotin	3.6-6.0 mcg/kg/day
	Folate	25-50 mcg/kg/day
	Vitamin B ₁₂	0.3 mcg/kg/dy

REFERENCES

1. Institute of Medicine, Food and Nutrition Board: Dietary Reference Intakes: Applications in Dietary Planning. Washington, National Academy Press, 2003.
2. RDA 2010. Indian council for medical research, Nutrient requirements and recommended dietary allowances for Indians, report of expert group. National Institute of Nutrition, ICMR. Hyderabad. 2010
3. FAO/WHO/UNU Expert Consultation: Human Energy Requirements. Food and Nutrition Technical Report Series 1. World Health Organization, Rome.2004.
4. Joint FAO/WHO/UNU Expert Consultation on Protein and Amino Acid Requirements in Human Nutrition. WHO Technical Report Series No.935, 2007.
5. Kleinman RE, ed , Pediatric Nutrition Handbook, 6th edition. American Academy of Pediatrics, Elk Grove Village, IL60007-1098, 2009. Pp79-486
6. World Health Organization. Vitamin and mineral requirements in human nutrition. Ed2, Geneva, WHO,2004.
7. European Society of Pediatric Gastroenterology and Nutrition (ESPAGAN):Committee on Nutrition of Preterm Infants. Nutrition and feeding of preterm infants. Acta Pediatr Scand1987; (suppl.) 336:1-14
8. American Academy of Pediatrics: Committee on Nutrition. Nutritional needs of low birth weight infants. Pediatrics1985; 75:976-86.

APPLIED ANATOMY AND PHYSIOLOGY OF THE MAMMARY GLANDS

Dr. Jayant Shah

*Such a spectacular survival strategy that we call ourselves after the mammary gland, mammals...animals that suckle their young... **Gabrielle Palmer**, author and activist.*

ANATOMY OF THE HUMAN BREAST

INTRODUCTION

The human breast experiences dramatic changes in size, shape, and function from birth through pregnancy, lactation, and ultimately involution. It undergoes four major phases of growth and development in utero, during the first two years of life, at puberty, during pregnancy and lactation, and finally involution.

BREAST DEVELOPMENT (1)

I. Embryo and Neonate:

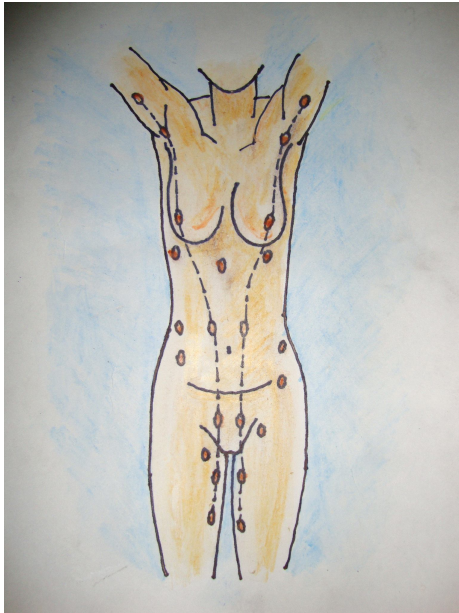
The mammary glands develop as ingrowths of the ectoderm into the underlying mesodermal tissue along the milk line running bilaterally from the axilla to the groin. The compressed mesoderm becomes concentrically arranged which later gives rise to the gland's stroma. The in-growing mass of the ectodermal cells later form the gland's future lobes and lobules much later, to the alveoli. Mesenchymal cells differentiate into the smooth muscle of the nipple and areola.

Lactiferous ducts and their branches form and open into a shallow epithelial depression known as the *mammary pit*. which becomes *elevated* as a result of the mesenchymal proliferation, forming the nipple and the areola. An *inverted nipple* results when the pit fails to elevate.

II. Childhood (Pre-puberty): The glands merely keep pace with general physical growth.

III. Puberty: Organogenesis involves ductal and lobular growth and begins before and continues through puberty. This results in growth of breast parenchyma along with its surrounding fat-pad.

Proliferation of ductal tissue takes place during each menstrual cycle. Complete development of mammary function occurs with pregnancy.



IV. Pregnancy, Lactation and Post-lactation:

Early in pregnancy, marked ductular sprouting with some branching and lobular formation occurs, stimulated by estrogen. Dilation of superficial veins, heaviness, and increased pigmentation of nipple and areola take place. During the last trimester, the enlargement is due to parenchymal cell growth and distention of alveoli with early colostrum. During lactation, further growth and distention occurs.

After lactation is over, the secretions are gradually absorbed, alveoli gradually collapse and perialveolar connective tissue increases.. However, the gland does not return completely to the pre-pregnancy state. Alveoli do not totally involute.

GENERAL ANATOMY OF MATURE HUMAN BREAST

A. Exterior Breast:

Located in the superficial fascia (fibrous tissue beneath the skin) skin surface contains the nipple, areola, and Montgomery glands.

Tail of Spence: Some glandular tissue projects into the axillary region. This is distinguished from the supernumerary tissue as the tail of Spence as it connects to the central duct system. Supernumerary tissue does not. It is a potential area of milk pooling, engorgement, and mastitis.

Size of the breasts is mainly due to the variation in amount of fat tissue. The functional glandular tissue is more or less the same. The size is not related to the functional capacity of total lactation. However, the size may indicate the milk-storage potential.

B. The Nipple-Areola Complex:

The Nipple:

Nipple Features:

Four to 18 milk duct openings are present on the nipple.

Smooth muscle fibers form a closure mechanism that prevents the milk from continuously leaking.

There are sebaceous and apocrine sweat glands but no hair.

There is a dense innervation of sensory nerve endings.

It is elastic in nature.

Nipple Erection:

The muscles are arranged in two layers- The inner longitudinal, and the outer circular and radial muscles. When these muscles contract, the nipple becomes erect. The erect nipple is supported by fibro-elastic tissue and local venostasis that decreases the surface of the areola. The erect nipple changes shape to a smaller, firmer, and more prominent projection to aid the infant in latching.

The Areola:

It enlarges during pregnancy and lactation. It is also extremely elastic. It is constructed of smooth muscles and collagenous, elastic connective tissue fibers in radial and circular arrangement. The areola darkens during pregnancy and always maintains some darker pigmentation thereafter. The areola's darker color may be a visual signal to the newborn so that the baby will close the mouth on the areola and not on the nipple alone, to obtain milk.

Montgomery Tubercles, present in the areola, enlarge during pregnancy and look like small, raised pimples. They secrete a substance that lubricates and protects the nipple and areola during pregnancy and lactation. They also produce the mother's individual scent that attracts the baby to the breast. Increased number of Montgomery glands is associated with increased infant weight gain in the first 3 days of life, increased latching speed and sucking activity, and decreased time to onset of lactation in primiparous mothers, suggesting that there is indeed a functional role of the Montgomery glands during lactation.(5) A small amount of milk is also secreted from these tubercles. After lactation, these glands recede to their former unobtrusive state.

C. The Parenchyma:

This is the functional part of the breast. The parenchyma includes the ductular-lobular-alveolar structures. The understanding of the anatomy of the breast has undergone major revision recently.(4,5) The gland is composed of secretory acinar units in which the ducts terminate. Clusters of alveolar cells are surrounded by a contractile unit of myoepithelial cells that are responsible for ejecting milk into the ductules. About 15-20 lobes are arranged like spokes, converging on the nipple. Each lobe is divided again into 20-40 lobules and each lobule is again subdivided into 10-

100 alveoli. Ductules from lobes converge into larger lactiferous ducts. Some ducts merge leading to fewer ductular orifices than the respective lobes.

Old versus New concept

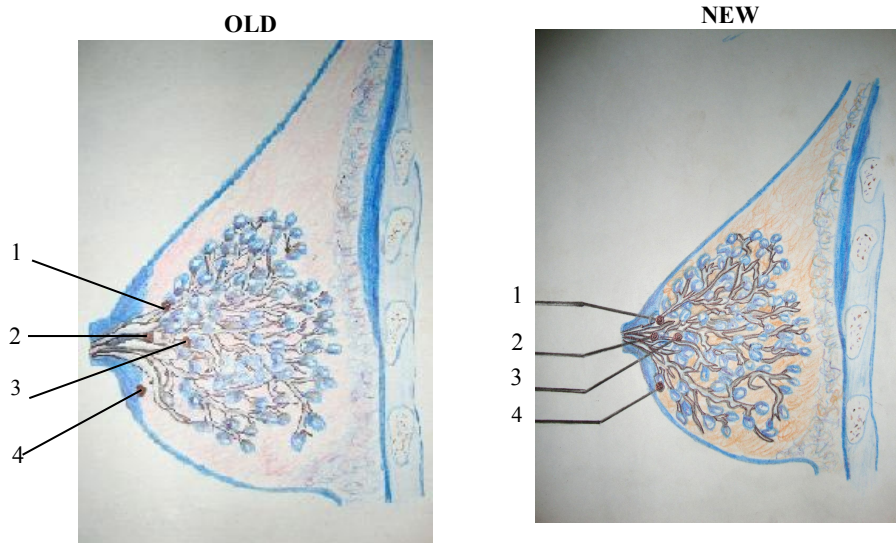
The conventional model of the breast is based on wax casts and dissections by Sir Astley Cooper. It introduced several artifacts into the model. The injection of the colored wax into the milk duct openings at the nipple inflated those ducts, giving the impression that near the nipple they expand into milk storage sacs called '*lactiferous sinuses*'. Dr Donna Geddes (nee Ramsay)(4,5) and her colleagues have studied the normal breast with sophisticated ultrasound and found out many differences.

Milk ducts branch closer to the nipple.

The conventionally described *lactiferous sinuses* do not exist.

Glandular tissue is found closer to the nipple.

Subcutaneous fat is minimal at the base of the nipple.



The other novel insights not identified in the figure are:

The external shape or size of the breast is neither predictive of its internal anatomy, nor of its lactation potential.

The ratio of glandular to fat tissue rises to 2:1 in the lactating breast compared to 1:1 ratio in the non-lactating breast. The fatty tissue is organized in 3 clearly defined areas.

Sixty-five percent of the glandular tissue is located within 30mm from the base of the nipple. The glandular tissue is more than what was previously believed.

Four-18 milk ducts are present in the nipple. (Textbooks denote 15-25 ducts).

Network of the ducts is complex, not homogeneous. It is neither always arranged symmetrically, nor in a radial pattern.

The ducts do not act as reservoirs for milk.

This changed knowledge of anatomy also changes our understanding of milk production and mechanism of breastfeeding. It will also help the surgeons in augmentation- and reduction- surgeries of the breast so that the future lactation potential is not compromised.

Because of the uneven distribution of the milk glands, the absence of the lactiferous sinuses, and the variability in the number of milk ducts, mothers need to consider their own particular anatomy when deciding how to use their hands to support their breasts during breastfeeding or manual expression.

D. The Stroma:

This includes the connective tissue, fat tissue, blood vessels, nerves, and lymphatics.

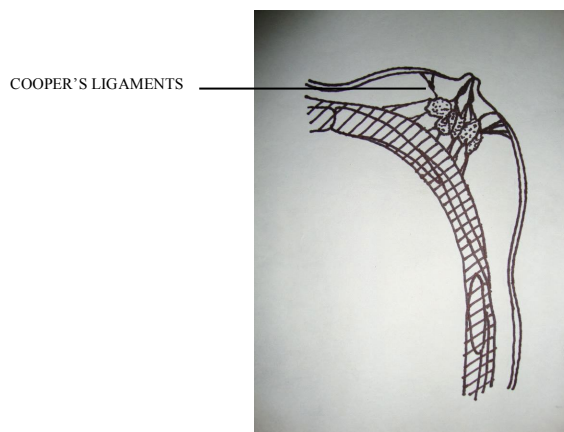
Cooper's Ligaments- running vertically through the gland and fixes the breast to the overlying dermis and the underlying pectoral fascia. The breast contains no supporting muscles and relies on the ligaments to sustain its shape.

E. Innervation:

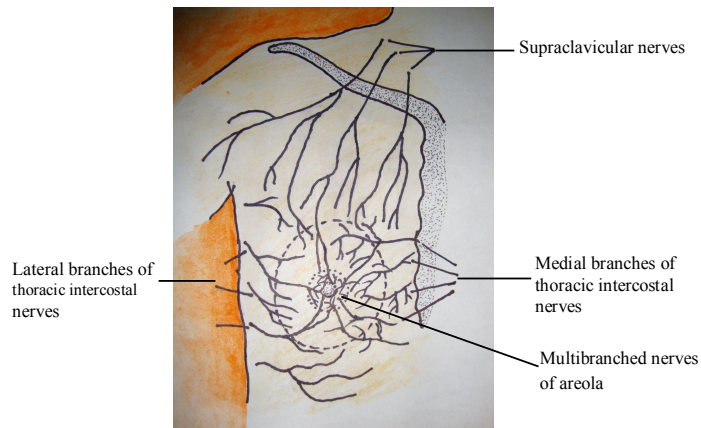
Breast innervation comes mainly from the branches of the 4th, 5th, and 6th intercostal nerves.

The sensory innervation of the nipple and areola is extensive and consists of both sensory and autonomic nerves. Nerve supply to the innermost areas is sparse and predominantly autonomic. Only sympathetic fibers are found. No parasympathetic or cholinergic fibers supply any part of the breast.

The 4th intercostal nerve penetrates the posterior aspect of the breast.



- It supplies the greatest amount of sensation to the areola. It enters the posterior aspect of the breast at the 4th intercostal space i.e. at 4 o'clock position on left breast and 8 o'clock position on the right breast.
- The lowermost branch penetrates the areola at 5 o'clock position on left and 7 o'clock position on right. Trauma to this nerve might result in some loss of sensation in the breast, nipple and areola. This injury could occur during breast-augmentation or breast-reduction surgeries.
- Aberrant sensory or autonomic nerve distribution in the nipple/areola complex may affect milk ejection reflex and secretion of prolactin and oxytocin.



VARIATIONS AND ABNORMALITIES

Breasts vary in size, shape, color, and placement on the chest wall. Some quadrants may not develop well in some individuals.

Breast Malformations:

Hypermastia: Presence of accessory mammary glands. Accessory or supernumerary gland develops along the milk line. It may involve breast parenchyma, areola and the nipple. About 2-6 percent of women have hypermastia. Often prominent during pregnancy and lactation, depending upon the tissue present. It may be associated with renal or other organ-system abnormalities. Accessory glandular tissue can lactate and undergo malignant changes.

Amastia: Congenital absence of breast and nipple. This is very rare.

Amazia: Nipple is present, but there is no breast tissue.

Hyperthelia/Polythelia: Along with normal breasts, extra nipple is present without its own breast tissue.

Hypertrophy/Hyperplasia: Abnormally large breast, over-development of breast.

Hypomastia/Hypoplasia: Abnormally small breast, under-development of breast. They may have tubular or tuberous shape due to lack of glandular tissue. This type of breast *may have increased risk for insufficient milk.*

Poland Syndrome: Unilateral hypoplasia of breast, with hypoplasia of thorax and pectoral muscles. It may also include symbrachydactyly, hypoplasia of middle phalanges and central skin webbing.

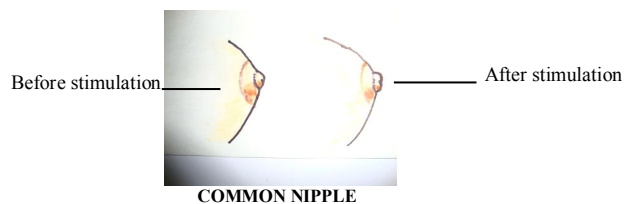
Hyperadenia: Presence of mammary tissue without nipples. The swelling and secretion of this tissue may produce pain during lactation.

Symmastia: Webbing between breasts.

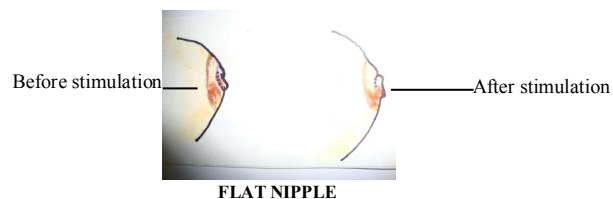
Inequality or Marked Asymmetry: Not very common. However, slight asymmetry is almost always present.

Nipple Variations: Poor nipple protractility is common in primigravid women. Protractility improves during pregnancy. Five basic types of nipples have been described:(2)

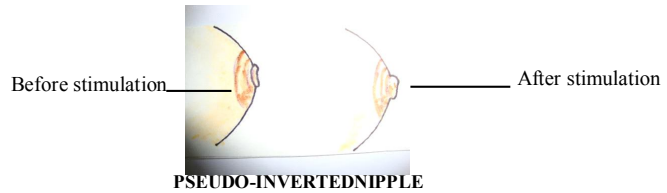
Common Nipple: The majority of mothers have *common nipple*. It protrudes slightly when at rest and becomes erect and more graspable when stimulated. A baby has no trouble finding and grasping this nipple in order to pull a large amount of breast tissue and stretch it to the roof of his/her mouth.



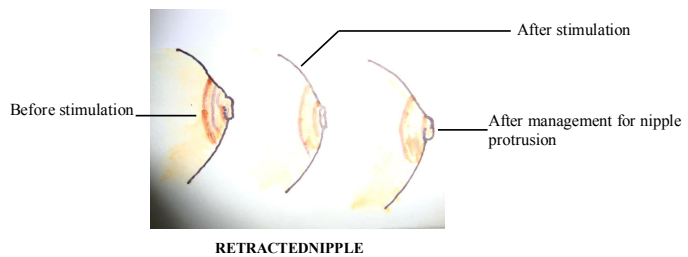
Flat Nipple with or without Short Shank: The *flat nipple* may be soft and pliable and have the ability to ridge; it molds to the infant's mouth without problem. The *flat nipple may have a short shank* that makes it less easy to ridge and for the baby to find and grasp. In response to stimulation, this nipple may remain unchanged or may retract with compression. This nipple may benefit from the use of a syringe to increase protractility.



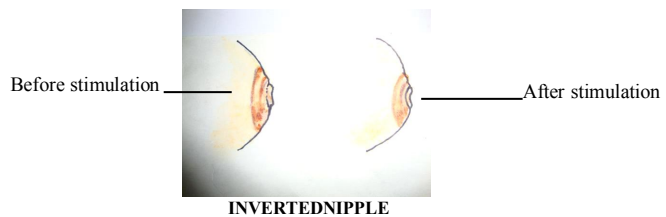
Pseudo-inverted Nipple: A *pseudo-inverted nipple* may appear inverted but becomes erect after compression and/or stimulation. This nipple needs no correction and presents no problems to the baby to grasp.



Retracted Nipple: The *retracted nipple* is the most common type of inverted nipple. Initially, this nipple appears to be graspable. However, on stimulation, it retracts, making attachment difficult. This nipple responds well to techniques that increase nipple protrusion.



Inverted Nipple: The *truly inverted nipple* is retracted both at rest and when stimulated. Such a nipple is very uncommon and more difficult for the baby to grasp. All techniques used to enhance protractility of the breast tissue can be used to improve attachment. Even if the nipple remains retracted, the baby should be able to latch on if the mother helps form a teat of breast tissue into the baby's mouth.



Other nipple variations like *bulbous*, *dimpled*, *bifurcated*, *double or multiple closely placed nipples*, or *skin tag* may make attachment difficult for the baby.

Acquired Abnormalities: These are usually iatrogenic; sometimes accidental.

- Chest wall trauma in infants due to chest tube insertion.
- Biopsy in pre-pubertal girls may remove vital tissue.
- Cutaneous burns to the chest wall.

APPLIED PHYSIOLOGY OF THE BREAST

INTRODUCTION

The breast undergoes growth, differentiation, and lactation in response to a complex interplay of hormones and stimulation. Lactation is the physiologic completion of the reproductive cycle. The stages are-

Mammogenesis: Development of mammary gland and related structures.

Lactogenesis I: Beginning of secretory cellular activity and accumulation of colostrum from about 10-12 wk of gestation. (2)

Lactogenesis II: After placental delivery, the establishment of fuller milk supplies.

Lactogenesis III: The stage of mature milk production and maintenance of its supply.

Involution: Regression of the changes after the lactation is over and returns to the near pre-pregnancy state.

The hormonal changes during pregnancy and post-partum are *dynamic* leading to milk production and compositional changes in milk. The breasts are capable of full lactation from about 16wk of pregnancy onwards.(1,2) The concept of milk '*coming in*' is fallacious in that the milk is already present before delivery in the form of colostrum.

Milk production is under *endocrine* control before delivery of placenta and changes to *autocrine* control during lactogenesis II. Abundant milk production is prevented before placental delivery by the inhibiting placental hormones. After delivery, this check is removed. With the stimulus of infant's suckling, copious amounts of milk is produced.

MAMMOGENESIS

Physiologic Changes during pregnancy

Early in pregnancy ductal sprouting-branching-differentiation in alveoli and lobes form. Blood flow, interstitial water and electrolytes increase. New capillaries form.

During the last trimester, secretory cells fill with fat droplets and alveoli become distended with colostrum.

Mammary cells become competent to secrete milk proteins at around 16wk of pregnancy but are kept in check by high levels of steroids, particularly progesterone.

Most milk products secreted during pregnancy go back into the plasma via the 'leaky junctions' (spaces between the alveolar cells).

Hormonal Control in relation to mammogenesis

Placental lactogen, prolactin, chorionic gonadotrophins, and 17 β -estradiol accelerate the mammary growth.

Glucocorticoids enhance formation of lobules.

Estrogen increases during pregnancy and stimulates ductular proliferation.

Prolactin in Mammogenesis

Essential for complete growth of mammary gland.

Prolactin levels rise throughout pregnancy.

Stimulates prolactin receptor sites located on the alveolar cell surfaces.

Lactogenesis II occurs early if the woman has breastfed before, possibly due to *the increased number of prolactin receptor sites*.

In non-nursing mothers, prolactin levels fall to pre-pregnant levels by 2 wk postpartum.

Prolactin is prevented from exerting its effect on milk secretion by elevated levels of progesterone and estrogen during pregnancy.

'Prolactin-inhibiting Factor' (PIF) is secreted by the hypothalamus to negatively control the effects of prolactin.

Progesterone in Mammogenesis

Increases during pregnancy.

It stimulates lobulo-alveolar growth while suppressing secretory activity.

Sensitizes the mammary cells to the effects of insulin and growth factors.

LACTOGENESIS I

This is the beginning of the secretory activity around midpregnancy. It involves significant increases in lactose, total proteins, and immunoglobulin and decreases in sodium and chloride.

Breast begins synthesizing unique milk components. Human Placental Lactogen (HPL) is thought to be responsible for this.

Thyroid hormones increase the responsiveness of the mammary cells to prolactin.

Three main hormones are necessary for initiation of lactation - *prolactin, insulin and hydrocortisone*. Supportive hormones include thyroid-parathyroid hormones, and growth hormone.

Colostrum shows a gradually increasing presence of lactose, casein and α -lactalbumin.

Colostrum is available to the infant at delivery (milk does not have to 'come in').

LACTOGENESIS II

Lactogenesis II is the onset of copious milk production.

Occurs 30-72 hr after delivery of the placenta.

Women do not typically begin feeling increased breast fullness until 2-3 days after the delivery.

Lactogenesis II is under *autocrine* control.

Placental expulsion following delivery leads to an abrupt decline in the levels of human placental lactogen (HPL), estrogen and progesterone.

Decline in the progesterone levels is thought to be the major initiating event for lactogenesis II, as progesterone is a prolactin-inhibitor. This decline in progesterone in the presence of lactogenic hormones like prolactin, glucocorticoids, and insulin leads to full lactogenic activity. The initiation process does not depend on suckling by the infant until 3rd-4th day, when secretion declines if milk is not removed from the breast.

Levels of citrate and α -lactalbumin in the milk rise sharply at the onset of lactogenesis II.

Major changes in the milk composition continue for about 10-14 days. From day 7-14, the milk is called *transitional*, and after 2 wk '*mature milk*' is established.

Lactogenesis II may be delayed by

Maternal fluid loads in labor.

Maternal health status.

Women with Type I diabetes mellitus: There might be a temporary imbalance in the amount of insulin required for glucose homeostasis and insulin required for initiation of lactation.

Retained placental fragments- as they would continue to secrete progesterone and HPL.

LACTOGENESIS III

This was previously called galactopoiesis- maintenance of lactation. Milk contains a whey protein called '**feedback inhibitor of lactation (FIL)**'. FIL slows down milk synthesis when the breast is full. Rate of milk synthesis slows when milk accumulates in the breast as more FIL is present. Rate of milk synthesis speeds up when milk is removed from the breast and less FIL is present. Ability to continue making milk is hence dependent on milk removal. More frequent milk removal will thus produce more milk. It controls the secretion of all milk constituents simultaneously; i.e. it affects *secretion*, not *composition*.

Prolactin in Lactogenesis

Plasma prolactin levels increase sharply after placental delivery and change with frequency, intensity and duration of nipple stimulation. Prolactin levels fall about 50% in 1 wk post-partum. Prolactin in non-lactating woman falls to baseline in 14 days.

Frequent feeding in the early lactation stimulates development of *prolactin receptor sites* in the mammary gland. The number of prolactin receptor sites is thought to be the controlling factor in breast milk production and not the amount of prolactin. While prolactin is necessary for milk secretion, its levels are not directly related to the volume of milk produced.

Prolactin release occurs only in response to direct stimulation of nipple and not as a psychological effect of the presence of the baby. Thus, even a worried or stressed mother is capable of producing enough milk.

Prolactin levels are notably *higher at night* than during the day, despite greater nursing times during the day. Hence breastfeeding at night is especially helpful in keeping up the milk supply.

Prolactin seems to make the mother feel relaxed and sleepy, so she usually rests well even if she breastfeeds at night.

The prolactin level is highest at about 30 min after beginning of a feed, so its most important effect is to produce milk for the *next* feed.

Human Placental Lactogen disappears within hours after delivery, **progesterone** drops over several days, and **estrogen** falls to baseline levels in 5-6 days. Although fall in progesterone level is the main trigger for lactogenesis II progesterone does not inhibit established lactation later. Estrogen enhances the effect of prolactin on mammogenesis but antagonizes prolactin in lactogenesis.

Suckling stimulates the release of prolactin from the anterior pituitary and of oxytocin from the posterior pituitary. These hormones stimulate milk *synthesis* and milk *ejection* respectively. Thus suckling, emptying of the breast, and receiving adequate precursor nutrients are essential for effective lactation. When milk is not removed, secretion ceases in a few days, and the composition of the mammary secretion returns to the colostrum-like fluid. Suckling also releases other pituitary hormones like *gonadotrophin releasing hormone* (GnRH), follicle stimulating hormone, and luteinizing hormone, which results in suppression of ovulation and menstruation. Therefore, frequent feeding can help delay new pregnancy. Frequent feeding at night is more important for this effect to occur.

Foremilk and Hindmilk

The initial part of the milk in a feed is foremilk and towards the end it is hindmilk. All milk starts out as concentrated milk, referred to as *hindmilk*. When milk remains in the breast, it draws in water

and lactose and becomes more dilute *foremilk*. Human milk fat content progressively increases during a single nursing.

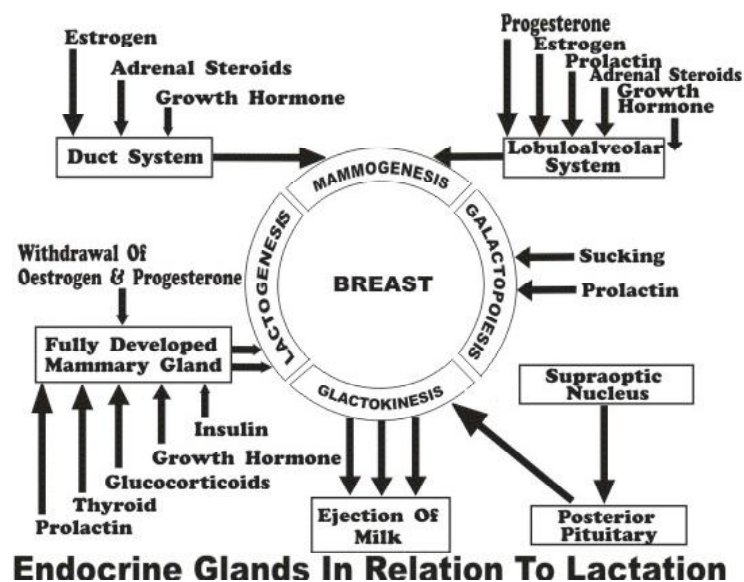
Caloric content of mature milk

Mean energy in Colostrum is 67kcal/dL and in Mature milk is 75kcal/dL.

The amount of fat and thus the caloric content in the human milk changes depending on the time since the last feeding. The longer the interval, the lower the fat concentration. Fat content in the human milk is also influenced by maternal metabolism, maternal weight, maternal diet, and frequency of feeds. High weight gain in pregnancy is associated with increased milk fat.

INVOLUTION

It occurs when milk-producing system in the breast is no longer being used. Complete involution varies among women and may occur approximately 40 days after complete cessation of breastfeeding. It is dependent upon the type of weaning process, whether abrupt or gradual. Probably the longer the duration of breastfeeding, the longer it takes for the production to go away completely. Maternal body type, obesity, maternal diet, rate of metabolism, and maternal medications may also affect the process of involution. Post-lactational involution of the mammary gland is characterized by two distinct physiologic processes- Secretory epithelial cells undergo *apoptosis* and *programmed cell death*, and the mammary gland's basement membrane undergoes *proteolytic degradation*.



GENERAL INFORMATION

Milk synthesis is controlled *independently in each breast*. If one breast is suckled significantly less frequently over a period of time, its secretion may fall compared with the more frequently suckled breast.

Storage capacity of the breasts varies greatly among women. Measured storage capacity of a breast increases with the breast size.

Small breasts are capable of secreting as much milk over a 24-h period as are large breasts.

MILK SYNTHESIS PROCESS

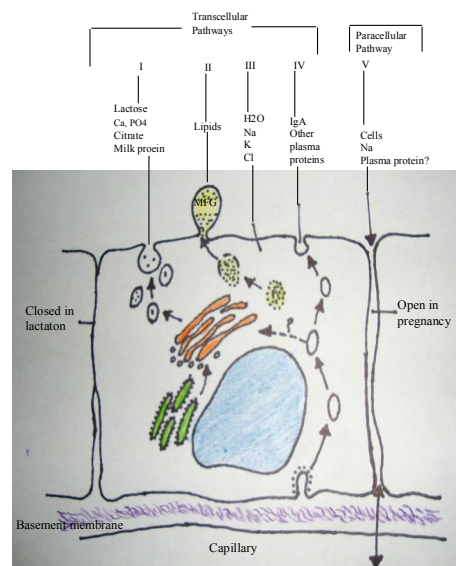
Cells lining both the alveoli and smaller ductules secrete milk.

Fullness of breast and rate of synthesis are inversely related.

Rate of milk synthesis varies widely [17-33 mL/h].

Milk is stored in the alveoli & small ducts & compresses and flattens the cells.

Five Pathways are involved in the milk synthesis: These include four major *transcellular* pathways and one *paracellular* pathway. (1,6)



Pathway I: *Exocytosis* of milk protein & lactose. **Pathway II:** Milk fat secretion via the milk fat globule (MFG). **Pathway III:** *Transmembrane* secretion of ions and water across the apical membrane. **Pathway IV:** *Transcytosis* of immunoglobulin. **Pathway V:** *Paracellular* pathway for plasma components and leukocytes

Milk Enzymes:

Some milk enzymes enter the alveolar milk from blood capillaries via the intercellular fluid. Others come from breakdown of the mammary secretory cells. The milk contains lipase, proteolytic enzymes, protease inhibitors, amylase, lysozyme peroxidase and many others.

Milk Release Milk Ejection Reflex or Let Down Reflex

Neuroendocrine involvement in milk ejection: Milk ejection involves a neural afferent pathway and an endocrinologic efferent pathway. Tactile receptors for both oxytocin and prolactin are present in the nipple and areola. Direct stimulation of them triggers the ejection reflex.

The nipple is the most sensitive area to both touch and pain, followed by the areola; the least sensitive area is the cutaneous breast tissue. The tactile sensitivity is similar in boys and girls before puberty. In the female, it increases after puberty and is increased at mid-cycle and during menstruation. Dramatic changes occur within 24h of delivery.

Estrogen treatment suppresses the prolactin release in response to tactile stimulation. On withdrawal of estrogen the prolactin response returns. *Increased tactile sensitivity* may be the key event in activating the suckling- induced release of oxytocin and prolactin at delivery.(1)

Impulses from the cerebral cortex, ears, and eyes also elicit the release of oxytocin through exteroceptive stimuli (such as hearing a baby cry). The reflex becomes conditioned to the mother's sensations and feelings, such as touching, smelling or seeing her baby, or hearing the baby cry, or thinking lovingly about the baby. If the mother is in severe pain or is emotionally upset, the oxytocin reflex may become inhibited, and her milk may suddenly stop flowing well. If she is supported, comforted and continues to feed the baby, the milk will again start flowing. It is important to understand the oxytocin reflex as it explains why the mother and the baby should be kept together and why they should have maximum skin-to-skin contact with each other.

The alveolus is enveloped in a basketlike network of myoepithelial cells that respond to oxytocin by contracting, and expelling the milk in larger and larger ductules until it can be removed by the infant.

Oxytocin also causes contraction of myometrium and involution of the uterus. Oxytocin thus first facilitates delivery and then promotes milk ejection sequentially.

Oxytocin is produced more quickly than is prolactin. It makes the milk that is already present in the breast to flow for the *current* feed, and helps baby get milk easily.

Some women feel milk ejection reflex as increased pressure or tingling within the breast or as shooting pains, whereas some women never feel the milk ejection reflex. Mothers, especially multiparous women, with each breastfeeding may also feel uterine cramping for the first few days after delivery. Mothers may also feel increased thirst, a warm or flushed feeling.

Milk ejection signs can be seen when the baby begins gulping milk. The rapid pattern of two sucks per second decreases.

Oxytocin

Oxytocin is produced in the supraoptic and paraventricular nuclei of the hypothalamus and released from the posterior pituitary. Receptors have been identified for oxytocin in the uterus and the breast as well as the brain. Oxytocin is not just a female hormone; it is produced by both males and females. a) A simultaneous and closed secretion of oxytocin occurs into the brain regions of the lactating mother. Oxytocin is released in the infant's brain also.

It permeates the areas of the brain associated with mothering and bonding behaviors. It enhances the mother's ability to interact with the infant. Hence oxytocin is called the hormone of calm, love and healing.

It lowers maternal blood pressure.

It decreases cortisol levels, decreases anxiety and aggressive behavior.

It causes contraction of myoepithelial cells.

Its principal action is to stimulate prostaglandin synthesis in uterine tissues.

It optimizes the transfer of energy to the mammary gland.

After suckling is initiated, the oxytocin response is transient and intermittent rather than sustained. Nipple stimulation causes oxytocin release of brief 3-4 second bursts into the blood stream every 5-15 minutes.

It causes shortening of the ducts without constricting them, thus increasing the milk pressure.

Cutaneous temperature of the breast increases with the release of oxytocin.

Oxytocin effects are enhanced when ventral side of the body is stroked. This helps in explaining the effectiveness of Kangaroo Mother Care and Breast-Crawl.

KEY FACTS

The breasts are capable of full lactation from about 16wk of pregnancy onwards. The concept of milk '*coming in*' is fallacious in that the milk is already present before delivery in the form of colostrum.

Prolactin levels are notably *higher at night* than during the day, despite greater nursing times during the day. Hence breastfeeding at night is especially helpful in keeping up the milk supply. Despite such night feeding, mother usually rests well as Prolactin seems to make the mother feel relaxed and sleepy.

Oxytocin (the let down) reflex is affected by the psychological status of the mother and the sight, sound, smell, touch etc of the baby. This is why the mother and the baby should be kept together and should have maximum skin-to-skin contact with each other.

MAIN SOURCES & REFERENCES

1. Breastfeeding- a guide for the medical profession 6th ed. Ruth a. Lawrence, Robert M. Lawrence.
2. Core curriculum for lactation consultant practice- ILCA 2nd ed.
3. Infant and young child feeding-Model chapter for textbooks for medical students and allied health professionals. World health organization 2009.
4. Ramsay DT, Kent JC, Hartmann RA, Hartmann PE. Anatomy of the lactating human breast redefined with ultrasound imaging. *J.anat.*2005; 206-pp525-534.
5. Geddes DT. Inside the lactating breast: the latest anatomy research. *Jmwh* 2007; 52-6; pp 556-563.
6. Neville mc. Milk secretion: an overview. [Http://mammary.nih.gov/reviews/lactation/neville001_index.html](http://mammary.nih.gov/reviews/lactation/neville001_index.html) accessed on 1 Oct 2010.

DEVELOPMENTAL READINESS AND INFANT FEEDING

Dr. Akash Bang, Dr. Pushpa Chaturvedi

Feeding is a complex activity that requires both the mother and child to be ready for it. It is important that the infant's body is mature enough to feed. Initially it is a reflex behaviour and requires a certain level of neurological maturation with well developed feeding reflexes and good motor coordination along with certain level of gastrointestinal maturity. The infant's instinctive reflex actions slowly graduate into a more learned behaviour and other complex actions like development of chewing. It is imperative that health care professionals are aware of these physiologic requirements for infant feeding and are able to assess them because the type, method and approach to infant feeding depends largely on how ready the infant is for feeding.

WHAT DEVELOPMENTAL CHANGES PREPARE AN INFANT FOR BREASTFEEDING?

For the breastfeeding to be established successfully, it is important that the infant learns to search for the breast whenever he is hungry; to suck the milk out of the breast; and to swallow it. This needs well developed neonatal reflexes. The fetus goes through a continuous maturation process before it is born to attain this "readiness to feed" status.

Changes in intrauterine life

Owing to the placental transfer of nutrients, the fetus does not have to ingest, digest or absorb food and nor is excretion required. The gastrointestinal tract (GIT) and renal functions develop progressively prior to birth. Primitive reflexes like rooting, sucking and swallowing reflexes, that are required for feeding, start appearing after 28 weeks of gestation and progressively become mature. The fetus demonstrates swallowing movements and swallows amniotic fluid. By 32-34 weeks these reflexes are well developed. At this age, a preterm baby can be fed by cup and spoon. Later, after about 34 weeks of gestation, the sucking reflex is well coordinated and synchronised with swallowing. (1) Once this coordination is well achieved, the infant is ready for breastfeeding. However, at this early age, the infant is ready to receive only liquid nourishment.

Postnatal changes in a term newborn

Feeding reflexes:

A full term newborn has all the reflexes required for feeding, ready and well developed.

The Rooting reflex: When the mother's breast touches the baby's upper lips, cheeks, or the side of the mouth, the baby opens his mouth and searches for the nipple with an open mouth. This helps the baby to find the nipple and get attached properly to the breast.

The Sucking reflex: The sucking reflex is triggered when the nipple is in the baby's mouth, the lips are sealed around it and it touches the palate. The reflex consists of dropping down of the jaw and the tongue thus enlarging the oral cavity and creating a negative suction pressure; a rhythmic jaw action reinforcing this negative pressure; a peristaltic action of the tongue, which along with the negative pressure, draws in the nipple and areola to form an elongated teat; presses this teat against the hard palate; strips milk from the breast and moves it to the throat, where it triggers the swallowing reflex.

The sucking reflex also stimulates the synthesis and secretion of lactogenic hormones that evoke the mother's milk-production and ejection reflexes, and removes the peptides that might suppress alveolar milk synthesis. (2)

The Swallowing reflex: When the mouth or valleculae is filled with milk, reflex swallowing occurs followed by breathing before the next sucking action starts.

Sucking and swallowing stages overlap with each other, with approximately 4-5 swallows every 5 seconds (3) and involve a rapid coordination of suck-swallow-breathe pattern. The normal ratio of sucking to swallowing is 1:1 in newborns, and 2:1 or 3:1 (with one or more breaths between swallows) in older infants. (1)

Factors interfering with the feeding reflexes

Undeveloped / immature reflexes

- In preterm babies and Low / Very Low / Extremely Low Birth weight babies, sucking reflex may be feeble or undeveloped. Such babies may not be able to breastfeed directly. The feeding approach depends on the severity of immaturity of reflexes. As swallowing reflex matures before the sucking reflex, some babies may have weak sucking, but good swallowing and poor sucking-swallowing coordination. They may still be fed with cup and spoon. If even swallowing reflex is underdeveloped, intragastric tube feeding can be undertaken.

Depressed reflexes

- Sick infants, infants under sedation, maternal peripartum analgesia or sedation etc can lead to depressed reflexes which subsequently can interfere with normal establishment of feeding.

Abnormal reflexes

- CNS infections or bleeding, birth asphyxia, cerebral damage, severe jaundice.

Physical defects-

- Cleft lip, cleft palate, oropharyngeal malformations etc can lead to problem in feeding establishment due to abnormal anatomy.

Interference in normal reflexes-

- The infant's instinctive reflex actions need to be consolidated into learned behaviour in the postpartum period. Ultrasound studies prove that there is a marked difference between this process of breast-feeding and how infants feed from artificial teats or bottles (4) which is the basis of "nipple confusion". Hence the use of other oral objects, whether teats, dummies, pacifiers or bottles, in the neonatal period may condition the infant to different oral actions that are inappropriate for breast-feeding.
- Just after birth, these reflexes are particularly responsive to changes in suckling frequency, duration and adequacy. Hence, for initiation and maintenance of successful breast-feeding, it is imperative to follow the correct IYCF practices including an early breastfeeding within an hour of birth- when the neonatal reflexes as well as mothers' sensitivity to tactile stimuli of the areola and nipple are strongest; ensuring adequate frequency, duration, and efficiency of infant suckling; and exclusive breastfeeding. Early bedding in and IYCF awareness amongst pediatric and obstetric staff takes care of most of these factors.

Development of GIT functions

Food Ingestion- At birth, with the help of the reflexes described above, a full term infant is able to suck out the milk from the breast, conduct it to the back of the mouth and swallow it. Solid or semi-solid food placed in the young infant's mouth is normally vigorously rejected by another normal reflex called *tongue thrust or extrusion reflex*. Thus at this age, the normal infant is at a stage of functional development that allows the acceptance of an essentially liquid diet.

Food Digestion- At birth, the activity of the disaccharidases is fully developed and delta-glucosidase, which hydrolyses sucrose and maltose, and beta-galactosidase, which hydrolyses lactose, both are present at the same activity levels as those found in older infants. (5) So the digestion and utilization of milk sugar poses no problem. Full term newborns have about 10% of adult amylase activity in the small intestine (6) and pancreatic amylase is not secreted during the first 3 months of life and is at very low level up to 6 months of age. (7) Thus the infant's GIT is obviously immature for the digestion and utilization of polysaccharides. These undigested starches may interfere with the absorption of other nutrients leading to failure to thrive. (8)

Also, though the capacity to digest proteins is fully developed, the intestinal mucosa is quite permeable to larger molecules. This physiological characteristic ability of a young infant to absorb intact protein molecules (9) is postulated to be the reason behind high incidence of cow's milk protein intolerance.

Similarly, the pancreatic and hepatic functions are also immature and levels of pancreatic lipase and bile salts, both of which are required for fat metabolism, are very low. However, as almost 40-50% of calories in human milk are from fats, newborn's GIT has 2 special

developmental features that help make use of these fats. (2) These are especially important because human milk fat droplets are particularly resistant to lipolysis as they are enveloped by a layer of phospholipids and proteins. The first one is the lingual lipases secreted by posterior tongue papillae. These act in stomach and thus cause a pre-duodenal lipolysis, the products of which help in the emulsification of the mixture and compensate for the low bile salt levels. The second one is the activation of the lipases present in the human milk which helps in fat digestion and absorption as well as utilization of breast milk vitamin A. All these physiological features are either less efficient or can cause harm if complementary feeding or animal milk is introduced before 6 months of age.

Development of Renal functions:

At birth, kidneys perform all their functions, but in a limited capacity. Human breastmilk is a balanced, fully utilizable, low residue food and the metabolism in the initial months of life is predominantly anabolic. In such a favourable setting, though the newborn's kidneys have low glomerular filtration rate and low concentration capacity, they meet all the needs of elimination of the low metabolic residues of a breast-fed normal newborn. Their functional capacity rapidly increases during the first few months of life. But this delicate system can fail when the water intake is markedly reduced or solute intake is noticeably increased eg. Cow's milk intake.

A young infant's kidneys have a limited ability to eliminate hydrogen ions, and hence are more prone to develop acidosis. Similarly their phosphate excretion capacity is limited too. It is adequate if the infant is breastfed. But if put on a high phosphate diet e.g. cow's milk, the kidneys do adapt finally but take some time during which, the infant may develop transitory hyperphosphatemia due to both renal immaturity and functional hypoparathyroidism.

WHAT DEVELOPMENTAL CHANGES PREPARE AN INFANT FOR COMPLEMENTARY FEEDING?

Food Ingestion- By 6 months of age, the ability to swallow fluids offered by cup has begun to develop, the tongue thrust or extrusion reflex is normally no longer present and hence the infant is able to cope with semi-solid complementary foods. The food now can be transported to the back of the mouth and swallowed. (10) All this needs a different series of movements than those needed for sucking and swallowing liquids.

Semi-solid or pureed foods are well tolerated at first. Slowly the child develops ability for "munching" (up and down mandibular movements). Further at 7 to 9 months of age, at the same time as the first teeth are erupting, rhythmic biting or chewing movements (use of teeth) start to appear and mastication is possible. With this, even more solid food can be introduced.

6 to 10 months of age is the **critical window** for introducing “lumpy” solid foods. If this is delayed beyond 10 months of age, it may increase the risk of feeding difficulties later on in life. Hence in this age, mixers-grinders should not be used to make food softer or semisolid. Rather mashing with fingers would be a better option.

Food Digestion- By 6 months of age, pancreatic amylase reaches adequate levels and the infant can easily digest the polysaccharides present in starch based complementary foods. Unlike early infancy, proteins are absorbed as amino acids and small peptides which are further digested during their mucosal passage. Thus it is mainly the free amino acids which enter the circulation. Large molecules, which can act as antigens, do not normally cross the intestinal mucosa at this age. Thus chances of cows’ milk allergy / intolerance to other animal food based proteins is quite less. By this age, the pancreatic lipase and bile salts levels are adequately high. Pancreatic lipase digests the dietary fats. The products of digestion are then made soluble for absorption by the bile salts.

Renal system- The relatively immature neonatal kidneys subsequently mature very rapidly during the first few months of life and are able to adapt to significant variations in diet and the solute load resulting from the metabolism of newly introduced foods.

When is a child ready for Complementary Feeding?

The general recommendations are to start a child on adequately thick and energy dense complementary foods after 6 months of age. Developmentally speaking an infant is ready to begin receiving complementary foods

When the head is held erect,

The hands are put to the mouth and

Semi-solid foods are accepted without difficulty (indicating the disappearance of the extrusion reflex)

Physiologic obstacles in starting early Complementary Feeding

Presence of Tongue thrust or Extrusion reflex- may cause rejection of solids or semisolids placed in mouth.

Lower pancreatic amylase levels- problem in digestion of starches.

Higher intestinal mucosal permeability to larger protein molecules- possible risk of protein intolerance and allergies.

Lower pancreatic lipase and bile salts- So if any fats other than human milk are added to the diet, the endogenous compensatory mechanisms may fall short.

A drastic decrease in bioavailability of breastmilk iron is seen when solid complementary foods of vegetable origin are given to the breast-fed infant.

Incorrectly prepared complementary foods can increase the intestinal osmolar load. The intestinal permeability to water and electrolytes in early infancy is quite high. This may not have any significance under normal conditions, but tends to put the child at a higher risk of water and electrolyte imbalance in situations with high intestinal osmolar loads. (2)

Low GFR and low concentrating ability of young kidneys- addition of cow's milk which has a high solute load or complementary feeding can lead to hyperosmolarity and hypernatremia.

Low acid or phosphate excretion ability of renal system below 3 months of age- the infant may develop transitory hyperphosphatemia, hypocalcemia and tetany.

Physiology of cessation of lactation

Suckling is the most important stimulus for milk production and lactation continues in each breast for as long as milk is being removed from it. Breastfeeding should be continued at least till 2 years and even beyond. After cessation of suckling, the milk production does continue for some time. Unlike most mammals where milk production stops within 5 days of the last suckling episode, the period of involution in human beings averages 40 days. Within this period it is relatively easy to re-establish full lactation if the infant resumes frequent suckling. Thus during a certain post-weaning time period, children can revert to full breast-feeding. This gradual involution is also advantageous for the mother as it allows some buffer time for the immunoglobulins and lactoferrin levels to rise, which prevents local breast infections. Slowly, as various inhibiting peptides responsible for cessation of milk secretion build up in the glandular tissue of the breasts, milk production declines and eventually stops owing to the autocrine control. (2)

REFERENCES

1. Fisher SC, Galera RI. An Introductory Guide for Parents and Families: Feeding an Infant with a Cleft Lip and/or Palate. Retrieved December 11, 2010. From URL: <http://knol.google.com/k/an-introductory-guide-for-parents-and-families-feeding-an-infant-with-a-cleft#>.
2. Akre J (Ed): *Infant Feeding- The Physiologic Basis*. Geneva; WHO, 1990:19-40.
3. Goldfield EC, Richardson MJ, Lee KG, Margetts S. Coordination of sucking, swallowing, and breathing and oxygen saturation during early infant breast-feeding and bottle-feeding. *Pediatric Research*, 2006;60:450-455
4. Woolridge MW. The "anatomy" of infant sucking. *Midwifery*, 1986;2:164-171.
5. Lebenthal E, et al. Development of disaccharidase in premature, small-for-gestational-age and full-term infants. In: Lebenthal E (Ed): *A textbook of gastroenterology and nutrition in infancy, Vol 1*. New York; Raven Press, 1981: 417.

6. Aurlcchlo S, et al. Intestinal glycosidase activities in the human embryo, fetus, and newborn. *Pediatrics*, 1965;35:944-954.
7. Lebenthal E, Lee PC. Development of functional response in human exocrine pancreas. *Pediatrics*, 1980;66:556-560.
8. Lilibridge CB, Townes PL. Physiologic deficiency of pancreatic amylase in infancy- a factor in iatrogenic diarrhea. *JPediatr*; 1973;82:279-282.
9. Walker WA, et al. Intestinal uptake of macromolecules: effect of oral immunization. *Science*, 1972;177:608-610.
10. Herbst JJ. Development of sucking and swallowing. In: Lebenthal E (Ed): *A textbook of gastroenterology and nutrition in infancy, Vol. 1*. New York; Raven Press, 1981: 102.

MATERNAL NUTRITION & FETUS

Dr. Alka Kuthe, Dr P.K. Shah, Dr. Vaishali Patil

A mother's joy begins when new life is stirring inside... when a tiny heartbeat is heard for the very first time, and a playful kick reminds her that she is never alone.

Pregnancy is every woman's dream, but it is also a period of physiological, biochemical and hormonal complex changes which occur in maternal body and influence needs for nutrients and the efficiency with which body uses them. The complex relationship between maternal nutritional and birth outcomes emphasizes the need for consistent and thorough assessments of women's diet and nutritional status throughout pregnancy and individualized nutritional education to promote positive birth outcomes¹. Healthy eating behavior during pregnancy enables optimal gestational weight gain and reduces complications², both of which are linked to positive birth outcomes and contribute to women's overall health. Although the relationship between supplementation of specific nutrients and fetal outcomes remains unclear, poor maternal nutrition is linked to low infant birth weight and other forms of perinatal morbidity.³

Weight Gain Recommendations in Normal Pregnancies

The Institute of Medicine (IOM) of the National Academy of Sciences issued a report, Nutrition during Pregnancy (1990)⁶, summarizing scientific data on the issues of gestational weight gain, dietary intake and nutrient supplementation during pregnancy. In addition, the IOM panels responsible for the on-going updates of the Dietary Reference Intakes (DRIs) takes special care to develop pregnancy-specific recommendations for each nutrient.

Recommended Total weight Gain		
Category	Pounds	Kilograms
<i>Low BMI(<19.8)</i>	28-40	12.4-18
<i>Normal BMI (19.8-26)</i>	25-35	11.5-16
<i>Overweight BMI(26-29)</i>	15-25	7-11.5
<i>Obese BMI(>29)</i>	<15	<7
<i>Twins</i>	35-45	16-20
<i>Triplets</i>	50	23

Note. BMI = body mass index.

Weight Gain in Baby: A mother's height, her weight for height at the beginning of pregnancy, and her weight gain can all influence the size of her fetus. Birth weights are lower in babies of mothers who choose to continue to smoke during pregnancy. Obesity in pregnancy increases the chances of a heavier and fatty baby.

WHAT IS ADEQUATE NUTRITION FOR A PREGNANT WOMAN?

Adequate nutrition during pregnancy is defined as the amount of each nutrient required in the diet to support optimal metabolism, function of the cells, tissues and organs and the maintenance of adequate tissue stores.

Calorie requirement⁷: No extra calories are required in the first trimester, 300 extra calories in second trimester and 500 extra calories in third trimester determine calorie requirement. Pre-pregnancy BMI, maternal age, nutritional stress factors like nausea, vomiting and weight loss for a prolonged period, pregnancy spacing less than 1 year, prior poor obstetrical outcome, failure to gain weight, age under 20, and emotional stress factors must be considered in tailoring caloric requirement. For each stress factor additional 200 calories should be given.

Protein requirement⁸: Protein is needed for growth of fetus and breast tissue, production of amniotic fluid and increase in maternal blood volume. Adequate protein intake reduces the risk of pregnancy induced hypertension and intrauterine growth restriction. Additional protein of 1.2, 6.0, and 10.5 gm. per day should be taken in first, second and third trimesters respectively. During lactation extra 24 gm/day is recommended.

Fats: The recommended fat intake for adults ranges between 20 and 35 % of total calories.^{9,10} Omega-3 fatty acids alpha-linolenic acid, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) are important constituents of prenatal diet. DHA is involved in neurotransmission, regulates ion-channel activity and gene expression and can be metabolized in neuro-protective metabolites.¹¹ It was reported that a lower ARA/LA ratio in IUGR compared to normal fetuses.¹² Insufficient levels of DHA are associated with impaired vision, nervous system disorders, low birth weight and premature delivery.^{13,14,15} Supplementation of Omega -3 fatty acid is shown to increase fetal DHA levels.¹⁶ Women with the lowest levels of omega-3 fatty acids were 7.6 times more likely to have preeclampsia compared to those with the highest level

Effect of Fluid Intake on Fetal Outcomes: Pregnant women need to understand the general importance of drinking adequate amounts of fluid to maintain a healthy level of amniotic fluid, which protects the fetus and cushions the umbilical cord. The amount of fluid intake needed to ensure optimal birth outcomes is unclear. Calhoun noted that many of the recommended fluid intake totals are based on anecdotal information.¹⁷ Suggested fluid intake amounts range from 4 to 5 glasses of water per day to 8 to 12 glasses of water per day, but no evidence is available to

support a specific amount of daily fluid intake by pregnant women to improve fetal well-being. Despite the absence of clear guidelines for a specific amount, adequate hydration is very important for pregnant women experiencing oligohydramnios or at risk for developing utero-placental insufficiency.¹⁸

The recommended dietary allowances and intakes:

For 3rd trimester are shown in Table: 1 as per the guidelines given by National Research Council (NRC), The Institute of Medicine (IOM), The Food and Agriculture Organization of United Nations and The World Health Organization (FAO/WHO).

Table 1: Recommended Dietary Allowances and Intakes for Pregnant Women

Nutrient	Nonpregnant, nonlactating women			Pregnant women (3rd trimester)			% Increase over nonpregnant, nonlactating women: pregnant women
	NRC, 25-49 y	IOM, 19-50 y	FAO/WHO, 18-60 y	NRC	IOM	FAO/WHO,	
Calcium (mg)	800	1000	400-500	1200	1000	1000-1200	140-150
Phosphorus (mg)	800	700	—	1200	700	—	—
Magnesium (mg)	280	310-320	—	320	350-360	—	—
Iron (mg)	15	—	—	30	—	—	—
Very low bioavailability	—	—	59	—	—	179-299	203-407
Low bioavailability	—	—	32	—	—	92-152	187-375
Medium bioavailability	—	—	16	—	—	46-76	187-375
High bioavailability	—	—	11	—	—	31-61	182-454
Zinc (mg)	12	—	1.4	15	—	2.0	43
Iodine (µg)	150	—	150	175	—	200	33
Selenium (µg)	55	—	21.5	65	—	27	26
Copper (mg)	1.5-3.0	—	1.15	1.5-3.0	—	1.15	0
Vitamin A (µg RE)	800	—	500	800	—	600	20
Vitamin D (µg)	5	5	2.5	10	5	10	300
Vitamin E (mg -TE)	8	—	—	10	—	—	—
Vitamin K (µg)	65	—	—	65	—	—	—
Vitamin C (mg)	60	—	30	70	—	50	67
Thiamine (mg)	1.1	1.1	0.8	1.5	1.4	0.9	12
Riboflavin (mg)	1.3	1.1	1.4	1.6	1.4	1.5	7
Niacin (mg NE)	15.0	14.0	11.5	17.0	18.0	12.6	10
Vitamin B-6 (mg)	1.6	1.3	—	2.2	1.9	—	—
Folate (µg)	180	400	170	400	600	370-470	118-176
Vitamin B-12 (µg)	2.0	2.4	1.0	2.2	2.6	1.4	40

In general the dietary intakes of all the women are lower than the ICMR recommended daily allowances.

IMPACT OF MATERNAL NUTRITION

Iron: Maternal anemia is responsible for less than optimal behavior in infants and children who scored lower on test of development, cognitive behavior, learning and school performance. In addition, maternal iron deficiency anemia during pregnancy reduces fetal and subsequent neonatal iron stores.¹⁹

Zinc: Zinc deficiency during pregnancy has been reported to increase the risk of fetal growth restriction, congenital anomalies, low birth weight, and preterm delivery and increase the incidence of pregnancy-induced hypertension, intrapartum hemorrhage, and prolonged labor.²⁰ In a large epidemiological study in California, preconceptual zinc supplementation reduced the risk of neural tube defects in infants²¹. Dietary zinc supplementation may help reduce incidence of IUGR babies.

The role of thyroid hormone in fetal brain development: In India, iodine deficiency accounts for a large number of stillbirths and neonatal deaths. It can impose a chronic, combined maternal and fetal hypothyroidism from the earliest stages after conception with the offspring being at risk of severe mental retardation and deaf mutism. Moreover the major effect of fetal iodine deficiency is cretinism. It is recommended that all pregnant women should take a supplement containing 150 micrograms of iodine and in addition, consume foods rich in iodine. Its deficiency leads to spontaneous abortion, stillbirth, congenital anomalies, perinatal mortality.^{22,23}

On Child's Intelligence: A child's nutritional future begins with the mother's nutritional status in adolescence and in pregnancy. Imbalance in maternal nutritional can adversely affect normal fetal growth and development such as learning disabilities, behavioral disorders, cerebral palsy and impairment of vision and deafness.

OTHER NUTRIENTS AND FETAL BRAIN DEVELOPMENT

LCPs: LCs or long chain polyunsaturated fatty acids are essential for the healthy development of child's brain, nervous system and vision. The LCs can get transferred to the unborn fetus through transplacental route to some extent. Hence it is imperative that the mothers should be encouraged to eat foods naturally rich in LCs. LCs can be available to the newborn through breast milk, but they are absent in most formula foods. Increasing maternal intake of DHA with dietary supplements during lactation has significantly higher cognitive outcomes of breastfed infants compared to the formula fed infants.

Selenium: Selenium helps in protection of body tissues against oxidative stress, maintenance of defenses against infection and modulation of growth and development. Selenoproteins are essential in the conversion of thyroxin or T4 to its physiologically active form of T3. Selenium plays an important role in cell division and thereby strengthens the process of fetal brain development.

Vitamin A: Lack of Vitamin A, can lead to decreased brain development, increased mortality rate and blindness. Beta-carotene is another essential nutrient which plays an important role in the development of eye tissues, maintenance of healthy immune system, body and skin tissue and prevention of cell damage. Colostrum is rich in beta-carotene.

Alcohol in Pregnancy: Heavy drinking especially in early weeks greatly increases risk of inducing fetal alcohol syndrome.

Preconceptional Vitamin Supplementation And Neural Tube Defects (NTD):

NTD and Folate deficiency: A decreased risk of NTDs may be linked with the increased serum or red blood cell folate concentrations. At the same time, inverse proportionality is well established between serum homocysteine levels and folate levels as the homocysteine levels increase with folate depletion. Hence the dilemma remains whether birth defects including NTDs are due to low folate or high homocysteine or both or to other downstream effects. Maternal hyperhomocysteinemia could be considered as a functional marker of the folate status and is a risk factor for spina bifida in the offspring. The folic acid supplementation stabilizes hyperhomocysteinemia thus supporting the fact the peri-conceptional vitamin supplementation reduces the occurrence and recurrence of spina bifida.

Importance of peri-conceptional supplementation of vitamins: The stage when the vitamin is needed is around 28 days after ovulation i.e. supplementation has to be peri-conceptional. Surveys conducted in India have reported that only 20% women had heard about folic acid but none of them knew that it should be taken before pregnancy or that it prevents birth defects. According to the interventional trials in Hungary, if a multivitamin combination containing a physiological dose of folic acid during peri-conceptional period is used approximately 92% of NTDs might be prevented. The multivitamin seem to be more effective for the reduction of NTD than high dose of folic acid.

Recommendations: Low concentrations of folate during pregnancy have been associated with an increased likelihood of low birth weight and impaired fetal growth²⁴. Women who are planning a pregnancy should consume 0.4 mg (400mcg) of folic acid daily to reduce the risk of serious birth anomalies. Women who have already had a pregnancy affected by a NTD are urged to consume at least 4000 mcg of folic acid each day. The ICMR only recommends an addition of 300 mcg during pregnancy to the normal requirement of 100 mcg per day. The implementation of food fortification with folic acid has been accompanied by a marked decrease (78%) in the rate of

NTDs. The intake of folate should be at least one month prior to conception until the first three months of pregnancy and needs to be sustained after complete closure of the neural tube.

Calcium: It is the only nutrient element whose requirement doubles in pregnancy. The absorption is likely to become more efficient. Deficiency may be associated with pregnancy induced hypertension, intrauterine growth restriction and preterm delivery

Emerging Role of Decosahexaenoic Acid

The brain is 60% structural lipid and uses arachidonic acid (AA) and docosahexaenoic acid (DHA) for growth function and structural integrity. DHA is the predominant structural fatty acid in brain and retina and comprises approximately 40% PUFAs in brain and 60% of PUFAs in retina.

Thus DHA lays down foundation of fetal life. The first few weeks after conception—usually before the mother knows she is pregnant are the most active period of brain cell division.

Development of fetal brain: At birth, babies are only 5% of adult weight yet the brain size is almost 70% of the adult brain. Brain growth continues by a further 15% during the first year of life and an additional 10% during pre-school years.

DHA and Intelligence: A study showed that at 4 years, children had higher mental processing scores (an indicator of intelligence) when their mothers were supplemented with DHA rich oil during pregnancy and lactation, as compared with children of mothers who were supplemented with corn oil, which is mainly omega-6 PUFA.

DHA and visual outcome: DHA is the major PUFA in photoreceptor outer segment membranes where it accounts for approximately 60% of outer segment. DHA appears to be a necessary component of the photoreceptor membrane including fluidity, rhodopsin activity and stability. An observational study of dietary factors related to measure of retinal function has reported

Figure 2: DHA Comprises Approximately 40% of PUFAs in Brain and 60% of PUFAs in Retina

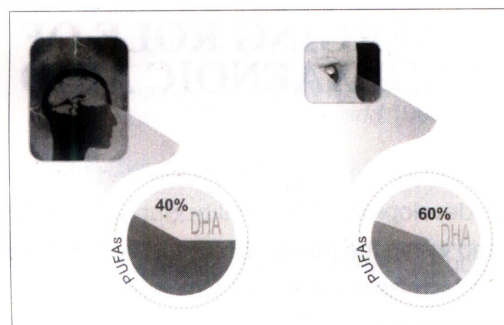
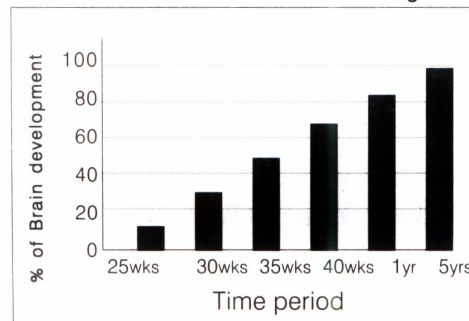


Figure 3: Brain Development from the Third Trimester till 5 Years of Age



that stereoacuity at age 3-5 years was enhanced among full term infants whose mothers had a DHA-rich diet during the pregnancy. Children whose mothers ate DHA rich food during pregnancy were also more likely to achieve high grade stereopsis than were children whose mothers did not.

DHA and Gestational Age/Birth Weight: The onset of labor appears to be influenced by prostaglandins (PG) produced by tissues in the region of the uterus. The occurrence of preterm delivery is almost 4 times less on omega-3 rich food supplementation. Observational study and the results have shown that the average birth weight and birth length of the baby increased by about 0.2 kg and 1 cm, respectively in the mothers who consumed omega-3 rich food.

DHA & Breastfeeding: Studies have shown that DHA content of the breastmilk is linearly related to the amount of DHA in the diet. Unlike human breast milk, cow's milk doesn't have DHA.

HEALTHY START SCHEME

A healthy diet is important for both mother and baby throughout pregnancy and after birth. However, 39% of people in low-income groups report that they worry about having enough food to last until they receive money to buy more. Similarly, 36% report that they cannot afford to eat balanced meals (NICE, 2008a).²⁵

To improve maternal and child nutrition, healthcare professionals should advise pregnant women and parents of children under four about the Healthy Start scheme. Pregnant women who are (or may be) eligible for the scheme should be offered the maternal Healthy Start vitamin supplement (folic acid, vitamins C, D).

CONCLUSION

There is growing evidence that maternal nutritional status can alter the epigenetic state (stable alterations of gene expression through DNA methylation and histone modifications) of the fetal genome. This may provide a molecular mechanism for the impact of maternal nutrition on both fetal programming and genomic imprinting. Therefore promoting optimal nutrition will not only ensure optimal fetal development but will also reduce the risk of chronic diseases in adults. It is never too late to understand that a healthy start would help shaping young minds. Just as the damaging effects of malnutrition, pass from one generation to the next, so can benefits of good nutrition.

REFERENCES

- 1) *JOGNN*, 33, 809-822; 2004. DOI:10.1177/0884217504270599
- 2) Kant, A., Schatzkin, A., Graubard, B., & Schairer, C. (2000). A prospective study of diet quality and mortality in women. *Journal of the American Medical Association*, 283, 2109-2115.

- 3) Abrams, B., Altman, D., & Pickett, K. (2000). Pregnancy weight gain: Still controversial. *American Journal of Clinical Nutrition*, 71(Suppl. 5), 1233S-1241S.
- 4) Brown, J., & Carlson, M. (2000). Nutrition and multi-fetal pregnancy. *Journal of the American Dietetic Association*, 100(3), 343-348
- 5) National Academy of science, institute of Medicine, Committee on Nutritional Status during Pregnancy and Lactation. 1991-2009. Nutrition During Pregnancy .Washington, DC: National Academy Press
- 6) ICMR (1990) Recommended Dietary Intakes for Indians ,New Delhi
- 7) Energy and protein requirements ,Report of a Joint FAO/WHO/UNU Expert Consultation WHO Technical Report Series 724 1991
- 8) Dietary guidelines for Americans, 2005; U.S. Department of Health.
- 9) Innis SM (2007a). Dietary (n 3) fatty acids and brain development. *J Nutr* 137, 855–859
- 10) Alvino G, Cozzi V, Radaelli T, Ortega H, Herrera E & Cetin I (2008). Maternal and fetal fatty acid profile in normal and intrauterine growth restriction pregnancies with and without preeclampsia. *Pediatr Res* 64, 615–620.
- 11) Nettleton, JA. 1993. Are Omega-3 fatty acids essential for fetal and infant development *JADA* 93(1):58-66
- 12) Foreman-van Drongelen , M, vaHouwelingen, AC, Kes Lactation ter, ADM, et al .1995. Long-chain polyunsaturated fatty acids in preterm infants :status at birth and its influence on postnatal levels, *J Ped* 126(4): 611-18
- 13) Olsen, SF, Sorensen. JD, et al 1992. Randomized controlled trial of effect of fish oil supplementation on pregnancy duration, *Lancet* 339: 1003-7
- 14) Holman, RT Johnson, SB and Ogburn, PL.1991. Deficiency of essential fatty acids and membrane fluidity during pregnancy and lactation, *Proc Nat Acad Sci*88:4835-39
- 15) Conner, WE, Lowensohn, R and Hatcher, L 1996. Increased docosahexaenoic acid levels in human newborn infants by administration of sardines and fish oil during pregnancy, *Lipids* 31 (suppl): 1833-875.
- 16) Williams, MA, Zingheim RW and King IB 1995. Omega-3 fatty acids in maternal erythrocytes and risk of pre-eclmpsia, *epidemol* 6(3) : 232-37
- 17) Calhoun, S. (2000). Examining maternal hydration and amniotic fluid volume. *AWHONN Lifelines*, 3, 20-24.
- 18) Wolman, I., Groutz, A., Gull, I., Gordon, D., Geva, E., Lessing, J., et al. (2000). Is amniotic fluid volume influenced by a 24-hour fast? *Journal of Reproductive Medicine*, 45, 685-687.
- 19) Allen, L. (2000). Anemia and iron deficiency: Effects on pregnancy outcomes. *American Journal of Clinical Nutrition*, 71(Suppl. 5), 1280S-1284S
- 20) King, J. (2000). Determinants of maternal zinc status during pregnancy. *American Journal of Clinical Nutrition*, 71(Suppl.), 1334S-1343S.
- 21) Velie, E., Block, G, Shaw, G, Samuels, S., Schaffer, D., & Kulldorff, M. (1999). Maternal supplementation and dietary zinc intake and the occurrence of neural tube defects in California. *American Journal of Epidemiology*, 150, 605-616

- 22) Zimmermann M, Delange F. Iodine supplementation of pregnant women in Europe: a review and recommendations. *Eur J Clin Nutr* 2004; 58:979-984.
- 23) National Health and Medical Research Council (2010), Public Statement, *Iodine Supplementation for pregnant and breastfeeding women*
- 24) Scholl, T., & Johnson, W. (2000). Folic acid: Influence on the outcome of pregnancy. *American Journal of Clinical Nutrition*, 71(Suppl.), 1295S-1303S
- 25) **NICE (2008a)** *Improving the Nutrition of Pregnant and Breastfeeding Mothers and children in low income households*. <http://www.nice.org.uk/guidance/index.jsp?action=byID&o=11943>

IMMUNOLOGY OF BREAST MILK

Dr. Ajay Gaur

Human milk is considered the ideal nutrition for infants for the first six months of life and specifically adapted to the requirements in this age^{1,2} The unique is the great array of “bioactive factors”, which provide protection from infection by various microorganisms, i—: hormones and growth factors that affect the development, agents that modulate the immune response and anti-inflammatory components. Simultaneously, breastfeeding stimulates release of protective substances in mother’s blood which protect mothers from breast cancer, ovarian cancer, hip fractures and rheumatic arthritis.³

The relationship between protection by breast milk and the postnatal development of newborns’ immune systems has been proposed with hypothesis that the delayed development of the immune system permits the use of the nutrients and energy for growth rather than diverting these resources for the maintenance of a well-developed immune system.^{4,5} In addition, breast milk components also modulate the development of immune functions, without causing inflammation, symptoms of infection, tissue damage or loss of energy. The multiple functions of the major nutrients of human milk are summarized in Table-1 & protective components in Table-2.

It is suggested that protection from infection is provided by two mechanisms:-

Classic immune protection provided by immunoglobulin’s and other milk components that acts as ligands for bacteria and viruses

Factors that fine-tune the interaction among these agents and also enhance the maturation of infants’ own immune potentials.

THE MAJOR IMMUNOLOGICAL AGENTS

1. Antibodies

The predominant antibody in human colostrum and mature milk is IgA. It consists of two IgA molecules bound to a J chain and the polyIgR (fig 1). IgA makes up 80-90% of the immunoglobulins in colostrum and milk. The concentration can be as high as 12 g/L in colostrum, decreasing to about 1 g/L in mature milk. The level of IgA is higher in milk from mothers of premature infants than mothers of full term babies.⁶

IgA is much more resistant to proteolytic enzymes than other forms of antibodies like IgG which primarily occurs in blood and tissues. Secretory IgA (SIgA) is more resistant than serum IgA to

proteases produced by bacteria like *H. influenzae* or *pneumococci* which often occur in the upper respiratory tract. It is postulated that towards the end of pregnancy there is migration of lymphocytes originating from Peyer's patches to mammary glands where, these cells produce IgA antibodies against the microbes they encounter in the gut. This is called the enteromammary link (**fig. 2**). This link explains why milk provides such good protection against a very wide range of microbes which tend to infect the infant via its mucosal membranes. Thus, milk IgA antibodies cover not only pathogens in the gastrointestinal tract, but also the respiratory tract.⁷

The major function of IgA antibodies is to bind microbes already on the surface of mucosal membranes. This prevents bacteria and viruses from attaching to the epithelial cells in the mucosa and blocks them from entering tissues. IgA antibodies bind and neutralize viruses and bacterial toxins. Clinical studies have shown that the level of IgA antibodies in human milk specific for *V. Cholerae*, enterotoxigenic *E. coli*, *Campylobacter*, *Shigella*, and *G. lamblia* provides protection against gastroenteritis. Secretory IgA also favors the formation of biofilm of microbes on an epithelial surface. This function may possibly promote the normal microbial colonization of the gut.

2. Lactoferrin

Lactoferrin, a glycosylated protein, consists of two globular lobes, each containing one iron binding site. It is one of the iron-binding proteins in the transferrin family. It is present in all exocrine secretions. It is bactericidal, antiviral, and anti-inflammatory and modulates cytokine function. The bactericidal activity is provided by an 18-amino acid residue loop formed by a disulfide bond between cysteine residue, 20 to 37 of human lactoferrin. This domain, called lactoferricin, is located in the N terminus in a region distinct from its iron binding site and has broad antimicrobial properties.⁹

Colostrum contains 5 to 7 g/L of lactoferrin, which decreases in mature milk to 1 to 3 g/L. This decrease is partly compensated by the increase in milk production. By 1 month of age, a breastfed infant consumes about 260 mg/kg/day of lactoferrin and as the age advances, it reduces to 125 mg/kg/day.¹⁰

Lactoferrin has multiple enzyme activities against *H. influenzae* and enteropathogenic *E. coli*. At the same time, it seems to promote the growth of *bifidobacteria*. Other lactoferrin activities include activation of natural killer cells, modulation of complement activation, effects on coagulation, inhibition of adhesion of enterotoxigenic *E. coli* and of adhesion and invasiveness of *S. flexneri*.¹¹ Lactoferrin has the capacity to enter leucocytes and their nuclei. There, lactoferrin binds to the Nuclear Factor κ B (NF κ B) which is the transcription factor directing the production of several pro-inflammatory cytokines including IL-1 β , TNF- α and IL-6. Inhibiting NF κ B blocks the pro-inflammatory effects of an infection.¹²

3. Lysozyme

Lysozyme, a glycoprotein, hydrolyzes the 1-4 linkages between N-acetyl glucosamine and N-acetylmuramic acid in bacterial walls. It is present in other exocrine secretions

too and lyses mostly gram-positive and few gram-negative bacteria. It increases during lactation in contrast to SIgA and lactoferrin. Colostrum contains about 70 ng/ml, by 1 month 20 ng/ml and by 6 months of lactation 250 ng/ml is present in human milk. An exclusively breastfed baby receives 3 to 4 mg/kg/day at 1 month and 6mg/kg/day at 4 months. Concentrations of lysozymes are several times higher in human milk than in bovine milk.⁶

4. Casein

k-Casein, is a highly glycosylated human milk protein, which inhibits adherence of *H. pylori* and of *S.pneumoniae* and *H. influenzae* to human epithelial cells.¹³ The protective functions of proteins present in human milk are summarized in Table-3.

5. α -Lactalbumin

α -Lactalbumin is a major whey protein in human milk. It has a very high nutritional value and is adapted to the requirement of newborn infants. It appears as an aggregate of several α -lactalbumin molecules known as HAMLET, human α -lactalbumin made lethal to tumor cells. It kills cancer cells only, not normal differentiated cells. HAMLET may be the reason why breastfeeding is suggested to result in a reduction in childhood leukemia.⁶

6. Glycoconjugates and Oligosaccharides

Lactose is the principal carbohydrate in human milk and besides providing energy it promotes normal gastrointestinal flora and calcium absorption. Human milk also contains oligosaccharides (1.29 gm/dl) and glycoconjugates which acts as ligands for microorganisms and viruses and their toxins, thereby inhibiting binding of pathogens to epithelial surfaces (**Table-4**)^{14,15} Microbial adhesion to various mucosal epithelium has been shown to be inhibited by milk oligosaccharides for diarrhea-causing *E. coli* and *C.jejuni*, for otitis-causing *S. pneumoniae* and *H. influenzae* and for several other microorganisms. The milk oligosaccharides seem to affect the composition of the gut micro flora and its capacity to cause infections.¹⁶

7. Lipids and milk fat globules

The average lipid content of mature milk ranges from 3.2 to 3.8 g/dl and the amount does not appear to be influenced by maternal diet. Milk-fat globules, the second most abundant component of human milk, protect infants from infection by acting as specific bacterial and viral ligands. The lipids of human milk are hydrolyzed by lipoprotein lipase, bile salt-stimulated lipase, and gastric lipase. The resulting fatty acids and monoglycerides are often anti-microbial.¹⁷ Lauric and linoleic acids amount to 5% and 15%, respectively, of total FAs in human milk and are also the most readily released during gastric lipolysis which inactivates enveloped viruses (HIV, HSV type I), gram positive and gram negative bacteria, fungi, and protozoa.¹⁸

Most of the fatty acids building triglycerides in human milk are long chain polyunsaturated fatty acids (LCP), which are important for early human growth and development. In contrast, most of the bovine and formula milk are devoid of LCP and children develop LCP depletion resulting in low visual acuity and decreased brain growth. LCP precursors are also needed for synthesis of prostaglandins, thromboxanes and leukotrienes which serve as potent immunomodulators.³

8. Anti inflammatory & immunomodulating components

Human milk contains numerous components with anti-inflammatory capacities. In general, these components consists of antioxidants (vitamin A, C, E, catalase and glutathione peroxidase), E prostaglandins, enzyme inhibitors (platelet activating factor, acetylhydrolase,) protease inhibitors, which prevent the potentially inflammatory action of trypsin, chymotrypsin, elastase, growth factors, anti-inflammatory cytokines and specific soluble receptors for inflammatory cytokines. Their examples and functions are summarized in **Table-5**. Immunomodulating agents present in milk can affect the development of newborns' immune systems. (**Table-6**)

Breastfeeding increases the size of the thymus. Its size even relates to the number of breastfeeds per day. Exclusively breastfed babies had a thymus that was twice the size of non-breastfed baby's thymus. This is an interesting observation because of the central role of the thymus in the maturation of T-lymphocytes, including both the killer cells, very important for defense, and regulatory T-cells (T-reg), important for prevention of autoimmune diseases.^{19,20}

9. Cells

Human milk contains protective cells which remain active in the neonatal intestine for 60 hours and migrate to spleen and liver.⁹ Some of them are:

a) Soluble CD-14 and soluble Toll-like Receptor

Colostrum and milk contain high concentrations of soluble CD-14, more than 20 times the serum concentration. This helps in formation of lipopolysaccharide (LPS) on Gram-negative bacteria, bind to the Toll-like Receptor (TLR4) which activates phagocytes. Intestinal epithelium carries TLRs, but not CD-14. By means of the milk CD-14, phagocytes in the intestine are activated by Gram-negative as well as Gram-positive bacteria since they both require both CD -14 and the latter TLR2. Human milk also contains soluble TLR2 which can bind Gram-positive bacteria, mycobacteria, a measles virus protein, and in milk modifies the response to Gram-positive bacteria, suggesting yet another anti-inflammatory component in milk. Soluble CD-14 also promotes differentiation and expansion of B-lymphocytes and synergizes with the anti-inflammatory capacity of lactoferrin. **Thus it is tempting to speculate on its role in actively stimulating the immune system of the suckling neonate.**²¹

b) Leucocytes in milk

During the first few days of lactation, human milk contains live activated macrophages, neutrophils, and lymphocytes at levels of 1 to 3 x 10⁶ cells/ml. By 2-3 months, it decreases to less than 1 x 10⁶/ml. By 4-6 months, epithelial cells increase to about 80% of the milk cells. Obviously, the breastfed infant obtains many millions of leucocytes via the milk daily, about 4% of them lymphocytes.

c) Neutrophils

Milk neutrophils show characteristics of activation by expression of certain surface structures, decreased adherence, and motility. Blood neutrophils exposed to milk react similarly.

d) Macrophages

Milk macrophages spontaneously produce the pro-inflammatory cytokines IL-1 β , TNF- α , and IL-6, but they produce less than blood mononuclear cells. They produce less of these cytokines after exposure to LPS. The milk macrophages produce prostaglandin-E₂, complement factor-3, lysozyme, and plasminogen activator, and may be the source of these components in milk. It is likely that the major role of neutrophils and macrophages in milk is to defend the mammary glands. The protein, fibronectin, the IgG antibodies, and the complement factor-3 present in milk may support phagocytic activity.²²

e) Lymphocytes

The milk lymphocytes are mainly T-cells (83%) with some B-cells (6%) and some NK-cells. There are T-helper cells as well as cytotoxic T-cells and T $\gamma\delta$ cells. They show characteristics of being activated and having immunological memory. The milk cells mainly produce IFN- γ , but also produce macrophage inhibiting factor (MIF) and monocyte chemotactic Factor.²³

10. Hormones and Growth factors

There are numerous hormones and growth factors present in human milk. In general, their concentrations are higher in colostrum. The common hormones with their concentrations and milk plasma ration are listed in Table-7.

11. Enzymes

The young infant has low enzymatic activity but uptake of human milk enhances their activity. Some of the milk enzyme involved in protective functions are lysozyme, lactoperoxidase, antiproteases, catalase, glutathione peroxidase, sulph-hydroxidase and PAF-acetylhydrolase. Milk bile salt-dependent lipase and amylase are secreted into human milk and are active in infants, providing better digestive potential than that of artificial milk.²⁴

12. Leptin, Erythropoietin and Melatonin

The appetite regulating hormone, leptin which has cytokine-like structure, is present in mammary epithelial cells, milk fat globules, and milk (73 ng/ml) as well as in a number of other tissues in man. Leptin stimulates differentiation and proliferation of hematopoietic cells and up regulates monocyte/macrophage functions. It also modifies T-cell responses by increasing the production of IL-2 and IFN- γ from Th-1 cells and IL-4 and IL-4 and IL-10 from Th-2 cells. Leptin has direct, as well as indirect, effects on the thymus by enhancing proliferation and survival of T-cells which mature in that site before reaching the periphery where they act in defense.²⁵

13. Nucleotides

Nucleotides present in human milk enhance intestinal repair after injury, and potentiate the immune response to some vaccines. In colostrum, its concentration is 53 to 58 mg/L and in mature milk about 33 mg/L. Nucleotides are important because they are the building blocks of nucleic acids, DNA, and RNA.²⁶

CONCLUSION

During fetal life there is a continuous transfer of IgG antibodies from the maternal circulation to the fetus via placenta. But still, the host defense of neonates is not fully functional at birth. Mechanical and chemical defenses are not adequate and complement system remains reduced for some months. Although, the immune system expands in response to exposure to outside environment, but takes some time to work with full capacity. That is why maternal defense working for the offspring via breast milk is so important and crucial which decides further natural protection of the child.

TABLE-1: MAJOR NUTRIENTS AND THEIR FUNCTIONS		
Nutrients	Amount	Function
Protein		
sIgA	50-100 mg/dl	Immune protection
IgM	2 mg/dL	Immune protection
IgG	1 mg/dL	Immune protection
Lactoferrin	100-300 mg/dL	Anti-infective, iron carrier
Lysozyme	5-25 mg/dL	Anti – infective
α- Lactalbumin	200-300 mg/dL	Ion carrier (Ca ²⁺), part of lactose synthase
Casein	200-300 mg/dL	Ion carrier, inhibits microbial adhesion to mucosal membranes
Carbohydrate		
Lactose	6.5 – 7.3 g/L	Energy source
Oligosaccharides	1.0 – 1.5 g/L	Microbial ligands
Glycoconjugates	-	Microbial and viral ligands
Fat		
Triglyceride	3.0 – 4.5 g/L	Energy source
LC – PUFA	-	Essential for brain and retinal development.
FFA	-	Anti – infective

TABLE-2: PROTECTIVE COMPONENTS IN HUMAN MILK	
Immune protection	Function
sIgA, G, M	specific antigen targeted anti – infective activity
Non specific protection	antibacterial, antiviral and antimicrobial – toxin, enhancing newborn’s immune system maturation.
Minor nutrients Nucleotides	enhance T-cell maturation , natural killer cell activity, antibody response to vaccines, intestinal maturation and repair after diarrhea
Vitamins: A (β-carotene), C (ascorbic acid), E (α – tocopherol)	Anti – inflammatory (scavenging of oxygen radicals)

TABLE-2: PROTECTIVE COMPONENTS IN HUMAN MILK	
Enzymes	
Bile salt dependent lipase	production of FFA with antiprotozoan and antibacterial activity
Catalase	anti – inflammatory (degrades H ₂ O ₂)
Glutathione peroxidase	anti – inflammatory (prevents lipid per oxidation)
acetylhydrolase	protect against necrotizing enterocolitis (hydrolysis of Platelet activating factor)
Hormones	
Prolactin	enhance development of B and T lymphocytes.
Cortisol, thyroxine, insulin and growth factors	promote maturation of the newborn's intestine host defense mechanism
Cells	
Macrophages, PMNs and lymphocytes	microbial phagocytosis, production of lymphokines and cytokines, enhancement of other protective agents
Cytokines	modulate function and maturation of the immune system

TABLE-3: PROTECTIVE FUNCTIONS OF HUMAN MILK PROTEIN	
Protein	Protective function
Lactoferrin (500-600 mg/dL) in colostrum (50mg/dL) in mature milk	Iron chelation: bacteriostatic for siderophilic bacteria and fungi; lactoferricin- broad spectrum antimicrobial & antiviral activity (HIV, CMV, HSV) at the stage of virus absorption and / or penetration. Immunomodulating activity: reduced release of IL-1, IL-2 and IL-6 and TNF- α from monocytes and of PGE ₂ from macrophages; activation NK cells, effect on complement activation.
Lysozyme (5-25 mg/dL), increase with prolonged lactation	Bacterial lysis , immunomodulating activity, enhances IgA production, macrophage activation; reduce endotoxic effect of bacteria's.
κ - casein (<100 mg/dL)	Antiadhesive: inhibits binding of <i>helicobacter pylori</i> to human gastric mucosa and <i>streptococcus pneumoniae</i> and <i>Haemophilis influenzae</i> to human respiratory tract epithelial cells.

TABLE-4: FUNCTIONS OF OLIGOSACCHARIDES AND GLYCOCONJUGATES	
Structure	Function
Oligosaccharides	Protect against heat stable <i>E. coli</i> enterotoxin, attachment of <i>H. influenzae</i> and <i>S. pneumoniae</i> to respiratory epithelium, <i>V. cholerae</i> hemagglutinin activity
Glycoproteins	Prevent binding of <i>V. cholerae</i>
Mucin	Prevent binding of <i>E. coli</i>
Lactadherin	Prevents binding of rotavirus
Gangliosides	Receptor analogs for heat labile toxins of <i>V. cholerae</i> and <i>E. coli</i>
Glycosaminoglycan	Inhibits binding of HIV gp 120 to CD4 receptor

TABLE-5: ANTI- INFLAMMATORY COMPONENTS	
Component	Function
Vitamins: A, B, C	all scavenges oxygen radical
Enzymes Catalase Glutathione peroxidase Acetylhydrolase	degrades H ₂ O ₂ prevents lipid per oxidation degrades platelet activating factor, a potent ulcerogen
Antienzymes: α1, antitrypsin & α1, antichymotrypsin	both inhibits inflammatory proteases
Prostaglandins: PGE1, PGE 2	both cytoprotective
Growth factor EGF TGF – α TGF – β	promotes gut growth and functional maturation promotes epithelial cell growth Suppresses lymphocyte function
Cytokines IL – 10	suppresses function of macrophages and natural killer and T cells
Cytokine receptors TGF – α: RI, RII	bind to and inhibit TGF – α

TABLE-6: IMMUNOMODULATING AGENTS		
Components	Function	Endogenous Production by Infant
IL-1	production of defense agents.	-
IL-3	-	markedly lower by T and MN cells
IL-4	-	< 10% of adult T cells
IL-5	-	reduce m-RNA expression
IL-6	regulates function of mammary gland	normal in term, reduced in preterm
IL-8	chemotactic for intestinal intraepithelial leukocytes	reduced m- RNA and protein
IL-10	modulates epithelial barrier integrity	15-20% of adult level
IL-12	enhances production of inflammatory cytokines	-
IFN- γ	modulates epithelial barrier integrity	< 10% of adult level
TNF- α	regulates function of mammary gland	~ 20 – 50% of adult level
TGF- β	anti-inflammatory	-

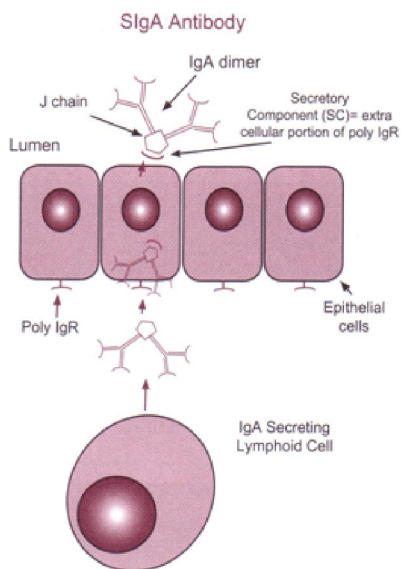


Figure 1: Structure of Secretory IgA (SIgA) (Ref: 6)

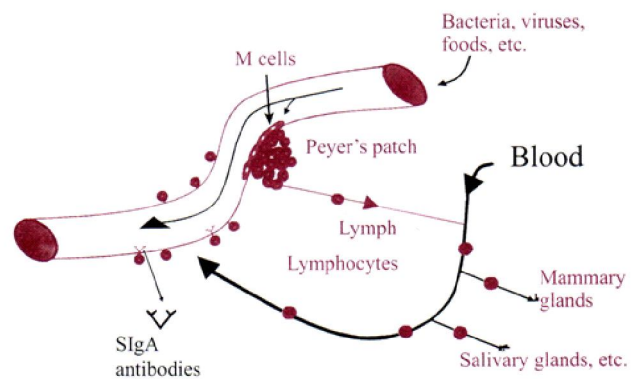


Figure 2: The Enteromammaric link

TABLE-7: HORMONES AND GROWTH FACTORS				
	Concentration per Milliliter	Milk : Plasma Ratio	Mammary synthesis	Effects in the Newborn
HORMONES				
Pituitary				
Prolactin	20-90 ng	> 1.0	Yes	neuroendocrine
GH	5-30 uU	>1.0	-	
TSH	2.7 -5.0 uU	<1.0	-	
Hypothalamus				
TRH	0.025-1.5 ng	>1.0	No	GH, TSH secretion
Somatostatin	23-113 pg	>1.0	No	
GnRH	0.1 – 4.0 ng	>1.0	Yes	Ovarian receptors GH secretion
GHRH	23-430 pg	>1.0	-	
Thyroid				
Thyroxine (T ₄)	0.3 -12 ng		Yes	
Triiodothyronine (T ₃)	0.2-0.4 ng		Yes	
Parathyroid				
PTH	15.0 pg			
Calcitonin	0-5 ng			
Steroids				
Estrogen	15-840 ng	> 1.0	Yes	Organ maturation
Progesterone	10-40 ng	≤ 1.0	No	
Adrenal steroids	0.2-32 ng	< 1.0		
GROWTH FACTORS				
Epidermal growth factor	3-107 ng	> 1.0	Yes	GI growth and gut closure
Insulin	3-20 µg	> 1.0	Yes	glycemia
IGF - I	1.3 – 11.0 ng	> 1.0	Yes	stimulate systemic growth
IGF – II		> 1.0	Yes	
TGF – α	0-8.4 ng			GI growth
TGF – β				inhibits GI Growth

REFERENCES

1. Picciano MF: Human Milk: Nutritional aspects of dynamic food. *Biol Neonate* 1998, 74:84.
2. Jelliffe DM. Biochemical Considerations in Human Milk in *Modern World* 1979, 27-58.
3. Kushwaha KP. Biochemistry and Immunology of breast milk In: *The science of infant feeding*. Anand RK, KumtaNB, KushwahaKP, Gupta Arun. (eds) Jaypee Brothers Medical Publishers, New Delhi. 2002, 2:3; 36-47.
4. Lonnerdal B. Biochemistry and physiological function of human milk proteins. *Am J Clin Nutr* 1985, 42: 1299-1317.
5. Goldman AS, Chheda S, Garofalo R. Evolution of immunologic functions of the mammary gland and the postnatal development of immunity. *Pediatr Res* 1998, 43: 155.
6. Hanson LA. Mother's Defense of the offspring via milk. In: *Immunobiology of human milk: How breastfeeding protect babies*. Pharmasoft publishing, Amarillo 2004, 5: 77-121.
7. Gaur A, Immunobiology of Human milk. In *Recent Advances in Pediatrics* eds Gupte S, Jaypee Brothers Medical Publication , New Delhi. 2009, Vol 20:18-39.
8. Hayani KC, Guerrero ML, Morrow AL. Concentration of milk secretory immunoglobulin A against Shigella virulence plasmid-associated antigens as a predictor of symptom status in Shigella-infected breast-fed infants. *J Pediatr* 1992, 121:852-856.
9. Hamosh M. Bioactive factors in human milk. *The Pediatric Clinic of North America*. 2001, 48: (1) 69-86.
10. Hennart PF, Brasseur DJ, Delogne-Desnoeck JB. Lysozyme, Lactoferrin and secretory immunoglobulin A content in breastmilk: influence of duration of lactation, nutrition status, prolactin status, and parity of mother. *Am J Clin Nutr* 1991, 53:32-39.
11. Howie PN, Forsyth DL, Ogston SA. Protective effect of breastfeeding infection. *BMJ* 1993, 300:11.
12. Sanchez L, Calvo M, Brock JH. Biological role of lactoferrin. *Arch Dis child* 1992, 67:657.
13. Hamosh M. Protective functions of proteins and lipids in human milk. *Biol Neonate* 1998, 74:163.
14. Peterson JA, Patton S, Hamosh M: Glycoproteins of the human milk fat globule in the protection of breast-fed infants against infections. *Biol Neonate* 1998, 74:143.

15. Kunz C, Rudloff S: Biological functions of oligosaccharides in human milk. *Acta Paediatr.* 1993, 82:903-912.
16. Newburg DS, Peterson JA, Ruiz-Palacios GM. Role human milk lactadherin in protection against symptomatic rotavirus infection. *Lancet* 1998, 351:1160-1164.
17. Hamosh M, Peterson JA, Hehderson Tr. Protective function of human milk: the milk fat globule. *Seimn Perinatol* 1999, 23:242.
18. Schroten H, Bosch M, Nobis-Bosch R. Secretory immunoglobulin A is a component of the human milk fat globule membrane. *Pediatr Res* 1999, 45:82-86,.
19. Hasselbalch H, Jeppesen DL, Engelmann MD. Decreased thymus size in formula-fed infants compared with breastfed infants. *Acta Paediatr* 1996, 85:1029-1032.
20. Ngom PT, Collinson A, Pido-Lopez J. Improved thymic function in exclusively breast-fed babies is associated with higher breast-milk IL-7. *Am J Clin Nutr* 2004.
21. Filipp D, Alizadeh-Khiavi K, Richardson C. Soluble CD 14 enriched in colostrum and milk induces B cell growth and differentiation. *Proc Natl Acad Sci USA* 2001, 98:603-608.
22. Robinson g, Volovitz B, Passwell JH: Identification of a secretory IgA receptor on breast-milk macrophages: evidence for specific activation via these receptors. *Pediatr Res* 1991, 29:429-434.
23. Bertotto A, Gerli R, Fabietti G. Human breast milk T lymphocytes display the phenotype and functional characteristics of memory T cells. *Eur J Immunol* 1990, 20: 1877-1880.
24. Hamosh M. Enzymes in human milk. In *Handbook of Milk Composition*. Jensen RG (ed) San Diego, Academic Press 1995, 388.
25. Friedman JM, Halaas. Leptin and the regulation of body weight in mammals. *Nature*. 1998, 395:763-770.
26. Kuchan M, Winship T, Masor M. Nucleotides in infant nutrition: effects on immune function. In *Pediatric Nutrition*. Basel Pediatr Adolesc Med, Reifen R, Lerner A, Branski D (eds), Basel, 1998, 80-94.

EARLY CHILDHOOD DEVELOPMENT: PROMOTING CHILD HEALTH, NUTRITION AND DEVELOPMENT

Dr. Rajesh Mehta, Dr. Neena Raina

INTRODUCTION

Annual cohort of newborns in India is about 27 million, out of which about 1 million die every year. Many survivors continue to remain at risk of stunting (physical, cognitive and social) and not reaching their full human potential due to lack of adequate nutrition, care and opportunities to learn. India, like many other developing countries, stands to suffer a 20% loss in adult productivity in absence of adequate efforts at early child development.

Good nutrition and health, loving care and encouragement to learn in the early years of life ensure children to be healthier, do better at school and have higher earnings. This is especially important for under-privileged children who have limited access to the basic needs of nutrition and care.

Comprehensive approaches addressing children's nutrition, health and psychosocial development have been shown to be effective. It is recognized that caregivers and families are best placed to support children's growth and development, but they need support. In India, huge initiatives are in place through the National Reproductive and Child Health (RCH) and Integrated Child Development Scheme programs to support child development. Pediatricians can play an important role in promoting the development of young children by enabling parents and caregivers to constantly provide appropriate nutrition, psycho-social stimulation and healthcare when needed.

WHAT IS EARLY CHILDHOOD DEVELOPMENT?

The definitions of Early Childhood Development (ECD) vary depending on the child development priorities of national and international institutions.

UNICEF uses a comprehensive definition of ECD, which includes the ecological, community, and policy environments in which children live; however, the notion of early childhood may be limited to age 3 and under. Canadian Center for Excellence for ECD defines it as the development of children under age 5 years and focuses on the five domains of physical, emotional, social, cognitive, and communication development. The UN Committee on the Rights of the Child defined ECD as the development of children 8 years of age or under and although not explicitly stated, the focus

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refers primarily to physical development and nutritional requirements of children in the area of children's rights.

Overall, the emphasis is on developmental inputs during the early years of life when it matters the most for children. The ultimate goal of ECD programs is to improve young children's capacity to develop and learn. The positive effects of ECD programs can change the development trajectory of children by the time they enter school. A child who is ready for school has less chances of repeating a grade, being placed in special education, or being a school drop-out. (1)

WHY EARLY CHILDHOOD DEVELOPMENT?

There are several inter-connected reasons for investing in ECD programs. A child's ability to think, form relationships, and live up to full potential is directly related to the synergistic effect of good health, nutrition, and appropriate stimulation and interaction with others. Ensuring healthy child development, therefore, is an investment in a country's future workforce and capacity to thrive economically and as a society.(1)

Science shows us that stable, responsive, nurturing relationships and rich learning experiences in the earliest years provide lifelong benefits for learning, behavior and both physical and mental health (2)

The WHO Commission on the Social Determinants of Health (CSDH) recognizes the importance of early childhood development. In the landmark report, "Closing the Gap in Health in One Generation" it states:

"Investment in the early years provides one of the greatest potentials to reduce health inequities within a generation."

"ECD— including the physical, social/emotional, and language/cognitive domains – has a determining influence on subsequent life chances and health through skills development, education, and occupational opportunities because what children experience during the early years sets a critical foundation for their entire life course. Through these mechanisms, and directly, early childhood influences subsequent risk of obesity, malnutrition, mental health problems, heart disease, and criminality."

BIOLOGICAL BASIS OF EARLY CHILDHOOD DEVELOPMENT

The basic architecture of the brain is constructed through an ongoing process that begins before birth and continues into adulthood. Early experiences affect the quality of that architecture by establishing either a sturdy or a fragile foundation for the learning, health and behavior that follow.

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(3) In the first few years of life, 700 new neural synapses are formed every second (4, 5). After this period of rapid proliferation, these connections are reduced through a process called *pruning*, so that brain circuits become more efficient. Connections proliferate and prune in a prescribed order, more complex brain circuits are built upon earlier, simpler circuits (2).

This neurodevelopment is dependent on multi-sensory stimulation experienced by the child. Young children naturally reach out for interaction through babbling, facial expressions and gestures, and adults (mother and other caregivers) respond with similar kinds of vocalizing and gesturing back at them (3). In the absence of such responses – or if the responses are unreliable or inappropriate – the brain's architecture does not form as expected, which can lead to disparities in learning and behavior (2).

RISK FACTORS FOR CHILD DEVELOPMENT

Poverty and its consequences are a major risk factor. Poverty is associated with food insecurity, poor sanitation and hygiene leading to increased infections and poor access to healthcare. Poverty is also associated with poor maternal education, increased maternal stress and depression, suboptimal parental care and inadequate stimulation in the home. All these factors have adverse implications for development.

Several nutritional risk factors have adverse effect on developmental outcomes, like IUGR (related largely to maternal malnutrition and infections in the developing countries), childhood under-nutrition, and micronutrient deficiencies (Iodine, iron and others like zinc). Repeated infections like diarrhea, dysentery, malaria, tuberculosis, HIV/AIDS etc. have a predictable adverse influence as well. Environmental exposure to lead, arsenic, manganese, mercury and pesticides etc. are associated with poor developmental outcomes.

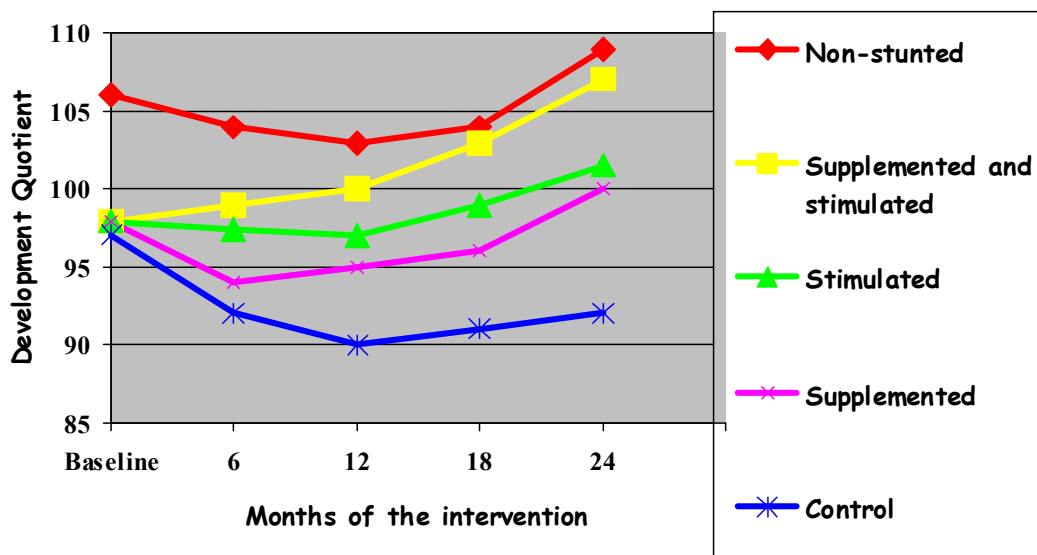
Parenting significantly influences the child development especially in the early years. Factors like inadequate cognitive stimulation; suboptimal parental / caregiver sensitivity and responsiveness; and poor emotional warmth (or rejection) have substantial adverse effect on child development. Maternal depression and exposure to violence in the family is also a direct risk factor (5).

Many times mothers, especially the first timers, and caregivers do not realize that the tiny newborns are also capable of engaging in communication and can have benefit of social interaction. Some even have doubt whether the newborn can see at all during first few weeks. This ignorance keeps the young caregivers away from providing stimulation through eye-to-eye contact, touch and just speaking to the newborn thus depriving the benefits of stimulation for early child development.

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BENEFITS OF EARLY INTERVENTIONS

The emotional and physical health, social skills and cognitive-linguistic capacities that emerge in the early years are all important prerequisites for success in school and, later, in the workplace and community (6, 7). Interventions in education programs prepare children for school, improving their performance and reducing the need for repetition (1).

The study in Jamaica by Grantham-McGregor et al (8) showed that both stimulation and food supplementation affect development. In this study, 129 stunted children, 9–24 months of age, were assigned to 24 months nutrition supplementation, or stimulation, or both combined or to control group. Mothers were taught educational play techniques and child given educational toys. Results for supplementation group were similar to those of the stimulation group. Best results were seen in the combined group.



Jamaica Project: Effects of supplementation and stimulation on the mean development quotient of stunted groups compared with non-stunted groups

In another experimental intervention study in Brazil 156 low socioeconomic infants, aged 13-17 months were assigned to intervention or control group. Mothers were taught to make toys and engage in activities to promote child development. Children were tested at 12 and 18 months. At 18 months intervention group had higher Bayley Scales of Infant Development mental and motor scores than controls (9).

Improved adult health is another benefit of early childhood interventions. An extensive body of evidence links adult chronic disease to processes and experiences occurring decades before, in

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some cases as early as intrauterine life, across a wide range of impairments. For example, experiences with toxic (psychological) stress in early childhood may result in heightened immune responses in adulthood that are known risk factors for the development of cardiovascular disease, diabetes, asthma, and chronic lung disease. Health promotion and disease prevention must begin at the early years rather than in adulthood (10).

CARE FOR CHILD DEVELOPMENT PACKAGE: WHO-UNICEF PACKAGE TO PROMOTE ECD

The critical role of the health-care system in ensuring every child's right to survival and development has long been recognized. It is the only system that reaches children during first three years of age - the most critical window of both risk and opportunity. They can provide critical guidance to parents and other caregivers on how to stimulate infants and young children through age appropriate communication and play activities. Interventions for promoting ECD should become part of the regular primary childcare package, and easily link with newborn care, breastfeeding and complementary feeding.

WHO/UNICEF's 'Care for Child Development' (CCD) package provides evidence-based, theoretically sound, and tested methods for supporting ECD, good nutrition and responsive feeding. It provides 3 - 4 recommendations for all children on play (cognitive development) and communication (language and social-emotional development) for each age group covering the first week of life through 24 -36 months. A snapshot of the counselling chart is placed at Annexure. The package also includes guidance on breastfeeding and complementary foods, as well as, responsive feeding. The package also includes recommendations to use if a health worker observes problems such as lack of mother-child attachment, harsh discipline or maternal depression. It includes a list of potential problems with recommendations for action.

A controlled trial in Turkey showed that use of the module could significantly improve parenting behaviours one month after the intervention with only about 10 additional minutes per visit (11). Efficacy trials showed that the intervention was acceptable to families, was understood, and resulted in increased satisfaction with the health care and the intervention could increase parental stimulation (10) and the child's development in rural China (12).

In India, the principles of psycho-social stimulation recommended in the WHO-UNICEF CCD package have been adopted in the Mother and Child Protection Card developed jointly by Ministries of Health and Women and Child Development.

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ROLE OF PEDIATRICIANS AND IAP

Nutrition and good health are essential to children's development. Lancet series on Childhood Development (2007) outlines recommendations for improving childhood development (13). Major policy and program recommendations from the series include:

Implementing ECD interventions in infancy through families and caregivers, particularly for disadvantaged children.

Ensuring that development programs combine health and nutrition services with early learning, and rely on families as partners to affect children's development cost effectively.

Pediatricians already counsel parents on healthcare, immunization, appropriate feeding practices like early and exclusive breastfeeding and complementary feeding and practice growth-monitoring. They must also contribute by educating parents about psychosocial development of young children and promote parenting skills so that they are able to provide desired stimulation to infants through age appropriate play and communication activities. WHO-UNICEF CCD package and ICDS Mother and Child Protection Card are useful tools for practicing ECD intervention in daily practice. In doing so, the Pediatricians would be able to present a role model for professional colleagues and subordinate health care workers to contribute to early child development.

IAP should strongly consider integrating ECD with the IYCF practices as a strategic approach. IAP must disseminate information about the importance of integrating ECD along with feeding recommendations among its members and other professionals. ECD also needs to be integrated with IYCF teaching in the medical and nursing education. Pediatric community should strongly advocate for this and implement this through the Faculty members in medical colleges. This will go a long way in developing capacity of the next generation of medical graduates in implementing ECD when they get into practice.

€:At the same time, IAP must mobilize awareness among parents and public on the importance of ECD. Various communication channels like IAP website, print and electronic media should be effectively utilized.

REFERENCES

1. <http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTCY/EXTECD/0,contentMDK:20260280~menuPK:524346~pagePK:148956~piPK:216618~theSitePK:344939,00.html> Accessed on 01 Oct 2010
2. JACK P. SHONKOFF Investment in Early Childhood Development Lays the Foundation for a Prosperous and Sustainable Society: Encyclopedia on Early Childhood Development 3 ©2009 Centre of Excellence for Early Childhood Development. Available at: <http://www.child-encyclopedia.com/pages/PDF/ShonkoffANGxp.pdf> Accessed on 01 Oct 2010













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3. Cambridge, MA: Center on the Developing Child at Harvard University; 2007. A science-based framework for early childhood policy; Using evidence to improve outcomes in learning, behavior, and health for vulnerable children. Available at: http://developingchild.harvard.edu/library/reports_and_working_papers/policy_framework/ ; Accessed on 01 Oct 2010
4. Knudsen EI, Heckman JJ, Cameron JL, Shonkoff JP. Economic, neurobiological, and behavioral perspectives on building America's future workforce. *Proceedings of the National Academy of Sciences* 2006;103(27):10155-10162.
5. Walker SP, Wachs TD, Meeks Gardner J, and the International Child Development Steering Group. Child development: risk factors for adverse outcomes in developing countries. *Lancet* 2007; 369: 145-157.
6. Emde R, Robinson J. Guiding principles for a theory of early intervention: A developmental-psychoanalytic perspective. In: Shonkoff JP, Meisels SJ, eds. *Handbook of early childhood intervention*. 2nd ed. New York: Cambridge University Press; 2000:160-178.
7. McCartney K, Phillips D, eds. *Blackwell handbook of early childhood development*. Oxford, UK: Blackwell Pub.; 2006.
8. Grantham-McGregor SM, et al. Nutritional supplementation, psychosocial stimulation, and mental development of stunted children: the Jamaican Study. *Lancet*, 1991, 338 (8758):1-5.
9. Eickmann SH, Lima AC, Guerra MQ, et al. Improved cognitive and motor development in a community-based intervention of psychosocial stimulation in northeast Brazil. *Dev Med Child Neurol* 2003; 45: 536-41.
10. Engle, P. Draft Strategy Paper for promoting ECD among children 0-3 years in the Ten SEARO Countries and Recommendations for Action. Report to WHO SEARO, 2008.
11. Ertem I et al. (2006). Promoting child development at sick child visits: A controlled trial to test the effect of the intervention on the home environment of young children. *Pediatrics* 2006;118(1):e124-131.
12. Jin X et al. (2007). "Care for development" intervention in rural China: A prospective follow-up study. *Journal of Developmental and Behavioral Pediatrics*, 28:213-218.
13. Child development in developing countries: *Lancet* 2007; 369: 8-9, 60-70, 145-157, 229-242.

Annexure













RECOMMENDATIONS FOR CARING FOR YOUR CHILD'S DEVELOPMENT

<p>Newborn, birth up to 1 week</p>  <p>Your baby learns from birth.</p> <ul style="list-style-type: none"> • Play: Provide ways for your baby to see, hear, move arms and legs freely, and touch you. Gently soothe, stroke, and hold your child. Skin to skin is good. • Communicate: Look into baby's eyes, and talk to your baby. When you are breastfeeding is a good time. Even a newborn baby sees your face and hears your voice. 	<p>1 week up to 6 months</p>  <ul style="list-style-type: none"> • Play: Provide ways for your child to see, hear, feel, move freely, and touch you. Slowly move colourful things for your child to see and reach for. Sample toys: shaker rattle, ring on a string.  <ul style="list-style-type: none"> • Communicate: Smile and laugh with your child. Talk to your child. Get a conversation going by copying your child's sounds or gestures. 	<p>6 months up to 9 months</p>  <ul style="list-style-type: none"> • Play: Give your child clean, safe household things to handle, bang, and drop. Sample toys: containers with lids, metal pot and spoon. <ul style="list-style-type: none"> • Communicate: Respond to your child's sounds and interests. Call the child's name, and see your child respond. 	<p>9 months up to 12 months</p>  <ul style="list-style-type: none"> • Play: Hide a child's favourite toy under a cloth or box. See if the child can find it. Play peek-a-boo.  <ul style="list-style-type: none"> • Communicate: Tell your child the names of things and people. Show your child how to say things with hands, like "bye bye". Sample toy: doll with face. 	<p>12 months up to 2 years</p>  <ul style="list-style-type: none"> • Play: Give your child things to stack up, and to put into containers and take out. Sample toys: Nesting and stacking objects, container and clothes clips. <ul style="list-style-type: none"> • Communicate: Ask your child simple questions. Respond to your child's attempts to talk. Show and talk about nature, pictures, and things. 	<p>2 years and older</p>  <ul style="list-style-type: none"> • Play: Help your child count, name, and compare things. Make simple toys for your child. Sample toys: Objects of different colours and shapes to sort, stick or chalk board, puzzle.  <ul style="list-style-type: none"> • Communicate: Encourage your child to talk and answer your child's questions. Teach your child stories, songs, and games. Talk about pictures or books. Sample toy: book with pictures.
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RECOMMENDATIONS FOR FEEDING YOUR CHILD

<p>Newborn, birth up to 1 week</p>  <ul style="list-style-type: none"> • Immediately after birth, put your baby in skin to skin contact with you. And, as soon as possible, put your baby to the breast. Give your baby the first milk (colostrum). • Breastfeed day and night, as often as your baby wants, at least 8 times in 24 hours. Frequent feeding produces more milk. • If your baby is low birth weight, feed every 2 to 3 hours. Wake the baby for feeding after 3 hours, if baby does not wake self. • Make sure your baby is well attached to the breast and is suckling well. • Do not give other foods or fluids. 	<p>1 week up to 6 months</p>  <ul style="list-style-type: none"> • Breastfeed as often as your child wants or shows signs of hunger, such as beginning to fuss, sucking fingers, or moving lips. • Breastfeed day and night, at least 8 times in 24 hours. Frequent feeding produces more milk. • Do not give other foods or fluids. 	<p>6 months up to 9 months</p>  <ul style="list-style-type: none"> • Breastfeed as often as your child wants. • Start giving 2 to 3 tablespoons of thick porridge and well mashed foods during 2 to 3 meals each day. • Continue with mashed family foods and increase gradually to 1/2 cup each meal. • Offer 1 to 2 snacks each day between meals, if child is hungry. For 	<p>9 months up to 12 months</p>  <ul style="list-style-type: none"> • Breastfeed as often as your child wants. • Give 1/2 cup of finely chopped or mashed family foods during 3 to 4 meals each day. • Offer 1 to 2 snacks each day between meals, if child is hungry. • For snacks, give small chewable items to eat with fingers. Let your child try to feed self, but provide help. 	<p>12 months up to 2 years</p>  <ul style="list-style-type: none"> • Breastfeed as often as your child wants. • Give 3/4 cup to a full cup of family foods 3 or 4 meals each day. Chop or mash the foods, if necessary. • Offer 1 to 2 snacks each day between meals, if child is hungry. • Feed slowly, patiently. Encourage—but do not force—your child to eat. Talk face-to-face with your child during feeding. 	<p>2 years and older</p>  <ul style="list-style-type: none"> • Give at least a full cup of family foods during 3 to 4 meals each day. Also, twice daily, give nutritious snacks between meals. • Offer a variety of foods. If a new food is refused, offer "tastes" several times. Show that you like the food. 
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Section II

PRACTICES

ANTENATAL PREPARATION FOR BREASTFEEDING

Dr. Suresh Thaker

Breastfeeding is crucial for the mother, the child, the family, the society and the nation as a whole. Like every crucial event it needs proper attention and preparation and antenatal period is best period for the preparation. In the new era of globalization and nuclear families there is paucity of parents' preparation for parenthood, lack of inclusion of fathers from antenatal education and that the inadequate preparation remains a concern to would be parents.

ANTENATAL COUNSELING

Introduction

In the settings, where practice of institutional delivery is high, the staff of healthcare facility should ensure education of the mothers regarding position and attachment of infant to the breast during antenatal period by the healthcare provider. At the village level, health workers can be utilized for health education of future mothers and support for the breastfeeding mothers.(1)

Traditional birth attendant training for improving health behaviours and pregnancy outcomes can bring good results if undertaken sincerely (2,3,4) Apart from antenatal counselling formal and informal education gives children, youth and adults numerous opportunities to obtain correct information about breastfeeding. Where breastfeeding practices are suboptimal, simple one-encounter antenatal education and counselling significantly improve breastfeeding practice up to 3 months after delivery. Provision of printed or audiovisual educational material is not enough. Health care workers should make every effort to have one face-to-face encounter to discuss breastfeeding with expectant mothers before they deliver.(5,6) Existing antenatal counselling on breastfeeding is inadequate in the population studied and needs to be strengthened.

Advantages of counseling

By simple antenatal preparation, successful breastfeeding in the early weeks was associated both with practices and support in hospital and with factors at home including having a supportive partner, family and health professionals who are encouraging breastfeeding. Peer counselling can be of great help. (7)

When effective support offered by professionals and lay people together was specific to breastfeeding and was offered to women who had decided to breastfeed there was a significant increase in exclusive breastfeeding/□. (8,9,10,11) Simple teaching for good positioning and developing support from care givers during antenatal period significantly enhances effective breastfeeding.(12)

Postnatal lactation support is marginally more effective than antenatal education.(13)

How to give counseling

Exclusive breastfeeding rates are still not encouraging in western world.(14) Sadly, in spite of the known risks of artificial feeding, many of these parents find that they feel they have no choice but to wean baby. Learning about breastfeeding before baby is born can really make all the difference. Baby friendly hospital movements have done a lot to improve awareness in society and doctors.(15)

One of the most important skills that a new baby and mother have to learn together is how to position and attach baby to the breast.(16) Empowering new parents with up-to-date facts will mean they will be better prepared to seek advice from knowledgeable and supportive health professionals and breastfeeding counsellors should the need arise.(17,18,19)

One should use innovative teaching techniques as well as DVD's, PowerPoint, hands on practice with dolls and breastfeeding cushions and lots of discussion so that mothers will feel much more knowledgeable and confident about breastfeeding. Partners are very welcome to attend the class at no extra cost.

Agenda for counselling

In fact WHO/UNICEF BFHI Section 3 has laid down very clear guidelines on antenatal preparation of breast feedings.(20)

- Anatomy and physiology of lactation

- Advantages of breastfeeding

- Disadvantages of not breastfeeding

- Impact of the decision of feeding on the baby, the mother and the family

- Techniques of breastfeeding which elaborates on correct latching, How to latch the baby on, different feeding positions, How to know the baby is getting enough milk,

- How to know when baby wants to feed and how long to feed for.

- How to avoid problems.

- What to do if you are having problems

- Expressing milk

Coping strategies for the early weeks
Instructions to working mothers
Role of fathers
Breastfeeding in public

ADVANTAGES OF BREASTFEEDING

Benefits for children

Remember to use breast milk as the ideal or norm and compare infant formula to breast milk, rather than comparing breast milk to formula, which may have a high level of a particular ingredient but this does not mean that a high level is better than the level in breast milk.

- A mother's own milk is best suited to the individual child (tailor made), changing to meet the baby's changing needs.
- Many of the effects of breastfeeding are 'dose responsive'. This means that longer and exclusive breastfeeding shows a greater benefit.

Importance of breastfeeding to the mother

Women who do not breastfeed are more likely:

To develop anemia

To retain fat deposited during pregnancy, which may result in later obesity.

To become pregnant soon after the baby's birth.

To develop breast cancer and some forms of ovarian cancer

To have hip fractures in older age.

Frequent pregnancies due to lack of child spacing effect of breastfeeding.

Fewer opportunities to be close to their baby

Impact over Families- When a baby is not breastfed

Loss of income through a parent's absence from work to care for an ill child.

Higher family expenses to purchase and prepare artificial feeds as well as extra time needed to give these feeds, as well as extra expense of the child's illnesses.

Worry about infant formula shortages or about an ill baby.

Children who are not breastfed have increased illness, therefore increased use of health care services, and increased health care costs, both as infants and later. Instead, healthy infants grow to become healthy, intelligent adults in the workforce, contributing to the well being of their community.

Risks and hazards of formula per se

Contamination, errors of preparation; errors of manufacturing
 Costs,
 Difficulty in reversing the decision not to breastfeed,
 Infant formula may contain unsafe ingredients or may lack vital ingredients.
 Water used for washing bottles or mixing infant formula may be contaminated.
 Errors in mixing formula, over concentration or under concentration, may cause infant illness.
 Families may dilute the formula to make it last longer.
 Formula may be given to settle a crying baby. It can lead to overweight and food being seen as the solution to unhappiness.

MYTHS AND MISBELIEVES

Certain myths and misbelieves can be found out and removed from the psyche of the mothers such as:

She must prepare her nipples for breastfeeding, as some women's breasts are not good for breastfeeding. Reassure her that most women breastfeed with no problems
 Antenatal practices such as wearing a bra, using creams, performing breast massage or nipple exercises, or wearing breast shells, do not assist breastfeeding.
 Practices such as 'toughening' of the nipples by rubbing with rough towel or putting alcohol on the nipples or excessive pulling are not necessary and may damage the skin and tiny muscles that support breastfeeding, and should not be encouraged.

BREAST EXAMINATION DURING PREGNANCY

It can be helpful if it is used to

Point out to a woman how her breasts are increasing in size, that there is more blood flow to them and changes in sensitivity, and how these are all signs that her body is getting ready to breastfeed.
 Check for any previous chest or breast surgery, trauma or other problem (e.g. lumps in breast).
 Talk to the mother about regular breast self-examination and how it can be useful.

Breast examination during pregnancy can be harmful if it is used to

Judge a woman's nipples or breasts as suitable or unsuitable for breastfeeding. It is very rare for a woman to be unable to breastfeed due to the shape of her breasts or nipples.
 Recommending nipple preparation with breast shells may reduce the chances of successful breastfeeding, and should be abandoned.

ADVICES

Keep the baby beside you (rooming-in or bedding-in), so that your baby is easy to feed as well as safe. Kangaroo Mother Care (KMC) is more beneficial specially, if the baby is pre-term or small for gestational age.

Learn feeding signs/cues in your baby so that feeding is baby-led rather than to a schedule.

Feeding frequently helps to develop a good milk supply.

Breastfeeding exclusively with no supplements, bottles, or artificial teats.

It is important to learn how to position and attach the baby for feeding

ADVICE TO FATHERS

Father should be emphasized that the pregnant woman needs support from you and all your family members to be able to breastfeed successfully.

Letting her know that she is setting a good example for mothers in the community by exclusively breastfeeding her baby.

Learning yourself about breastfeeding

Making your partner feel good about her by praising her job as a mother.

Telling your wife and your relatives that you want your wife to breastfeed, and that you know that mother's milk is the best food for your baby.

What fathers should avoid

You should not doubt your wife's ability to provide enough milk for your baby.

You should not feel embarrassed if she is feeding baby outside home.

Working and Breastfeeding is taken up in details in other chapters Problems encountered while breastfeeding are preventable if due care is taken from the pregnancy period to prepare for breastfeeding.

TAKE HOME MESSAGE FOR MOTHERS

Like all mothers you can successfully breastfeed your baby, which is the most natural way to feed babies.

Mother's milk is complete nutrition for the baby for first 6 months and your child should be exclusively breastfed during this period of time. No other milk, food, drink or even water is required.

Your baby should be breastfed immediately after birth preferably within ½ to 1 hour of birth.

Your baby should be breastfed unrestrictedly and on "early cues" or demand.

Your baby must be given Colostrum - the first yellowish mother's milk during the first 2-3 days after birth.

You can continue breastfeeding during your sickness without any harm to the baby and yourself.

You should continue breastfeeding for two years or beyond.

Bottle-feeding is not necessary and even harmful for your baby.

Solid foods should be introduced only after 6 months of age.

Home-made, family food is better than commercial food for your baby.

Commercially available powder milk is always inferior to mother's milk.

REFERENCES

1. Dongre AR, Deshmukh PR, Rawool AP, Garg BS: "Where and how breastfeeding promotion initiatives should focus its attention?" *Indian J Community Med.* 2010 Apr;35(2):226-9.
2. Chaturvedi P: "Knowledge and attitude regarding breast-feeding, in mothers attending antenatal clinics." *Indian J Pediatr.* 2000 Apr;67(4):259-62.
3. Karen A Bannock Michelle Trombley Katherine freeman and diane mckee. Randomized, Controlled Trial of a Prenatal and postnatal lactation consultant intervention on duration and intensity of breastfeeding up to 12 months *pediatrics* 2005;116;1413-1426 DOI: 10.1542/peds. 2005-0435.
4. Anette ekstrom, Ann-marie widstrom , and eva nissen : "Does continuity of care by well – trained breastfeeding counselors improve a mother's perception of support?" (*BIRTH* 33:2 June 2006)
5. Mattar CN, Chong YS, Chan YS, Chew A, Tan P, Chan YH, Rauff MH: "Simple antenatal preparation to improve breastfeeding practice: a randomized controlled trial." *Obstet Gynecol.* 2007 Jan;109(1):73-80.
6. Lynch SA, Koch AM, Hislop TG, Coldman AJ: "Evaluating the effect of a breastfeeding consultant on the duration of breastfeeding." *Can J Public Health* 1986;77(3):190–195.
7. Kistin N, Abramson R, Dublin P: "Effect of peer counselors on breastfeeding initiation, exclusivity, and duration among low-income urban women." *J Hum Lact* 1994;10(1):11–15.
8. Britton C, McCormick FM, Renfrew MJ, Wade A, King SE: Support for breastfeeding mothers. *Cochrane Database Syst Rev.* 2007 Jan 24;(1):CD001141.
9. *BMJ* 2007; 335 : 596 doi: 10.1136/bmj.39279.656343.55 (Published 1 August 2007)

10. Memmott M, Bonuck K. Mother's reactions to a skills-based breastfeeding promotion intervention. *Matern Child Nutr* 2006;2:40-50.
11. Duffy EP, Percival P, Kershaw E. Positive effects of an antenatal group teaching session on postnatal nipple pain, nipple trauma and breastfeeding rates. *Midwifery* 1997;13(4):189–196. *
12. Ingram J, Johnson D, Greenwood R: “Breastfeeding in Bristol: teaching good positioning, and support from fathers and families.” *Midwifery*. 2002 Jun;18(2):87-101.
13. Mattar CN, Chong YS, Chan YS, Chew A, Tan P, Chan YH, et al. Simple antenatal preparation to improve breastfeeding practice: a randomized controlled trial. *Obstet Gynecol* 2007;109:73-80.
14. Editorial: Increasing exclusive breastfeeding Maria A Quigley *BMJ* 2007;335:574-575 doi:10.1136/bmj.39330.522014.80 (Published 20 September 2007)
15. Frank DA, Wirtz SJ, Sorenson JR, Heeren T. Commercial discharge packs and breastfeeding counseling: effects on infant-feeding practices in a randomized trial. *Pediatrics* 1987;80(6):845–854.
16. Curro V, Lanni R, Scipione F, Grimaldi V, Mastroiacovo P. Randomised controlled trial assessing the effectiveness of a booklet on the duration of breastfeeding. *Arch Dis Child* 1997;76(6):500–504.
17. McEnery G, Rao KP. The effectiveness of antenatal education of Pakistani and Indian women living in this country. *Child Care Health Dev* 1986;12(6):385–399.
18. Bridget A. Aidam, Rafael Perez-Escamilla, and Anna Lartey Lactation counseling increases Exclusive Breast-Feeding Rates in Ghana. *J. Nutr.* 135: 1691-1695, 2005.
19. Redman S, Watkins J, Evans L, Lloyd D. Evaluation of an Australian intervention to encourage breastfeeding in primiparous women. *Health Prom Int* 1995;10(2):101–113.
20. WHO/UNICEF BFHI Section 3: Breastfeeding promotion and support in a baby-friendly hospital – 20-hour course 2009.

BREASTFEEDING

Dr. Sanjay. B. Prabhu, Dr. Prashant Gangal

WHO and UNICEF recommend, in their Global Strategy exclusive breastfeeding for six months (180 days), nutritionally adequate and safe complementary food from the age of six months along with continued breastfeeding for up to two years of age or beyond.

Exclusive breastfeeding means that an infant receives only breast milk from his or her mother or a wet nurse or expressed breast milk and no other liquids or solids, not even water, with the exception of oral rehydration solution, drops or syrups containing medicines or vitamin and mineral supplements.

Breastfeeding does confer short term and long term benefits for both mother and child.

The Lancet Child Survival Series has shown that appropriate breastfeeding in the first year of life can save at least 13% under five deaths.

Diarrhea and pneumonia are more common in artificially fed children and these are very important causes of Under Five mortality.

Artificially fed children have increased risk of diseases with immunological basis as asthma and atopy, type-1 Diabetes and Inflammatory bowel diseases. The incidence of childhood leukemia is also higher in artificially fed.

Obesity in later childhood and adolescence is less common in breast fed with longer duration of breastfeeding being associated with lower risk. Artificial feeding is associated with increased risk of cardiovascular disease in adulthood.

Cognitive function is 3.2 points higher in breastfed than formula fed.

For mothers exclusive breastfeeding reduces risk of postpartum hemorrhage, decreases the risk of ovarian, breast and endometrial cancer, and delays the return of fertility and decreases obesity and postmenopausal osteoporosis.

How should mother prepare for breastfeeding during pregnancy? Should she take some special care of breasts and nipples?

Both mother and family need to get psychologically geared up for this task. The family routine changes after birth of the child. All family members should provide encouragement, adequate time and supportive environment for breastfeeding. All members of the family who would assist the mother should get to know scientifically correct information on advantages of breastfeeding, positions, attachment and commonly encountered problems (prenatal counseling).

A pregnant mother can immensely benefit by observing another mother breastfeed and sharing experiences.

Breasts and nipples undergo natural changes as the pregnancy advances. The nipples which initially appear smaller become optimally fit for feeding by the time of delivery. There is no need to prepare/treat flat or inverted nipples antenatally by stimulating/pulling them. They have to be managed postnatally with proper attachment-latching-positioning.

The mother should not worry about the size of the breasts because milk production does not depend on it. The breast size varies due to differences in amount of fat. Amount of milk producing glandular tissue is almost same in all the mothers.

Proper clothes that facilitate breastfeeding need to be kept ready. Sari-Blouse, shirt or gown (full front opening) is best suited for this purpose

When should breastfeeding begin after delivery and how?

Breastfeeding & skin-to-skin contact within the 1st hour of birth is very important. It has been estimated that if more than 90% (from current 40%) newborns start breastfeeding within 1st hour of life, it will save more than a million newborn deaths by 22% reduction in neonatal mortality! UNICEF, WABA & WHO has endorsed this fact. After normal delivery, in the labor room itself, clean the baby (no need to give bath) and keep it in skin to skin contact with mother (on her unveiled chest) in naked state & cover them with a blanket. Mother should be promoted to kiss and cuddle the baby and hold the baby in close skin to skin contact (in about 5 min.).

Newborn babies have capacity of “self-attachment” so that most often babies crawl to nipple & start sucking without any assistance when placed on mother’s chest. One of the popular methods to initiate breastfeeding employed is the Breast Crawl. This helps the baby to initiate breastfeeding in first one hour. The Breast Crawl Video will guide you to implement this recommendation. Kindly go to www.breastcrawl.org for more details. After Caesarean delivery, the mother should start breastfeeding as soon as she regains consciousness (maximum four hours).

Following are the benefits of early initiation.

1. Baby is very alert and eager to breastfeed in the first hour after delivery.
2. The child remains warm being in close contact with the mother, especially important for small and low birth weight babies. Breast temperature increases by 0.5°C within 2 minutes when baby starts feeding! The baby is less stressed, calmer and has steadier breathing and heart rates when given early breastfeeding.
3. Risk of infections is reduced. Baby gets the colostrum containing innumerable helpful factors, baby gets colonized with mother's commensals against which the mother's milk contains protective factors. These bacteria colonizing the baby's intestines and skin compete with more harmful bacteria from health providers and the environment, and so prevent them from causing infection.
4. Ensures short term and long term breastfeeding success (total duration)
5. Post-partum hemorrhage decreases
6. A strong emotional bond begins to develop between the mother and the baby. Mother feels calm, relaxed, and "in love" with her baby.

Note: The first skin-to-skin contact should continue till completion of the first breastfeed. A landmark study published in Pediatrics has shown that neonatal mortality is reduced by 22% if breastfeeding is initiated in one hour after birth.

Mother does not produce milk for first few days after delivery. What should be fed to quench baby's thirst and hunger during this period?

Even though the mother does not produce copious milk during the first two or three days post delivery, she produces a yellow fluid known as Colostrum. Though less in quantity, it is sufficient enough to meet baby's needs.

Following are the benefits of colostrum:

1. Rich in antibodies and protects the baby against infections. Hence it is the first vaccine for the baby.
2. Helps the baby to pass her first stool (meconium). This helps to reduce the severity of physiological jaundice.
3. Helps to complete maturation of the intestines.
4. Rich in vitamins A and K

The relatives and health care providers should motivate the mother to give frequent skin to skin contact and breastfeed as soon as the baby shows the desire to do so. This ensures that the baby gets good quantities of colostrum. Some children cry little more during this period. But one should avoid the temptation of giving any milk or fluids (water, glucose, honey etc.). Instead, the mother should focus on breastfeeding (at least 8-10 times in 24 hours)

In the early days mothers should practice 'Feeding on Cue' instead of feeding on demand. Early Feeding cues are sucking movements, sucking sounds; hand to mouth movements, rapid eye movements, soft cooing or sighing movements, restlessness. Crying is a late feeding cue and may interfere with effective breastfeeding.

If the infant is not aroused remove blankets, clothing, change diaper, place infant in skin to skin contact and massage infants back or abdomen.

Is it appropriate to follow the tradition of giving honey, sugar water, etc. to the baby before the first breastfeed (Pre-Lacteal feeds)?

Traditionally, sometimes the baby is fed some fluid before the first breastfeed or during first three to five days of life (before the mother starts producing mature milk). This is known as "Pre-lacteal feed". This custom is inappropriate because it increases the risk of infection. This pre-lacteal feed may decrease the baby's eagerness to suckle at the breast. Thus the first and the subsequent breastfeeds may get delayed. This may lead to breastfeeding failure.

Where the child should be kept after delivery?

The child should be kept as close to the mother as possible, preferably on the same bed ("Bedding in") Next best would be "Rooming in" where the mother and the baby are kept in the same room. Keeping all newborn babies together in a separate room is a wrong practice.

The benefits of "Bedding in" are as follows:

1. It promotes demand feeding
2. The baby remains warm
3. Risk of infection is reduced
4. Helps let-down of milk
5. Helps to develop a stronger emotional bond between the mother and the baby.

How frequently and how long should the child be breastfed?

It is necessary to feed the baby more frequently during the first seven days (at least 8-10 times in 24 hours). In this period baby should be put to breastfeed every 1.5 - 2 hrs by giving close skin-to-skin contact. Only after child starts urinating frequently (more than 6 times in 24 hrs.) and starts gaining weight that the baby can be fed on demand i.e. whenever the baby wants and as long as she wants. Very few babies demand feeds with a regularity of 2-3 hours.

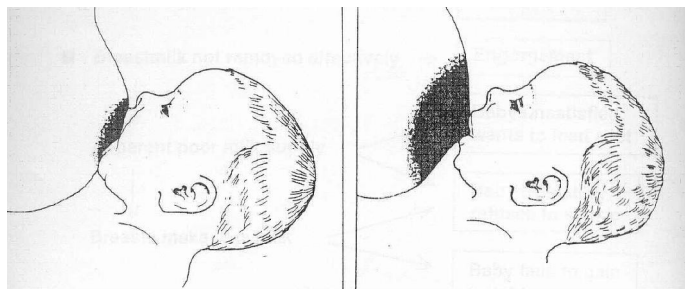
Some sleep during the day and keep their mothers awake at night. Some have exactly opposite schedule. Some babies do not follow any definite timetable. Some babies sleep for a long time and then after waking up feed very frequently for many hours and also urinate frequently. All these patterns should be considered as normal. The mothers should adjust her daily routine to suit baby's needs. Some babies are fast feeders (finishing their breastfeed in 5 to 10 min.), while slow feeders may continue to suckle for as long as 30 to 45 min.

Mother should feed on one side as long as possible because the milk which comes initially is rich in water & sugar (foremilk), while the milk which comes in the later part of the breastfeed is rich in fats (hind milk).

It is necessary to feed the child frequently at night and there are no ill-effects associated with this. In fact, the mother produces more milk during the quiet hours of night as prolactin secretion is high during that time. Night feeds help to maintain day time production.

It is not mandatory for the mother to breastfeed in sitting position; she can also feed while lying down. She may find it more comfortable.

How should the mother hold the child while breastfeeding? How baby suckles from the breast



Correct Attachment

Incorrect Attachment

Baby's attachment to the breast

1. Maximum possible areola in baby's mouth (Lower portion more).
2. Mouth wide open.
3. Lower lip turned outward.
4. Chin touches the breast.

Baby's Position

1. Whole body turned towards the mother.
2. Good skin to skin contact
3. Head and body in one line.
4. Neck, back and buttocks well supported.

Mother's Position

1. Sitting comfortably with good back support
2. Holding breast in big "C" grip of hand
3. Touches nipple to upper lip of baby by bringing nipple in front of nose and gives mouthful of breast including areola as soon as the baby opens the mouth widely.
4. Interacting with baby while feeding.

Note: If child is more than one month old and it is certain that the baby is getting enough milk, it may not be wise to instruct the mother regarding attachment and positioning.

How long should the baby be breastfed?

The baby should be given only mother's milk (Exclusive Breastfeeding) for the first six months of life. Even water is not necessary during this period. Breast milk contains enough water to take care of baby's needs even in summer.

Proper complementary foods should be started at the end of six months. However breastfeeding should continue along with complementary foods at least till second birthday. Breastfeeding can be continued to some extent till the child is five years old because child's immunity matures only by this age. Continued breastfeeding till this age reduces the risk of various infections.

MANUAL EXPRESSION OF BREAST MILK

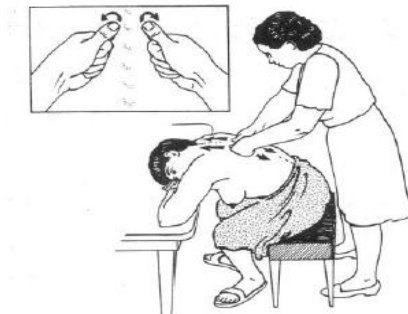
Indications for expressing breast milk:

- Prevention and management of engorged breasts
- Working mother,
- Sick \ premature baby.

METHOD OF MANUAL EXPRESSION OF BREAST MILK

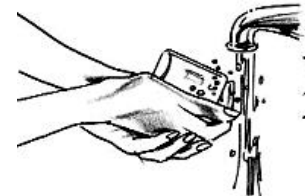
1. Relax the mother:

- Back Massage
- Upper Limb Exercise (Only if breasts are engorged)
- Warm shower / fomentation
- Hold baby close / think lovingly about the baby / keep baby's photo in front (in case of NICU transfers)



Wash hands with soap and water.

Mother should assume a comfortable position and keep the vessel for collection nearby. The vessel should be made germ free beforehand, by boiling it for 10 minutes.



2. Massage the breast: Support breast from below and massage breast all round the areola between chest wall & four fingers

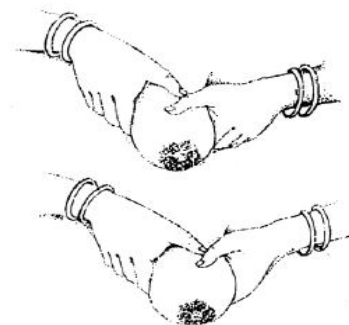
Fingers kept parallel to chest wall (to achieve this give more pressure on fingers near areola)

Do not forget to massage breast tissue in axilla (Axillary Tail)



4. Expression

Hold breast one inch behind areola (like small "C")

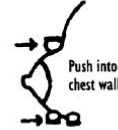


Give & maintain backward thrust with thumb & fingers

Roll thumb & Fingers forward

Repeat these steps all round the areola. To empty each breast both hands are required.

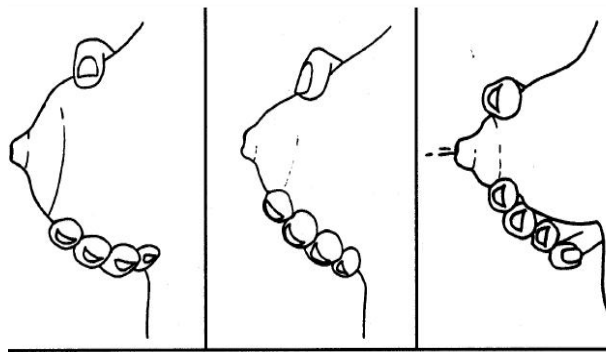
There should be no pain and no pressure on nipple



Right Hand



Left Hand



Notice how the thumb and fingers rotate to press in on the milk reservoirs.

WHAT ARE THE DIFFERENT METHODS TO HOLD THE BABY FOR BREASTFEEDING?



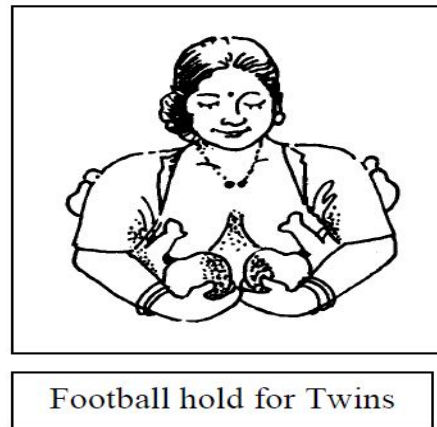
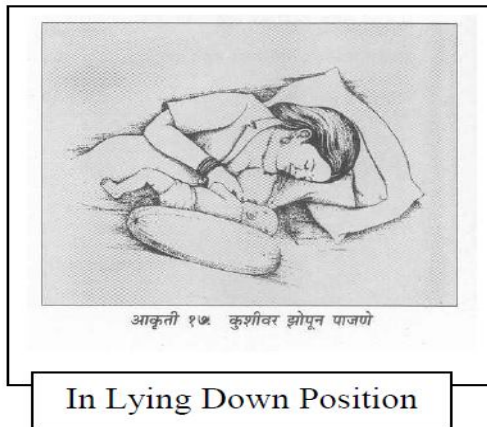
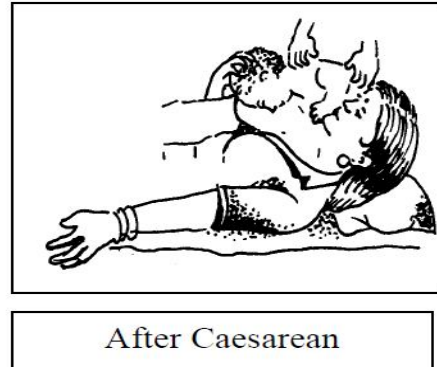
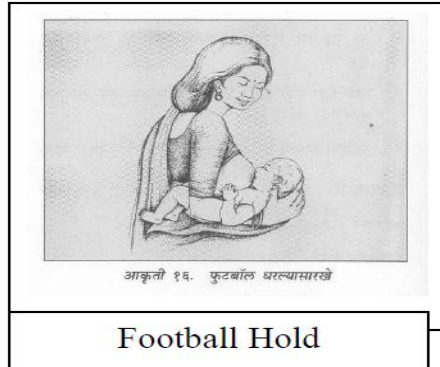
आकृती १४. पाळणा पद्धत

Cradle Method



आकृती १५. सुधारित पाळणा पद्धत

Modified Cradle Method



CRYING BABY

The baby cries excessively and the pattern of crying suggests the cause

1. Pain or illness
2. Hunger due to growth spurts at 2 weeks, six weeks and 3 months
3. Sensitivity to substances in mother's food- sometimes with milk, soy, egg, peanuts consumed by mother. Caffeine in tea, coffee, colas and cigarette smoke can also upset the baby.
4. Gastroesophageal reflux
5. Evening colic
6. High need babies- some babies need to be carried more

REFUSAL TO BREAST FEED

The baby refuses to feed arches her back, cry and turn away leaving the mother frustrated and rejected leading to increased anxiety and low milk transfer.

There may be a physical problem like illness, infection or oral thrush, pain due to traumatic delivery or GER, sedation due to maternal analgesics.

The baby may have difficulty or frustration with breastfeeding due to sucking on bottle or pacifier, poor attachment on the breast, pressure applied on baby's head while feeding, mother shaking her breast while positioning.

The baby may be upset by a change in the environment as mother resuming work, too many caregivers, changed caregiver or change in mothers smell due to different soap or perfume.

If all these causes are ruled out and optimum skin to skin contact with proper position and attachment would resolve most problems and as a last resort mother can express breast milk and feed the baby till baby latches on.

ACCEPTABLE MEDICAL REASONS FOR USING BREAST MILK SUBSTITUTES (CONTRAINDICATIONS FOR BREASTFEEDING)**1. Infant conditions**

Infants who should not receive breast milk or any other milk excepting specialized formulas:

- Classic galactosemia,
- Maple syrup urine disease,
- Phenyketonuria (some breastfeeding is possible under careful monitoring)

Infants for whom breast milk remains the best feeding option but may need other food in addition to breast milk for a limited period:

- Very low birth weight infants –less than 1500 grams
- Very preterm infants less than 32 weeks of age
- Newborn infants at risk of hypoglycemia

2. Maternal conditions

Conditions requiring to avoid breastfeeding temporarily:

- Severe debilitating illness in mother which prevents a mother from caring for her infant
- Herpes simplex type 1 especially as long as there are breast lesions
- Maternal medications:
 - Sedating psychotherapeutic drugs, anti-epileptic drugs and opioids and their combinations may cause side effects such as drowsiness and respiratory depression and are better avoided if a safer alternative is available
 - Radioactive iodine-131 is better avoided given that safer alternatives are available - a mother can resume breastfeeding about two months after receiving this substance;
 - Excessive use of topical iodine or iodophors (e.g., povidone-iodine), especially on open wounds or mucous membranes, can result in thyroid suppression or electrolyte abnormalities in the breastfed infant and should be avoided;
 - Cytotoxic chemotherapy requires that a mother stops breastfeeding during therapy.

Conditions where breastfeeding can be continued but with a concern, requiring monitoring and counseling:

- HIV positive mothers on ART, ARV PROPHYLAXIS or no treatment as per new GOVT. OF INDIA guidelines 2010
- Breast abscess: Breastfeeding should continue on the unaffected breast. feeding from the affected breast can resume once treatment has started
- Hepatitis B. Infant should be given vaccine
- Hepatitis C
- Mastitis. If painful, express out breast milk
- Substance abuse: Breastfeed with caution as abused substance like alcohol, opioids, benzodiazepines and cannabis can cause sedation in baby. Nicotine, alcohol, ecstasy, amphetamines, cocaine and related stimulants has been demonstrated to have harmful effects on baby.
- Tuberculosis
- Breast cancer, till radiotherapy/chemotherapy is started

PROBLEMS DURING BREASTFEEDING (MOTHER'S)

Dr. Mukul Tiwari, Dr. Archana Tiwari

A mother, specially a first time mother, may face certain problems while breastfeeding. But these problems are preventable or correctable if due care is taken. Some of these problems relate to shape and size of the nipple, some to breast tissue as a whole and some are related to psychology. Below are some of the main problems and tips on how to deal with them.

NIPPLE RELATED PROBLEMS

Flat nipple

Flat nipples are not really a problem because nipple is only the ejection outlet for milk. It is the areola, the dark part around the nipple which should be pulled out by the sucking baby to form the teat. Mother should check whether her nipples are protractile or not. She can hold her nipples with index finger and thumb and try gently to pull them out. If nipples can be pulled out, they are protractile and fit for breastfeeding.

Inverted nipple

An inverted nipple does not come out on trying to pull. Rather it sinks back deeper into the breast. True inverted nipples are not common. Usually during pregnancy the nipple becomes normal and protractile. If they remain inverted, they can be treated in consultation with the doctor.

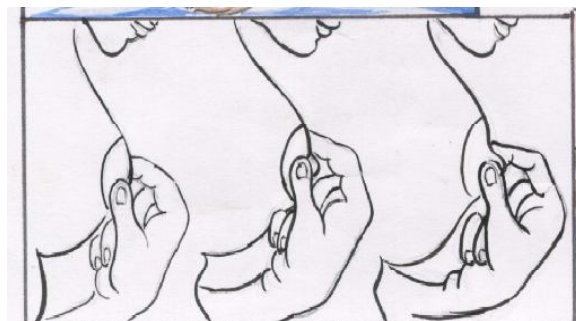
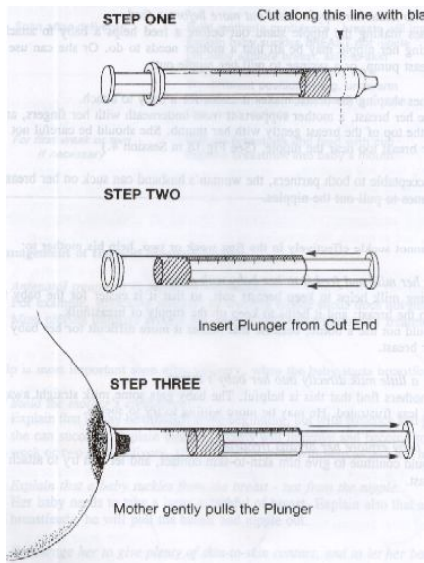


Figure 1 : Inverted nipple; Flat nipple; Normal nipple

How to correct inverted nipples

1-Manual method: Here the nipple is gently pulled out and rolled between the fingers few times a day and also each time before feeding.

Figure 2: Syringe method- correcting inverted nipple



2-Syringe method: A 10 cc plastic syringe is taken and its piston is removed. Its barrel is cut half an inch from the nozzle. Next, the piston is inserted from the newly cut end of the barrel. The other opening (uncut smooth edged end) of the barrel is placed firmly around the nipple of the breast and the piston is withdrawn gently and slowly to avoid injury to the nipple. The nipple will slowly protrude into the barrel due to suction. After 1 minute, the piston is pushed back to release the syringe from the nipple. This procedure is repeated 4 to 5 times before each breastfeed. The nipple will become prominent in this way. Then the mother is taught to hold the nipple and areola together to form a teat while putting the baby to the breast.

Long nipple

A long nipple may create problem as the baby may suck on the nipple only and may not take enough of the areola into his mouth. To tackle this problem the baby should be brought closer to the breast, at the same time ensuring that all requisites of good attachment to the breast are present to enable him to take more of the areola into his mouth.

Sore nipples and cracked nipples

This problem happens due to the incorrect position/attachment of the baby at the breast when baby sucks only at the nipple and does not take whole areola into his mouth. Sucking on nipple only does not give milk to baby and in turn to get more the baby bites more vigorously thus damaging the nipple.

If a mother continues to feed in wrong way it may even lead to mastitis and breast abscess. Sometimes sore nipples may be due to fungal infection or contact dermatitis due to soap, detergents used for washing clothes, deodorants, perfumes, nipple shields, creams etc.

How to avoid sore/cracked nipple?

It must be ensured that the baby is attached properly to the mother's breast i.e. whole or most of areola is in the baby's mouth. If the mother feels pain during breastfeeding it means there is improper attachment.

While taking baby off the breast mother should wait until the baby releases the breast, or she can unlatch baby's mouth from her breast by guiding her finger gently into the baby's mouth to break the suction (See adjacent figure) or by tickling the baby gently, thus carefully avoiding pull at the nipple while detaching and hence injury to the nipple. Then she can again start to breastfeed in a correct position.

Breastfeeding should be continued on the affected breast as sore nipples usually heal after correcting the suckling position.

Treatment of Sore/cracked nipple (Advice to mothers)

Breastfeed in correct position.



Apply a drop of her hind milk on the nipple after each feed.

Continue to breastfeed.

If sore nipple is due to fungal infection an antifungal cream will help. IN such case, it must be remembered to treat BOTH the mother as well as the baby.

Do not use medicated/other creams as they do not help, even may worsen the soreness.

FULLNESS AND ENGORGEMENT OF THE BREAST

Breasts produce milk continuously and if enough milk is not removed in time, engorgement of the breasts may result. The engorged breast is shiny painful and occasionally cause fever for a day.

Causes of engorged breasts

Infrequent breastfeeding.

Delayed starting of breastfeeds.

Incorrect positioning of baby while breastfeeding.

Incorrect attachment of the baby to the breast.

Early removal of the baby from the breast while breastfeeding.

If breast is engorged, the baby cannot feed properly as it becomes difficult to suck on the hard and engorged areola. Thus inadequate emptying occurs which in turn increases the engorgement and at later stage may lead to decreased breast milk production.

How to avoid and how to treat this problem? (Advice to mothers)

Start breastfeeding early; continue it frequently, effectively and fully with good attachment of the baby to the breast.

If breastfeeding cannot be done due to any unavoidable reason, breasts must be emptied by manual expression or by use of a pump.

Warm fomentation/compresses followed by some manual expression of breast milk can help reduce congestion and make it easy for the baby to feed on an engorged breast

Proper sized garments can ease pain of engorgement

BLOCKED DUCT

This problem happens when the baby does not suckle well and in a particular segment of the breast stagnant milk thickens and blocks the milk duct leading to pooling of the milk behind it and a painful hard swelling. It can occur more frequently in dependent parts of large sagging breasts. Tight garments and trauma e.g. by infant's leg can also precipitate the issue.

Treatment (Advice to mothers)

Massage the swelling frequently towards the nipple to promote drainage of the breast. Sometimes during this process a small lump of clogged milk comes out. It is harmless even if infant consumes it.

Suckle baby frequently on the affected breast and in different positions so as to improve the emptying.

Sufficient rest is necessary.

Wear loose clothes.

Watch for developing abscess.

MASTITIS / BREAST ABSCESS

If the blockage of the duct continues infection supervenes and the breast becomes swollen, painful and hot to touch. The mother may develop fever with chills. This condition is known as mastitis. An abscess (pus collection) may form soon.

Treatment (Advice to mothers)

Massage the breast and express the milk frequently.

Continue to breastfeed.

Ice application may help.

Antibiotics may be needed if fever persists Consult a doctor.

Incision and drainage (a surgical procedure) of the abscess is necessary if pus collection occurs.

Start breastfeeding from the affected breast as soon as possible even after surgery.

MILK FISTULA

Rarely though, as a complication of mastitis or after surgical drainage of breast abscess there can be formation of milk fistula, wherein breast milk may go on oozing from the fistula for prolonged time. In this situation also breastfeeding should be continued. Stopping breastfeeding won't help healing of fistula faster.

LEAKAGE OF MILK FROM THE BREAST

It is a harmless natural phenomenon and will disappear in a few weeks. It commonly occurs when it is time for a feed or when intervals between feeds are increased and when the mother has loving thoughts about her baby. It is not a sign of overproduction. Absence of it is not a sign of underproduction.

Treatment (Advice to mothers)

Do not, in any case, stop breastfeeding.

Wearing bright colored clothes can tactfully camouflage it.

Clean pads to soak milk leakage can be advised. But pads should be changed often so they do not cause harm to breasts by wetness and infection.

THRUSH

Thrush is a common yeast infection that can be passed between the mother and the baby during breastfeeding. The yeast (called *Candida albicans*) thrives in warm, moist areas. The baby's mouth and the mother's nipples are perfect places for this yeast to grow. A yeast infection can be difficult to cure, but fortunately this is uncommon. Yeast infections often occur during or after antibiotic treatments. Symptoms of yeast infection in the mother are deep-pink nipples that are tender or uncomfortable during and immediately after nursing.

Treatment

An antifungal cream can help the mother.

Keep the breast clean and dry.

BLOOD IN THE MILK

This is not common. Although nipple fissure or wound can cause it, often it is not there. Sore nipples with severe pain and bleeding, is also a feature of fungal infection.

Treatment (Advice to mothers)

It is usually a harmless and self-limiting condition. Continue breastfeeding.

Consult doctor for persistent bleeding, especially if associated with sore nipples and severe pain / lump / pain in breast; bleeding from elsewhere in body.

BREASTFEEDING DURING ILLNESS

Very few maternal illnesses require the mother to stop breastfeeding. Breastfeeding with a little drug in the milk is almost always safe. Stopping breastfeeding for even a short period of time may result in baby not taking the breast again. Most fevers are caused by viruses and mother has already passed the infection to baby before the fever appears in the mother. However, breastfeeding protects the baby against infection, and the mother should continue breastfeeding, in order to protect the baby. If the baby does get sick, which is possible, he is likely to get less sick than if breastfeeding had stopped. But many babies do not get sick at all despite their mothers having the fever. Bacterial infections (such as “strep throat”) are also not of concern for the very same reasons.

The only definite exception to the above is HIV infection in the mother. Until we have further information, it is generally felt that the mother who is HIV positive not breastfeed, although the final word is not yet in.

Some mothers have “autoimmune diseases”, such as idiopathic thrombocytopenic purpura, autoimmune thyroid disease and many others. Even in these breastfeeding should be continued. The antibodies that make up the vast majority of the antibodies in the milk are of the type called secretory IgA. Autoimmune diseases are not caused by secretory IgA. Even if they were, secretory IgA is not absorbed by the baby. There is no issue. Breastfeeding can be continued.

THIRSTY FEELING DURING BREASTFEEDING

A mother may feel thirsty often during the first few days after delivery as her body sheds excess fluid accumulated during the pregnancy. After that, the body will balance out to a thirst based on mother's body's needs; however, most mothers do notice they are thirstier when breastfeeding. They have to drink plenty of liquids, such as juice, water, milk, and soup to quench their thirst. Liquids can be in any form, but they should limit their intake of any with caffeine. It is not necessary to force fluids beyond their thirst, but it is a good idea to drink something whenever they feel thirsty

NOT ENOUGH MILK

This is a common complaint among mothers; especially in first time mothers. It is usually due to misconception or her lack of self confidence and excessive anxiety. This is augmented by the onlookers and relatives without proper knowledge and is one of the most frequent causes of starting top milk.

It can occur in first few days of lactation before the milk “comes in”. If the child cries often due to improper latching the mother may interpret it as less milk production.

Often during 3rd month of lactation the breasts stop engorging before breastfeeding due to a fine tuning in production and demand. So the mother feels her breasts lighter. At the same time the infant starts showing interests in surroundings and has learnt to be quick in feeding. So during breastfeeding infant frequently stops, unlatches and re-latches. These processes cause the feeling of not enough milk even if the baby is thriving well.

Mothers should have some working knowledge of how to increase their milk production in a natural way and also what factors will hamper their milk production.

Factors which increase milk production

Starting breastfeeding within 1 hour of delivery. It can be practiced even after cesarean/ vacuum/ episiotomy deliveries.

Frequent feeding, even at night. Night time breastfeeding promotes prolactin secretion which increases breast milk production.

Proper latching to the breast is mandatory for proper suckling and emptying of breasts. Emptying is the best stimulus for production.

Support from family and health professionals

Mother's confidence in herself

Relaxed and happy mother

Mother should eat well without superstitions and restrictions.

Mothers should be told that "MORE SUCKING MAKES MORE MILK"

Factors which decrease milk production

Delayed introduction of breastfeeding

Infrequent breastfeeding

Use of other milks-cow, formula milk etc. and use of other fluids like glucose water and honey causes satiety in infant and hence leads to infrequent suckling.

Improper technique of breastfeeding

Painful breast conditions.

Lack of confidence & support.

Anxiety and stress in the family

Restricted eating due to superstitions.

Smoking

Maternal conditions like Diabetes Mellitus-Type 1, Obesity, Polycystic Ovarian Disease, placental retention, antihistaminic medication can delay or reduce lactogenesis

REFERENCES

1. Payne PA, Tully MR. Breastfeeding. In: Ratcliffe SD, Baxley EG, Cline MK, Sakornbut EL, eds. Family Medicine Obstetrics. 3rd ed. Philadelphia, Pa: Elsevier Mosby;2008: section C.
2. Eglash A, Montgomery A, Wood J. Breastfeeding Disease-a-Month. 2008;54.
3. Infant and young child feeding - tools and materials- <http://www.who.int/topics/breastfeeding>
4. Breastfeeding-Practices ,problems and Prospects -www.BPNI.org
5. Breastfeeding problems- <http://www.llli.org/FAQ/sore.html> (Le Leche League International)
6. "Is your baby getting enough milk?" <http://www.mayoclinic.com/health/breast-feeding>

PROBLEMS RELATED TO BREASTFEEDING (BABY)

Dr. R. Kishore Kumar

Breast milk is the BEST milk for the babies (1). Breastfeeding is an art, but unlike anything else in Medical therapeutics, the success here is determined by two parties and failure on one side can make this “art” unsuccessful.

From the babies’ point of view, breastfeeding can sometimes be painful and uncomfortable due to mainly 3 problems:

Mechanical problems including attachment problems

Problems associated with maturity

Milk supply problems.

MECHANICAL PROBLEMS

Babies can have problems in sucking properly and getting their food if their position is not appropriate. Mothers who don’t know how to latch baby properly to breast feed need guidance and help by Lactation Consultants to “learn properly” to help babies feed. Unlike mothers and older children, *babies won’t be able to adjust the position for breastfeeding* when held. This can be rectified by breast-crawl where the mother lies on supine position and babies’ crawl to the breast of the babies there by *reducing the problems of attachment*².

Many mothers, who have undergone breast implants; breast augmentation or breast surgery or breast reduction; or any other forms of surgery that have affected the breast ductules, may face problems in the amount of milk produced and also difficulty for the baby to obtain proper feed because of improper size of the breast relative to the mouth of the baby along with many other factors³.

PROBLEMS ASSOCIATED WITH BABIES’ MATURITY

Preterm Babies

Successful breastfeeding requires that the baby suckles effectively and efficiently. The sucking reflex usually develops around 34 weeks of gestation. Thus majority of babies born before 34

weeks will not be able to suck properly and may require assisted feeding, mothers need to express the milk and feed the babies either through tube or sometimes they can try and feed them through “palada” (spoon).

Premature babies are also prone to get respiratory distress syndrome (RDS) and babies with RDS from whatever cause will not be able to suck properly since their energy is being spent on breathing. Any baby with any medical problem associated with Prematurity may experience a delayed establishment of breastfeeding.

Term Babies

Babies can have functional problems in sucking like tongue-tie which can interfere with sucking, if so the tongue tie needs to be released, but if the feeding is not affected, tongue tie need not be released. In case of maternal flat, cracked or retracted nipples, the babies suffer too; they can't get enough milk to drink. Hence they cry more, driving already stressed mother even crazier, leading to a vicious cycle for which the relief lies with the mother and not the baby. This need to be emphasized and identified by the treating Paediatrician and appropriate counseling should be provided rather than prescribing any medications for a crying baby.

When babies are born to mothers who have Gestational Diabetes or babies with polycythemia or any other condition which can cause low sugars soon after birth, their “mental state” can be affected and so is their sucking. This again can be helped by proper breastfeeding practices in terms of early initiation and proper latching, and also needs to be addressed appropriately by the treating Paediatrician.

Babies who are severely icteric can become lethargic affecting their sucking. Such babies consume less breastmilk, pass less stools. In that process, increase in jaundice is caused by higher enterohepatic circulation of bilirubin. Hence prompt treatment of jaundice is the most important factor in helping babies with feeding difficulties.

Generally babies have nose block because of mucosal swelling, which is the commonest reason they sneeze and have hiccups. This can cause difficulty in feeding as they are obligate nasal breathers. All that the baby needs is intranasal saline drops instilled about ½ hour before the feeding and no aspiration of mucous or any other expensive treatment is required.

Many babies swallow air while feeding and they have to be burped. Otherwise they may land up passing the air to intestines, which causes colicky pain.

Post-term or Post mature babies

Babies who are post-term have different problems, though usually they may not have any problems and feed quickly unlike premature babies. But ingestion of maternal blood and/or meconium stained liquor is more common with post-maturity. These babies are more prone to suffer from Persistent Pulmonary Hypertension (PPHN) and poor feeding can be a manifestation of this. PPHN is a serious disease of adaptation of newborn babies unless identified early and treated effectively. A treating Paediatrician need to be alert for this possibility and should not ignore poor feeding being a common problem in the first 48 hours of birth. Prompt action to address PPHN or prevent problems is more effective. Sometimes these babies may benefit from stomach wash to remove the “irritant” in the stomach i.e., blood or meconium to stop these babies from vomiting.

OTHER CONDITIONS

Mothers given epidural analgesia or who have delivered by Caesarean section sometimes need a bit longer time to “recover” before they can successfully breastfeed. Understanding this, both by the mother and the family will help cope better. Babies born by prolonged 2nd stage and forceps delivery – sometimes feel better with pain relief medications for “headache”, especially if they have significant subgaleal bleed, caput or cephalhaematoma.

Sepsis, meningitis etc. can present at all gestations and may lead to lethargy. They may not feed properly and need appropriate treatment with antibiotics to help them ‘recover’ so they feed better.

Babies having hypothermia will also have feeding problems.

Babies with hypotonia, structural facial or GIT problems, Dysfunctional Sensory Integration also have their own problems, as dealt with else where in this book.

NIPPLE CONFUSION

Sometimes babies who have been given feeds with bottle refuse breastfeeding. In bottle feeding child doesn’t have to make effort while sucking; milk automatically flows down once the bottle is tilted. In fact at times baby has to push the bottle’s nipple so regulate the excess flow. While in breastfeeding the baby has to take out the milk from mother’s breast by active sucking. Both the processes are entirely different. Hence if the baby is given bottle feed he may get confused that which nipple is there. This situation is called “*nipple confusion*”. Bottle feeding is easier and therefore baby refuses breastfeeding. It is therefore recommended that bottle feeding must be strictly discouraged.

MILK SUPPLY PROBLEMS

Problems with mother’s breast milk supply (either over supply leading to engorgement or under supply leading to maternal exhaustion) can also cause significant distress and feeding problems for the baby. Under-supply can make the baby hungry and cry more, with the mother not realizing that the baby is being under-fed. This may lead to pathological weight loss. A Lactation Consultant’s help can go a long way in sorting out the major problems.

Oversupply can definitely make the breasts engorged, which itself can lead to mastitis in mother and difficulty in feeding for the baby as the breasts may be harder and fuller. This again needs proper counseling and advice. This may also cause baby tending to feed only foremilk and not the hind milk. It can make the baby bloated by excess gas formation in bowel and colicky all the time.



In the adjacent figure, one can see two 25ml samples of human breast milk. The sample on the left is foremilk, the watery milk coming from a full breast. To the right is hind milk, the creamy milk coming from a nearly empty breast.

Breastfeeding, if established quickly and properly, can save millions of lives in countries like India and help us achieve MDG4.^{4,5}

REFERENCES:

- 1) Picciano M. Nutrient composition of human milk. *Pediatr Clin North Am.* 2001; 48(1): 53-67.
- 2) Bushnell IWR, Sai F, Mullin JT. Neonatal Recognition of the mother’s face. *Br J Dev Psych.* 1989; 7: 3-15.
- 3) Breast Surgery Likely to Cause Breastfeeding Problems: The Implant Information Project of the Nat. Research Center for Women & Families. February 2008. Available at: <http://www.breastimplantinfo.org/augment/brstfdg122000.html>
- 4) Edmond KM, Zandoh C, Quigley MA et al. Delayed Breastfeeding initiation increases risk of neonatal mortality. 2006; 117: 380-386.
- 5) Spatz D. State of the science: use of human milk and breast-feeding for vulnerable infants. *J Perinat Neonatal Nurs* 2006; **20** (1): 51–5.

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REDUCED MILK SUPPLY

Dr. Mangala Wani

Reduced milk supply of the breast milk remains the major cause for initiation of supplementary feeding and then discontinuation of breastfeeding during the first two months postpartum. Most difficulties with insufficient milk supply results from unresolved problems with breastfeeding during this initial phase as the mother's milk is being established. There are many mothers whose ability to breastfeed becomes jeopardized by interruptions in the natural process, by stress, and by bad advice (from family, friends or health professionals).

The most common cause of low milk supply is ineffective suckling and/or infrequent feeding routines that do not adequately stimulate milk production and removal.

DEMAND AND SUPPLY

When a baby cries with hunger but a schedule prevents feeding, mother's body will respond to the cries with oxytocin release. But when milk is not taken, prolactin is not produced, thus there is no milk production when suckling does not occur. So hormone and milk production is reduced when the body perceives that the need is less. In addition to this, when cow's milk or formula supplements are provided to an infant, the amount it takes from the breast is further reduced; again reducing the amount the breast believes it should produce.

The vast majority of reduced milk supply is perceived rather than real, the mothers use wrong signs to judge milk supply. Perceived insufficient milk (PIM) supply is the erroneous belief that the mother is not producing enough milk for her infant when in reality she is. However, delayed lactogenesis or PIM creates vulnerability for actual low milk supply if supplements are unnecessarily introduced. (Chen et al 1998). Thus a faulty perception of insufficiency becomes a reality.

True low milk supply can be caused by number of factors and is often a combination of factors, and if the infant does not receive supplementation, low intake of breast milk will result in weight loss or slow weight gain which is a major concern.

WEIGHT GAIN IN THE INFANT

Most babies loose weight in first few days following delivery, primarily due to fluid loss as a natural consequence of declining maternal hormones. Weight loss more than 7% from birth weight may be

an indicator of breastfeeding difficulties, and requires observation and evaluation. Weight loss more than 10% requires intervention from the physician or lactation consultant.

Return to birth weight is expected by 10-14 days of age. The American Academy of Paediatrics (AAP) guidelines state that an infant must be seen by health professionals at 3-5 days of age, when infant status and maternal milk production are at a critical juncture. Thereafter, the infant should be seen as necessary to evaluate breastfeeding and monitor weight gain. Once above the birth weight and gaining steadily, the baby is seen at routine intervals.

PERCEIVED INSUFFICIENT MILK SUPPLY

The vast majority of low milk supply is perceived rather than real. The infant is judged to be normal on the basis of weight gain & urine frequency.

Mother lacks confidence in her ability to produce enough milk because her baby begins to be fussy, cries more and feeds more frequently for several days. This seems to occur several times during the first 3 months. These transient periods are called growth spurt. If mother follows baby's lead on this by letting him breastfeed as often as he wants, it will help bring up milk supply quickly, and the baby soon returns to his usual routine.

When breasts don't leak milk or only leak a little, when breasts seems softer, when mother does not feel let down sensation, or mother gets very little milk when she expresses or pumps the milk, mother perceives it wrongly as reduced milk supply.

POTENTIAL CAUSES OF LOW MILK SUPPLY

These can cause or contribute to the true low milk supply.

Supplementation: Supplementary feeds satisfy hunger and thus baby will suck less at breast and so milk production also reduces.

Nipple confusion: A bottle-nipple requires a different type of sucking than breastfeeding and it is easier for the baby to take the milk from the bottle. As a result, once bottle is introduced, it may result in breast refusal and reduced milk supply.

Pacifiers: Pacifiers can cause nipple confusion. They can also significantly reduce the amount of time baby spends at the breast, which may cause the milk supply to diminish.

Scheduled feeding interferes with the supply and demand cycle of milk production.

Sleepy baby: For the first few weeks some babies are very sleepy and may breastfeed infrequently and for shorter periods.

Mother and baby separation due to various reasons.

Infrequent night feeds pose a serious threat to successful breastfeeding. Prolactin levels are higher and human babies are designed to be fed in the night.

Most of these potential causes can be removed with a specialized attention from a lactation consultant or even a peer breastfeeding counselor.

CAUSES OF LOW MILK SUPPLY

Maternal factors

Delayed Lactogenesis-II

If full milk production is delayed for more than 72 hours after delivery, it may contribute to early supplementation, and subsequently to a reduction in ultimate milk supply.

Long duration of labour, emergency caesarean section, primiparity, polycystic ovarian disease, stress during labour, intravenous fluids and Pitocin drip during labour, instrumental delivery, lack of initiation within one hour, type 1 diabetes, obesity, retained placental tissue and severe haemorrhage can cause delayed lactogenesis-II.

Maternal nipple anomalies

Inverted or flat nipples, large or long nipples can cause difficulty with proper latch-on, adversely affecting milk supply. Prenatal treatment is not necessary, but support and practical help from a Lactation Consultant is essential.

Nipple shields are devices made up of latex or silicon that cover the mother's nipple and areola, providing an artificial nipple for the infant while sucking at the breast. They are used to assist latch-on or to provide temporary relief from painful nipples. Studies have shown that nipple shields impair milk removal which in turn reduces milk production. Hence nipple shield should be avoided & if used only under guidance of a person who is knowledgeable in breastfeeding. Again, silicon shield should be used instead of latex one. Mother should express extra milk to ensure an adequate milk supply.

Painful conditions of the breast

Engorgement, cracked nipples, thrush, plugged duct, and mastitis can all lead to attachment problems resulting in reduced milk supply.

Maternal medication

Oestrogen containing oral contraceptive pills, bromocryptine, diuretics, antihistaminics and nasal decongestants, especially those contain pseudoephedrine may reduce milk supply. Smoking and alcohol also adversely reduces milk supply.

Maternal illness

Thyroid disorders, diabetes, hypertension, hypo-pituitarism, infection, anaemia, autoimmune disease, connective tissue disease, renal failure can affect milk supply.

Maternal breast anatomy

Insufficient glandular tissue may occasionally be responsible for lactation failure. Cosmetic breast surgery especially breast reduction can be a major risk factor for decreased milk production.

Psychosocial factors

Both mother and family need to get psychologically geared up for breastfeeding. All family members should provide encouragement, adequate time and supportive environment for breastfeeding. Once the family is convinced of the importance of breastfeeding, they will support the mother for the same

Maternal nutrition

Several studies show no significant relationship between reduced maternal intake of calories/fluids and the volume of the milk produced. Lactating woman needs to maintain good nutritional status for her own health and for future pregnancies.

Infant factors***Oral motor dysfunction***

Some form of suckling abnormality causes ineffective suckling resulting in low milk supply. Initially mother may need to express the milk to increase her milk and needs lactation consultant's close supervision.

Congenital malformations

Malformations like cleft palate may diminish baby's ability to breastfeed.

Ankyloglossia

Short frenulum or tongue-tie may restrict tongue motion.

Uncomfortable baby

Pain due to fractured clavicle, repeated heel pricks, vacuum extraction may lead to breastfeeding refusal.

Down's syndrome

Low muscle tone and other issues require special help in feeding.

Premature infant

May not suckle well enough for adequate milk removal.

Food sensitivities or allergies

May lead to fussy behavior at the breast.

MANAGEMENT

The problem should be addressed by careful history-taking, physical examination of both mother and the baby and breastfeeding assessment. A review of perinatal history, complete feeding history, feeding difficulties, or breastfeeding problems is taken. Maternal past medical history and reviews of the systems must include current routine medications, history of breast surgery, postpartum haemorrhage or endocrine disorders. Family history and psychosocial history is also important and may give some clue to see how much support the mother has from the family. Potential etiologies that can ultimately lead to a problem-oriented approach to management can be identified. Make sure the baby is getting enough milk by assessing output and weight gain.

Increasing milk production

Milk production is demand and supply process. To speed milk production and increase overall milk supply, the key is to remove more milk frequently from the breast, so that less milk accumulates in the breast between the feedings.

Make sure that the baby is breastfeeding effectively. The mother should be taught how to position her baby at the breast for effective latch on and how to know when the baby is swallowing the milk.

Compressions. Once the baby is sucking without drinking, the technique of breast compression is helpful to increase the flow of milk to the baby.

Switch nursing. In normal breastfeeding, the baby is allowed to finish one breast before the mother switches to the other side. For the infant who spends longer time in a non-nutritive suckling, the technique of switch nursing may be considered. When the baby no longer drinks even with compression, mother is taught to observe a change from nutritive to non-nutritive suckling. At that point she switches the infant to the other breast, and when non-nutritive suckling is again apparent, switches back to the original side and repeat the process. She keeps going back and forth as long as the baby gets reasonable amount of milk.

Avoiding pacifiers and bottles. If temporary supplement is medically required, it can be given with a spoon, cup or dropper. Cup feeding has been shown safe for both term and preterm infants and may help preserve breastfeeding duration among those who require multiple supplemental feedings.

Avoid supplementary feeding like formula, cow's milk or water. If supplements are being used, they should be gradually reduced to 'challenge' the breasts to produce more milk.

Consider expressing the milk. Expressing the maternal milk effectively is the mainstay for woman who is supplementing their infants. The aim is remove more milk from the breasts and/or to increase the frequency of the breast-emptying. This should be done under the guidance from lactation consultant. Expressing the milk after each breastfeeding is essential. Many mothers find that it works well to breastfeed, supplement with the previously expressed milk and then express the milk from the breasts.

Support the mother. Give her a rest when baby sleeps. It is amazing to see how rest can help to increase the milk supply as well as the mother's mood. Also providing her reasonably well balanced diet and liquids to drink is important.

Supplemental nursing systems have the advantage of supplying appropriate supplement while simultaneously stimulating the breast to produce more milk and reinforcing the infant's feeding at the breast. Unfortunately, most systems are awkward to use, difficult to clean,

and expensive and require moderately complex learning. A simpler version, supplementing with a dropper or syringe while the infant is at breast, may be effective

Galactogogues.

Pharmacologic galactogogues:

Domperidone has been used successfully in Canada and other parts of the world and has significantly less side effects. It increases the prolactin levels. It has been approved by the A.A.P. for use in breastfeeding mothers and has given Lactation Risk category L1 (safest) in 2004. The dose used is 30 mg 3 times a day to start with and can be used up to 40 mg 4 times a day. Many mothers take it for 3-8 weeks, but sometimes it may be needed for a longer period. Galactogogues must be used in conjunction with other steps. Metoclopramide is probably most commonly known and used drug to increase milk supply.

Herbal galactogogues:

There are reports of plants being used to increase milk supply. However caution needs to be exercised when using herbal treatment. *Shatavari* is a root that has been used extensively in India for hundreds of years to increase milk production. It seems to be quite effective for many mothers and has actually been scientifically studied and found to compare favourably to metoclopramide.

Fenugreek (methi) has been found to bring about a significant increase in milk supply. *Garlic* has been found to increase the suckling time of the baby at the breast, which may help to increase the milk supply. Other herbs like *Blessed thistle*, *Alfalfa*, *Red clover* and *marshmallow roots* also are being used to increase the milk supply.

CONCLUSION

Perceived or real low milk supply is a common concern of women and is a major cause to start supplementary feeding. Early breastfeeding follow-up by a skilled health professional at 3 to 5 days after delivery would allow early detection of many correctable problems. Proper positioning and latch-on are the foundation of the efficient milk transfer and infant weight gain. This may be a very stressful time for the mother and paying attention to her by giving rest, relaxation, proper diet and enough fluids is important. It is preferable to give mother's expressed milk as a supplementation. As the maternal milk supply increases and the infant becomes more effective at the breastfeeding, the amount of supplementation should be decreased. Rarely, maternal anatomy or physiology will preclude a full milk supply. In these cases, the mother is supported to provide as much breast milk as possible while acknowledging the grieving process that comes with the loss of the desired breastfeeding experience.

REFERENCES

1. Academy of Breastfeeding Medicine (2008) Clinical Protocol #3: Hospital Guidelines for the Use of Supplementary Feedings in the Healthy Term Breastfed Neonate.
2. Chen DC et al. Stress during labour and delivery and early lactation performance. *Am J Clin Nutr* 68(2):335-44, 1998
3. Hale T. Medications and Mothers' Milk. 11th edition. Amarillo, TX: Pharmasoft Publishing, 2004, p. 259-260
4. Riordan J. (2005) Breastfeeding and Human Lactation, Third Edition. Jones and Bartlett Publisher, Inc. Boston
5. Nissen E, Uvnas-Moberg K, Svensson K, Stock S, Widstrom AM, Winberg J. Different patterns of oxytocin, prolactin but not cortisol release during breastfeeding in women delivered by cesarean section or by the vaginal route. *Early Hum Dev* 1996;45(1-2):103-18.
6. Sharma, S., Ramji, S., Kumari S., et al. Randomized controlled trial of *Asparagus racemosus* (Shatavari) as a lactagogue in lactational inadequacy. *Indian Pediatr* 1996;33:675-7.

DYSFUNCTION OF SENSORY INTEGRATION (DSI) IN IYCF

Dr. Salim Hirani

INTRODUCTION

The development of feeding skills is an extremely complex process influenced by multiple anatomic, neurophysiologic, environmental, social, and cultural factors. Most children negotiate the necessary developmental sequence without significant difficulties. An understanding of the development of normal feeding abilities aids the pediatrician in monitoring this remarkable process and also helps equip dealing with a child with complex feeding problems.

The neurophysiologic control of feeding and swallowing is complex and involves sensory afferent nerve fibers, motor efferent fibers, paired brainstem swallowing centers, and suprabulbar neural input. Close integration of sensory and motor functions is essential to the development of normal feeding skills. Feeding development, although dependent on structural integrity and neurologic maturation, is a learned progression of behaviors. This learning is heavily influenced by oral sensation, fine and gross motor development, and experiential opportunities. The basic physiologic complexity of feeding is compounded by individual temperament, interpersonal relationships, environmental influences, and culture.(2)

‘Oro-motor disorders’ refers to a group of diseases that predominantly affect sensory inputs, motor systems and movement organization involved in sucking, chewing, swallowing, speech articulation and facial non-verbal communication. Four main groups of oro-motor disorders can be distinguished: due to dysmorphological syndromes; secondary to bilateral perisylvian cortical dysplasias; due to brainstem dysgenesis, and secondary to congenital muscular diseases.

Dysfunction of sensory integration is very less studied and explored in context of breastfeeding. Infants and children with developmental dysfunctions and neurological abnormalities have dysfunction in sensory integration.

Sensory integration is the ability of the brain to take in, combine, and organize sensory information so that it can be interpreted and acted upon.

Sensory modulation is the ability to filter or attend selectively to sensory information, in other words, to pay less attention to unimportant things like the feeling of your clothes on your body and more attention to important things like the traffic in the street you are crossing. Sensory modulation typically improves as children mature.

Sensory discrimination is the ability to notice small differences in sensations. A child with poor tactile discrimination may have difficulty with fine motor skills.

Dysfunction of Sensory Integration (DSI) is a neurological disability in which the brain is unable to accurately process the information coming in from the senses. Children with poor sensory modulation may be *hypersensitive* wildly overreacting to touch or movement or loss of balance; or *hyposensitive* needing crashing or banging or sharp sounds and flavours to register anything; or a combination of both. It is not unusual to be hypersensitive to some senses, and hyposensitive to others.

Sensory integration problems can affect the five traditional senses particularly touch and hearing, but also taste, sight and smell as well as two additional senses: the *vestibular* sense, and the *proprioceptive* sense. Children with DSI may appear hyperactive, oppositional, obsessive-compulsive, or attachment disordered, when in fact they are just reacting to and compensating for their unreliable and unpredictable view of the world.

BREASTFEEDING AND DSI

Feeding difficulties for infants with DSI can present in many different ways:

Tactile defensiveness

Tactile defensiveness is a sensory modulation difficulty that results in an inability to tolerate touch stimulation. Infants who exhibit tactile defensiveness will often arch away from contact, have difficulty feeding, and have great difficulty in self-regulation. Conversely, they may insist on being held constantly, screaming if put down. Parents may suspect that something is unusual about their child's behavior, but since the signs of sensory modulation problems are subtle, the child may go undiagnosed for years. Tactile defensiveness is rarely the only sensory processing or modulation issue in an individual; it is usually a component of a wider dysfunction in sensory integration.

It may include a hyperactive gag reflex that makes it uncomfortable for the baby to draw the nipple deeply enough into his mouth to breastfeed effectively, and there is poor sucking quality and rhythmicity due to poor tactile discrimination. The baby may have difficulties feeding, whether he is

breastfed or bottle fed. In some cases, his distress signals are mild and easily missed when he is a newborn. However, as the baby asserts his preferences, refusal to feed at the breast or at the bottle may result.

Sensitivity to touch

It varies with each baby. Some babies are super-sensitive over all their body. Others are super-sensitive on only one part of their body. Because breastfeeding is a “high touch” activity, a baby who is touch-sensitive would experience special challenges.

Sensitivity to light

Infant sleeps all day to avoid the light. He may be wakened at night by just a small amount of light.

Distraction by sound

He finds it hard to concentrate on breastfeeding. He may sleep through the day when there is a lot of sound, or he may hardly sleep because sound keeps him awake.

Sensitivity to smell

It may cause refusal to feed if mom puts anything with odor on her body, especially her nipples, like soaps, lotion, cream or perfumes, or chlorine from the pool all may cause the baby to fuss rather than nurse.

Sensitivity to motion

He may need to be kept in motion a specific way. He may cry or fret when the movement is not present. In some cases, he may need to be kept very still. Often this baby cries in alarm and discontinues nursing from slight shifts and movements. It can be difficult to find a position to remain in while baby is nursing.

Dysfunction of senses of Balance, Body Position

It may lead to fear of falling; Uncomfortable sensation when being moved. Often this baby seems distressed by handling, cries when handled, and settles when put down or swaddled.

Sensitive Interoception

It is the communication the baby has with the inside of his own body: what he feels when he needs to urinate or stool, what he feels when he is hungry, or feeling discomfort or pain due to a

problem such as GERD-reflux. These babies may want to pause while nursing, or to not initiate breastfeeding at all, while he is tuning in to his internal stimulus and listening to his body.

Breastfed babies with DSI seem to work unusually hard. Oral muscle tone is usually low in children with DSI, and overall hypotonia (low muscle tone) may also be present due to under-activation of the muscles by the brain. Due to hypotonia, baby may need to be held loosely with the arms drawn across his chest and his legs drawn up toward his belly for feedings.

Firm touch is usually far more tolerable to a tactile defensive infant than light touch. If the baby hates to be held, perhaps he will tolerate being held in a sling to nurse, or he might need to have his legs and belly angled away from mother's trunk on a firm pillow, with just his shoulders and head supported at the breast. The infant must work harder to use low tone muscles, therefore feeding is more of an effort.

The baby with DSI, may take much longer to breastfeed because of the poor timing of sucking bursts and the need for long rests. If feeding is inefficient, he will also need to feed frequently to get enough milk. By the end of a feeding, their hair may be soaked with sweat, partly due to the effort of feeding, and partly because control of autonomic functions is also poor. Due to lack of discrimination of various sensations in the mouth, he may have a hard time transitioning from rooting to sucking. Baby may tolerate touch to the mouth and face and gently rubbing the baby's lips and the outer surface of the gums, before feeding, by mother may immediately help him get ready for breastfeeding. If the baby does not tolerate touch at all, being swung in a blanket swing from head to toe, providing linear vestibular stimulation may increase the baby's organization and improve muscle tone. This simple intervention can have dramatic effects, and is less scary to the child with tactile defensiveness.

Babies with DSI may also have difficulty with the *mechanics of sucking*. Decreased awareness of the tongue may lead to difficulty using it properly to propel milk from the milk sinuses under the areola toward the nipple then onto the back half of the tongue; then form the milk into a small pool or bolus, and transport the bolus toward the throat for swallowing. If the tongue does not have the tone, strength, or range of motion to lift and press the breast against the palate (roof of the mouth), the baby might compensate by pressing more with his jaws. This excessive compression is painful for the mother. Getting a deeper latch, making sure the baby is not tongue-tied, and using an asymmetrical latch, to increase the amount of tongue in contact with the breast can all be helpful to reduce compression. If the baby tolerates touch to the tongue, the mother might "*walk back on the tongue*" immediately before feeding, or in the middle of a feeding if the baby increases compression due to tongue fatigue. Walking back on the tongue consists of providing a firm, vibratory stimulus with a fingertip on the tongue tip, then repeating it slightly farther back until just before the area that would trigger the baby's gag reflex. Vibration is small amplitude, high frequency

stimulus, in other words, the fingertip wiggles, moving very slightly but very quickly on each spot on the tongue.

TIPS TO HELP

If baby likes a firm touch, hold him in a firm embrace. Consider swaddling. If baby does not like a light touch, do not stroke him while he is nursing.

Avoid bright lights. Nurse in a dimly lit room, even at night, while nursing.

Use a quiet room to nurse.

Only use lotions, soaps, or perfumes that baby is used to and does not react to.

Experiment with positioning. Lay baby flat on a pillow with mother dropping her breast into the baby's mouth.

For babies who like movement, sitting in a rocking chair while nursing or swinging in a porch style swing while nursing may help.

Holding in a firmer, more secure feeling way. Moving baby to breast more slowly. Slow, careful handling. Keeping the baby's arms close to his body when moving him.

Become familiar with your baby's body language. Hold him quietly until you see he has finished his processing. Try not to distract him by talking to him, urging him to nurse, or moving him, unless you see that what you are doing is helpful for him and not distracting.

FEEDING THE OLDER CHILD WITH DSI

Children who are hyposensitive are usually messy eaters, they have a hard time finding their mouths with the food, and their tongue has difficulty moving the food to the teeth and back to the tongue for a swallow. They typically overstuff their mouths, because they do not notice the sensation of fullness until the muscles are much stretched. It can be difficult for hyposensitive children to know when to swallow, and they may chew food far longer than necessary. Overstuffing the mouth can make it even harder to safely control the food in the mouth, and the child may gag or choke often. The child may not seem to notice soft foods at all, and may greatly prefer hard and crunchy foods, again because they provide more stimulation.

Children with tactile defensiveness often refuse solids, or foods with particular textures, tastes, and smells. They may run from the kitchen complaining about the smell.

They may learn to use cutlery very early, out of reluctance to feel food on the hands.

They may use many napkins at a meal trying to keep food particles away from the hands and face. They may even pick up finger foods with a fork, spoon, or napkin to avoid touching them.

They often hate mixed-phase foods, such as foods with small chunks, or stews and soups that combine liquids and solids. This may be because the different thicknesses and textures need to be handled simultaneously in different ways in the mouth: the liquid needs to be swallowed while the solids are held on the tongue for later chewing. This can be impossible for a child who has difficulty handling even one texture at a time. When served mixed-phase foods, older children will typically separate out the ingredients on their plate, and eat all of one food, then all of another.

PSYCHOSOCIAL ASPECTS OF DSI

A mother might have strong feelings of rejection if her baby arches away from her body when she holds him, averts his eyes from her, or falls to respond to her at all. She should be psychologically assured regarding the infant's needs and tolerance of touch. Some babies with DSI prefer being held facing away from mother; others prefer the firm containment of a baby sling, or the reduced contact of a backpack carrier. Some babies like to be held but have difficulty tolerating movement. These babies may be gravitationally insecure or have hypersensitive vestibular systems. Speaking to them before touching them, holding their heads firmly, and moving them slowly and gradually may help them tolerate movement. Children with DSI-related speech delays may learn to communicate in other ways, for example, by gesturing or consistently using non-word sounds (jargon). Parents of children with tactile defensiveness quickly learn that the child finds it impossible to tolerate tags in the clothing or synthetic fabrics. The behavior of children with DSI is often rigid and stereotyped.

This can be emotionally difficult for the family when visiting, as the child may be teased for "being a baby" or "playing with food" and the parents criticized for allowing this behavior. Even when DSI has been diagnosed, it can be difficult for the parents to make relatives understand the child's needs. It's even harder when the parent cannot explain why the child needs to eat in an unusual manner.

REFERENCES

1. Roig-Quilis M, Rodríguez-Palmero A. [Article in Spanish]. Oromotor disorders in a paediatric neurology unit. Their classification and clinical course . Rev Neurol. 2008 Nov 16-30;47(10):509-16. PMID: 19012254 (PubMed)
2. Stevenson RD, Allaire JH. The development of normal feeding and swallowing. Pediatr Clin North Am. 1991 Dec;38(6):1439-53. PMID: 1945550 (PubMed)
3. Catherine Watson Genna, BS, IBCLC New York City, New York, USA.

From: LEAVEN, Vol. 37 No. 3, June-July 2001, pp. 51-53
4. Beverly Morgan, IBCLC, Caroline L. Bias, M.S., CCC-SLP, Susan Chick, & Hilary Jacobson, CH.HU.SI.

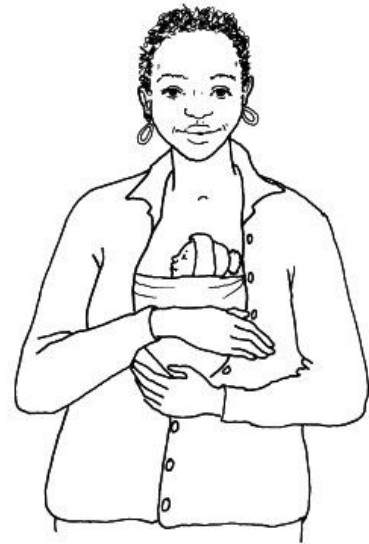
KANGAROO MOTHER CARE (KMC)

Dr. Sharad Thora, Dr. V.P. Goswami, Dr. Manju BiswasIntroduction

The Kangaroo Mother Care (KMC) method is a standardized protocol based care system for preterm or LBW infants and is based on skin to skin contact between the baby and the mother. It was initiated at the Instituto Materno Infantil in Bogota, Columbia by Dr Edgar Rey in 1978.¹ Now it is known as Kangaroo Mother Program.^{2,3}

The Kangaroo Mother Intervention is given to LBW infant as far as the baby can tolerate the Kangaroo position (KP), in which baby is placed between the mother's breast in direct skin to skin contact, below her clothes. KP is the hallmark of KMC. KMC can be continuous KMC (C-KMC), 24 hrs a day or intermittent KMC (I-KMC) for short periods once or a few times per day and for a variable number of days.⁴

This method has grown in acceptance as a way of dealing with inadequate and insufficient incubator care for very small preterm and LBW.⁵ The benefits of KMC are, easy acceptability by mothers and healthcare staffs as it has good long term outcome in survival; and early hospital discharge of these babies.



FEW TERMINOLOGIES RELATED TO KMC

Definition: It is a universally available and biologically sound method of care for all newborns, but in particular for premature babies. It has three components: Skin-to-skin Contact, Exclusive Breastfeeding and Support to the Mother-Infant dyad.

Skin-to-skin contact is between the baby front and the mother's chest. The more skin-to-skin contact area, the better. For comfort a small nappy is fine, and for warmth a cap may be used. Skin-to-skin contact should ideally start at birth, but is helpful at any time. It should ideally be continuous day and night, but even shorter periods are still helpful.

Exclusive breastfeeding means that for an average mother, expressing from the breasts or direct suckling by the baby is all that is needed. For very premature babies, supply of some essential nutrients may be indicated.

Support to the dyad means that whatever is needed for the medical, emotional, psychological and physical well being of mother and baby is provided to them, without separating them. This might mean adding ultramodern equipment if available, or purely intense psychological support in contexts with no resources.

ELIGIBILITY CRITERIA FOR KMC

For the Baby

All stable LBW babies are eligible for KMC. However, very sick babies needing special care should be cared under radiant warmer initially. KMC should be started after the baby is hemodynamically stable. Guidelines for practicing KMC include:

Birth weight >1800 g.: These babies are generally stable at birth. Therefore, in most of them KMC can be initiated soon after birth.

Birth weight 1200 to 1799 g.: Many babies of this group have significant problems in neonatal period. It might take a few days before KMC can be initiated. If such a baby is born in a place where neonatal care services are inadequate, he should be transferred to a proper facility immediately after birth, along with the mother/family member. He should be transferred to a referral hospital after initial stabilization and appropriate management, one of the best ways of transporting small babies is by keeping them in continuous skin-to-skin contact with the mother/family member during transport.

Birth weight <1200 g.: Frequently, these babies develop serious morbidity related to prematurity, often soon after birth. They benefit the most from in-utero transfer to the institutions with neonatal intensive care facilities. It may take days to weeks before baby's condition allows initiation of KMC.

For the Mother

All mothers can provide KMC, irrespective of age, parity, education, culture and religion. The following points must be taken into consideration when counselling on KMC:

Willingness: The mother must be willing to provide KMC. Healthcare providers should counsel and motivate her. Once the mother realizes the benefits of KMC for her baby, she will learn and undertake KMC.

General health and nutrition: The mother should be free from serious illness to be able to provide KMC. She should receive adequate diet and supplements recommended by her physician.

Hygiene: The mother should maintain good hygiene: daily bath/sponge, change of clothes, hand washing, short and clean finger nails.

Supportive family: Apart from supporting the mother dealing with her conventional responsibilities of household chores, family members should also be encouraged to provide Kangaroo Care when mother wishes to take rest.

Supportive community: Community awareness about the benefits should be created. This is particularly important when there are social, economic or family constraints.

BENEFITS OF KMC

For the Babies

Breastfeeding: KMC results in increased breastfeeding rates and increased duration of breastfeeding. Even when initiated late and for a limited time during day and night, KMC has been shown to exert a beneficial effect on breastfeeding. ^{6,7,8,9,10}

Thermal control: Prolonged skin-to-skin contact between the mother and her preterm/LBW infant provides effective thermal control with a reduced risk of hypothermia. For stable babies, KMC is at least equivalent to conventional care with incubators in terms of safety and thermal protection. ^{11,12,13}

Early discharge: KMC cared LBW infants could be discharged from the hospital earlier than the conventionally managed babies. The babies gained more weight on KMC than on conventional care. ^{14,15}

Less morbidity: Babies receiving KMC have more regular breathing and fewer predispositions to apnea. KMC protects against nosocomial infections. Even after discharge from the hospital, the morbidity amongst babies managed by KMC is less. KMC is associated with reduced incidence of severe illness including pneumonia during infancy. ^{13,16}

For the Mothers

KMC helps both infants and parents. Mothers are less stressed during kangaroo care as compared with a baby kept in incubator and prefer skin-to-skin contact to conventional care. They report a stronger bonding with the baby, increased confidence, and a deep satisfaction that they were able

to do something special for their babies. Fathers felt more relaxed, comfortable and better bonded while providing kangaroo care.^{17,20}

For the Community

KMC does not require hospital staff, can be used in hospitals with limited sources, easily acceptable to the mother and the healthcare staff.

PROBLEMS WITH IMPLEMENTING KMC

Lack of plans, policies, guidelines and protocols are main obstacles for implementing KMC. Poor facilities, cultural problems, poor communication skills are also obstacles for implementing KMC. These can possibly be solved by development of national guidelines and proper communication.

METHODOLOGY



When mother is not available, other family member such as grandmother, father or other relative can provide KMC

Preparing for KMC

When baby is ready for KMC, arrange a time that is convenient to the mother and her baby. The first few sessions are important and require extended interaction. Demonstrate to her the KMC procedure, answer her queries and allay her anxieties. Encourage her to bring her mother/mother in law, husband or any other member of the family. It helps in building positive attitude of the family and ensuring family support to the mother which is particularly crucial for post-discharge home-based KMC. It is helpful if the mother starting KMC interacts with someone already practicing KMC.

Mother's Clothing

KMC can be provided using any front-open, light dress as per the local culture. KMC works well with blouse and sari, gown or shawl. Another very good and universally available option is the husband's shirt. Suitable apparel that can retain the baby for extended period of time can be adapted locally.

Baby's Clothing

Baby is dressed with cap, socks, nappy, and front-open sleeveless shirt or 'jhabala'.

Kangaroo Positioning

The baby should be placed between the mother's breasts in an upright position.

The head should be turned to one side and in a slightly extended position. This slightly extended head position keeps the airway open and allows eye to eye contact between the mother and her baby.

The hips should be flexed and abducted in a "frog" position; the arms should also be flexed.

Baby's abdomen should be at the level of the mother's epigastrium. Mother's breathing stimulates the baby, thus reducing the occurrence of apnea.

Support the baby's bottom with a sling/binder.

Ensure that baby's neck is not too flexed or too extended, breathing is normal, and feet and hands are warm during KMC

Time of Initiation

KMC can be started as soon as the baby is stable. Babies with severe illnesses or requiring special treatment should be managed according to the unit protocol. Short KMC sessions can be initiated during recovery with ongoing medical treatment (IV fluids, oxygen therapy). KMC can be provided while the baby is being fed via orogastric tube or on oxygen therapy.

Can The Mother Continue KMC During Sleep And Resting?

A comfortable chair with adjustable back may be useful to provide KMC during sleep and rest. In the KMC ward or at home, the mother can sleep with the baby in kangaroo position in a reclined

or semi recumbent position. This can be achieved with an adjustable bed or with several pillows on an ordinary bed. It has been observed that this position decreases the risk of apnea in the baby.

Duration of KMC

Skin-to-skin contact should start gradually in the nursery, with a smooth transition from conventional care to continuous KMC.

Sessions that last less than one hour should be avoided because frequent handling may be stressful for the baby.

The length of skin-to-skin contacts should be gradually increased up to 24 hours a day, interrupted only for changing diapers.

DISCHARGE CRITERIA

The standard policy of the unit for discharge from the hospital should be followed. Generally the following criteria are accepted at most centers:

Baby's general health is good and no evidence of infection

Feeding well and receiving exclusively or predominantly breast milk.

Gaining weight (at least 15-20 gm/kg/day for at least three consecutive days)

Maintaining body temperature satisfactorily for at least three consecutive days in room temperature.

The mother and family members are confident to take care of the baby in KMC and should be asked to come for follow-up visits regularly.

CONCLUSION

KMC is a simple intervention to care for preterm newborn through continuous skin to skin contact. It enhances bonding, early establishment of breastfeeding and increases the duration of exclusive breastfeeding. Various studies show major mortality reduction [51%, range 18-71%] for neonatal mortality in babies with birth weight <2000 gm. with even greater reduction in serious morbidity.^{8,9,10} Routine use of KMC for all babies <2000 gm. is recommended as soon as they are stable. KMC is especially useful for resource poor countries like India.⁹ Up to half a million of neonatal deaths due to preterm birth complications could be prevented each year if KMC was implemented at the peripheral level.^{2,3,21,22} KMC should be promoted actively as a routine part of neonatal care by health professionals. Mother should be encouraged to use it as soon as possible during the intensive care period up to 40 weeks of gestational age.

REFERENCES:

1. Rey ES, Martinez HG. Manejo racional del niño prematuro. In: Universidad Nacional, Curso de Medicina Fetal, Bogotá, Universidad Nacional, 1983.
2. Low birth weight. A tabulation of available information. Geneva, World Health Organization, 1992. (WHO/MCH/92.2).
3. De Onis M, Blossner M, Villar J. Levels and patterns of intrauterine growth retardation in developing countries. *European Journal of Clinical Nutrition*, 1998, 52(Suppl.1):S5-S15.
4. Anderson GC. Current knowledge about skin-to-skin (kangaroo) care for preterm infants. *Journal of Perinatology*, 1991, 11:216-226.
5. Christenson K, *et al.* Randomized study of skin-to-skin versus incubator care for rewarming low-risk hypothermic neonates. *The Lancet*, 1998, 352:1115.
6. *Thermal control of the newborn: A practical guide.* Maternal Health and Safe Motherhood Programme. Geneva, World Health Organization, 1993 (WHO/FHE/MSM/93.2).
7. Shiau SH, Anderson GC. Randomized controlled trial of kangaroo care with fullterm infants: effects on maternal anxiety, breastmilk maturation, breast engorgement, and breast-feeding status. Paper presented at the International Breastfeeding Conference, Australia's Breastfeeding Association,
8. Charpak N, *et al.* Kangaroo mother versus traditional care for newborn infants $\lt; 2000$ grams: a randomized controlled trial. *Pediatrics*, 1997, 100:682-688.
9. Cattaneo A, *et al.* Kangaroo mother care for low birthweight infants: a randomised controlled trial in different settings. *Acta Paediatrica*, 1998, 87:976-985.
10. Charpak N, *et al.* Kangaroo-mother programme: an alternative way of caring for low birth weight infants? One year mortality in a two-cohort study. *Pediatrics*, 1994, 94:804-810.
11. Ludington-Hoe SM, *et al.* Selected physiologic measures and behavior during paternal skin contact with Colombian preterm infants. *Journal of Developmental Physiology*, 1992, 18:223-232.
12. Acolet D, Sleath K, Whitelaw A. Oxygenation, heart rate and temperature in very low birth weight infants during skin-to-skin contact with their mothers. *Acta Paediatrica Scandinavica*, 1989, 78: 189-193.

13. Anderson GC, Wood CE, Chang HP. Self-regulatory mothering vs. nursery routine care postbirth: effect on salivary cortisol and interactions with gender, feeding, and smoking. *Infant Behavior and Development*, 1998, 21:264.
14. Kambarami RA, Chidede O, Kowo DT. Kangaroo care versus incubator care in the management of well preterm infants: a pilot study. *Annals of Tropical Paediatrics*, 1998, 18:81-86.
15. Whitelaw A, Sleath K. Myth of marsupial mother: home care of very low birth weight infants in Bogotá, Colombia. *The Lancet*, 1985, 1:1206-1208.
16. Fischer C, *et al.* Cardiorespiratory stability of premature boys and girls during kangaroo care. *Early Human Development*, 1998, 52:145-153.
17. Affonso D, Wahlberg V, Persson B. Exploration of mother's reactions to the kangaroo method of prematurity care. *Neonatal Network*, 1989, 7:43-51.
18. Affonso D, *et al.* Reconciliation and healing for mothers through skin-to-skin contact provided in an American tertiary level intensive care nursery. *Neonatal Network*, 1993, 12:25-32.
19. Legault M, Goulet C. Comparison of kangaroo and traditional methods of removing preterm infants from incubators. *Journal of Obstetric, Gynecologic, and Neonatal Nursing*, 1995, 24:501-506.
20. Bell EH, Geyer J, Jones L. A structured intervention improves breast-feeding success for ill or preterm infants. *American Journal of Maternal and Child Nursing*, 1995, 20:309-314.
21. Bergman NJ, Jürisoo LA. The "kangaroo-method" for treating low birth weight babies in a developing country. *Tropical Doctor*, 1994, 24:57-60.
22. Lincetto O, Nazir AI, Cattaneo A. Kangaroo Mother Care with limited resources. *Journal of Tropical Pediatrics*, 2000, 46:293-295.

RELACTATION

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There are many reasons that mothers stop breastfeeding. However it is not unusual to experience the desire to breast feed weeks or even months after use of animal/formula milk.

The desire to breast feed may be because of various reasons, such as:

After formula/animal milk feeding, the baby has been falling ill frequently.

The baby is not gaining weight or is gaining weight excessively.

The mother who was unavailable earlier because of ill health or other problems has now recovered and is available.

Due to frequent social pressures she wants to start/restart breastfeeding.

The mother feels that she need to develop more emotional bonding with baby.

After counseling the mother feels motivated to start/restart breastfeeding.

A woman adopts a baby.

The mother is not available and the grandmother or other family member want to breast feed the baby.

Relactation has been used in times of disaster or epidemics (1).

Having nursed a child in the past increases the mother's chances of successful relactation. Relactation or induced lactation takes a lot of time and patience, but it is possible with a very high success rate. Physician whenever they come across mothers who are unable to breastfeed or have discontinued for some reason should help mothers to breastfeed.

Definitions: The process by which the mother who has breastfed earlier and stopped, and now wants to start again is called relactation.

When the lactation gap is less than 15 day, the process is called as establishing lactation (2) and when the lactation gap is more than 15 days the process is called relactation (3). Lactation and relactation are termed complete when no top milk is supplemented (4). It is termed partial when top milk requirement is reduced by more than half (4). A woman who has been pregnant in the past or never been pregnant can also establish lactation this is called Induced lactation (2).

The basic methodology used for increasing a reduced breast milk supply and for relactation is the same and so is being described together.

Breast milk production and supply depends on two hormones i.e. Oxytocin and Prolactin. The best and most efficient way to stimulate them is to let the baby suckle as often as possible along with other measures (5). Without suckling, the milk supply will not increase, no matter whatever else is done. Removal of any milk which is secreted also helps to increase and maintain production (6). “Saving” milk in the breast until the mother is aware of pressure and fullness inhibits further production (6).

Numerous methods have been used to increase breast milk supply like

Extra diet: It is necessary for the mother to eat extra foods to make up for the loss of nutrients in the breast milk. But *eating extra meals does not have any effect on breast milk supply.*

Extra fluids: Many mothers are thirsty just before, during or immediately after breastfeeding, however taking *extra fluids of any type do not influence breast milk production.*

Extra rest: *Increasing period of sleep or rest also has no direct beneficial effect on milk production although some indirect benefits are there like decreased stress, anxiety, tiredness and increase in a feeling of well being which improve oxytocin production.*

Lactogogues: In most communities various type of food or drinks or herbs are used to increased milk production. They are called Lactogogues. They *may or may not increase milk supply* but help the mother to feel confident and relaxed.

Role of Medications: Certain drugs like Chlorpromazine, Domperidone, Metoclopramide are used to augment breast milk supply. These drugs do have a minor positive effect but should not be used routinely. They shouldn't be used as a substitute for good patient management (7). Certain medications like Iron, Calcium or Multi vitamin tablets are used to improve general health of the mother. They have a placebo effect on breast milk supply.

To have a significant supply of breast milk frequent suckling is the most effective method.

The time needed to have significant lactation varies from mother to mother. It depends on

Frequency of suckling: The more the better. Night time suckling helps release of prolactin better.

Duration of discontinuation of breastfeeding: The shorter the duration, the easier it is to relactate.

Baby's age: The younger the baby, the easier it is to relactate (8). Older infant tend to be less willing especially if they have become used to feeding from bottles with teats. Mothers can relactate even babies who are older than 12 months. Hence *no mother should be discouraged from making an attempt to relactation.*

Low birth infants who are cup fed during transitional phase between gavage and breastfeeding may breastfed more easily than those who have been bottle fed. (9)

If the mother has ever breast feed earlier it is easier to relactate, even a post menopausal women can produce milk, e.g. a grandmother can breastfeed a grandchild. (Non puerperal Induced lactation).

If mothers are motivated, they are most often willing to relactate as breastfeeding is beneficial for the infant's health and her health. (10) If mothers are given sufficient skilled help even infants who are used to artificial teats can usually learn to suckle at the breast. (11) Grandmothers in Africa & Asia produce milk when they put infants to their breasts to soothe them in the absence of their mothers. (12)

Induced Lactation is the process by which a woman who has never breastfed or has never been pregnant or has stopped breastfeeding many months or years back is helped to produce breast milk. She may not be able to exclusively breast feed the child but she can produce significant amount of milk.

Opportunities in Day-to-Day Pediatrics practice

NICU: Maximum opportunities abound in the neonatal intensive care setup. Initiating and establishing lactation with help of nurses, family support and other mothers of NICU i.e 'mother-to-mother' support.

Many mothers would have initiated top up feeds in first 2 months of baby's life, thinking that their milk is insufficient.

Relactation is possible even in 2nd year of life. Whenever child comes with illness like B. dysentery, gastroenteritis or respiratory illness many mothers give history of stopping breastfeeding in last one to two months. Mothers are encouraged for relactation and many babies can breastfeed successfully.

Some mothers stop breastfeeding due to illness, they are encouraged to relactate they can breastfed successfully. Unfortunately many mothers who have stopped breastfeeding are pregnant hence they are not encouraged to breastfeed.

Tips for the Process of Relactation

Most mothers require admission to hospital for one to two weeks if breastfeeding was stopped for a long duration. This is needed to frequently motivate, help & monitor the technique suggested to her to relactate. It also prevents the pressure to use the bottle at home. On the other hand, if milk supply has to be increased in an ongoing breastfeeding, this can usually be done at home.

Use the counseling skills discussed elsewhere to motivate the mother. Counsel the family members individually & in groups & help them decide the technique most suitable for them & support their decisions. The higher the motivational level of the family, the easier it becomes to relactate the mother.

Try to visit the mother at least twice a day, the staff handling her should also be adequately trained, motivated and competent.

She should have a private corner made by moveable screen or curtains or a separate room. The bed and environment should be relaxed, comfortable & hygienic. The attendant should be supportive and friendly with the mother.

Encourage her to relax, eat, drink & frequently suckle the baby. She may take a locally prevalent lactagogue to build her and family's confidence.

The baby should be on the same cot as the mother with maximum skin to skin contact and cuddling. Explain the technique to the mother with patience and answer her queries. Check her understanding & praise her frequently for all the right things she is doing.

Explain that night sucking is very important for milk production (prolactin reflex).

Keep a watch on attachment and position of the baby and mother.

Plan replacement feeding for the baby and reduce it as her milk production increases. Amount of replacement feeds is discussed elsewhere.

Show her how to give replacement feed by cup/drip drop method/dropper & not bottle.

As soon as milk production starts, decrease the daily amount of top milk by 30-60 ml. each day.

Watch baby’s weight gain & urine output.

Signs of breast milk being produced

Breast-milk production may start in a few days or a few weeks. Signs include:

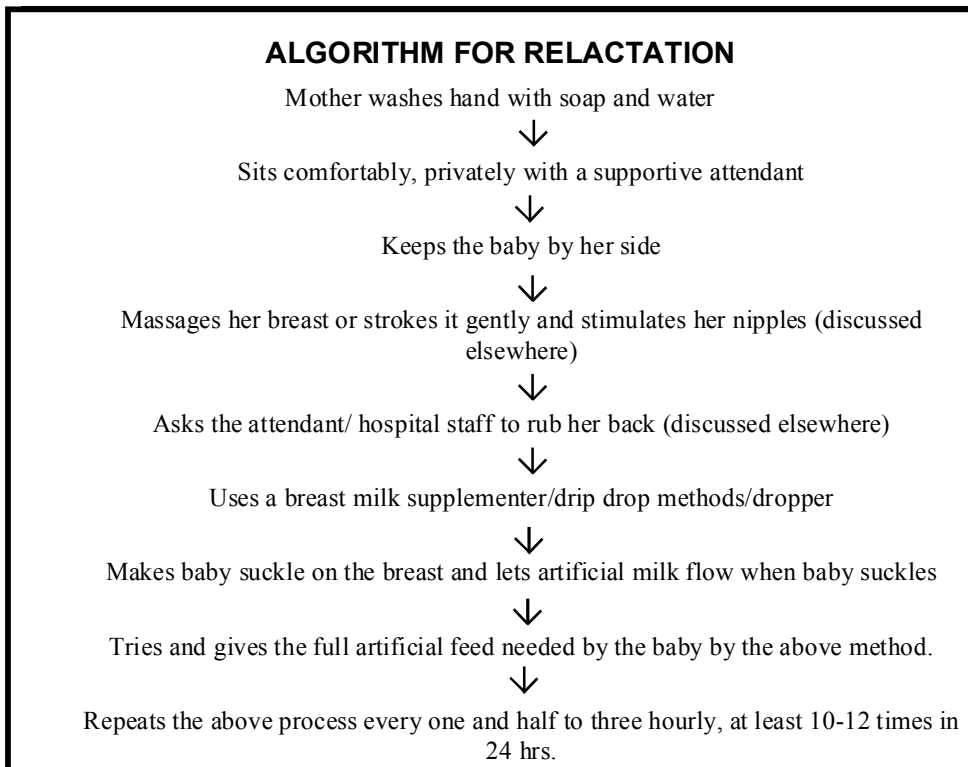
Breast changes: The breasts feel fuller or firmer, or milk leaks or can be expressed.

Less consumption of supplements: The infant takes less supplement while continuing to gain weight.

Stool changes: The infant’s stools become softer, more like those of a breastfed infant.

BREASTFEEDING SUPPLEMENTERS

These are various devices available in the market as well as hospital assembled ones, used to deceive the baby that when she suckles milk is coming from the breast. In this manner the baby



keeps suckling on the breast and gets its required milk supply and at the same time stimulates the breast to produce milk. This is necessary because if the baby suckles on an empty breast for a few times she gets frustrated and refuses to suckle further and starts crying.

1. Self assembled model

It consists of:

1. A cup or bowl or a 20/50 cc syringe for holding milk.
2. Nasogastric tube with its end cut off till the last side-hole to prevent milk from coming out from side.
3. Adhesive plaster of any type.

Method

The mother straps the tube on her breast in such a manner that its cut end is placed just beyond the tip of the nipple.

The baby suckles in such a way that the cut end of the tube is in the mouth of the baby along with the nipple.

The free end of the tube is placed in the cup or a 20/50 cc syringe is attached to it.

An attendant can hold the cup/syringe or the cup can be placed on the table.

When the baby suckles, by the negative pressure the milk is pulled into the tube and into the baby's mouth.

If the baby gets milk he continues to suckle and stimulates the breast. This starts the production of milk. As the breast milk production increases the amount of milk from the supplementer decreases and is ultimately no longer required.

It is important that the baby gets milk fast enough to keep his interest in suckling, but not too fast to cause choking or aspiration.

If the cup is raised, the flow of milk increases and vice versa. With the syringe, the flow can be control by pressing the piston. Alternatively if the piston is not used, in both methods a paper clip or simply pinching the tube can regulate the flow of milk.

The cup or syringe & tubing have to be washed after each use and sterilized before using them.

2. Dropper method: The mother drops the milk into the baby's mouth from the sides as the baby suckles.

3. Commercially available breast milk supplementer: The basic components of the commercially marketed supplementers are the same i.e. a receptacle for the supplement and thin clear plastic tubing with adhesive tape and some modifications. There are mainly two brands available in the international market i.e. *Medela Supplemental Nursing System (SNS)* and the *Lact-Aid Nursing Trainer System*. In Australia a device called *Supply Line* is also available. These are not easily available in the Indian markets. They are to be used in the same manner as the self assembled system. They have some advantages like they do away the need of an attendant. Cost is the prohibitive factor. Deciding which type of supplementer system is to be used depends upon several factors i.e. availability convenience, product effectiveness, nursing style, personal preference and cost.



Figure 1: A mother breastfeeding her baby using a breastfeeding supplementer (syringe attached to the free end is not visible)

To summarize

Suckling is the most important and the only stimulus to increase milk production or initiate relactation.

Counseling skills are necessary to keep the mother and family motivated.

Various methods are available to initiate the baby to suckle on to the breast.

Drugs and Lactogogues have a very minor role to play, if any at all.

Relactation is practically possible with very high success rates in a willing and well motivated mother who has family & counseling support

REFERENCES

- 1) Brown RE: Some nutritional considerations in times of major catastrophe, *Clin Pediatr* 11:334, 1972.
- 2) Relactation: Review of experience and recommendations for practice. Department of Child and Adolescent Health and Development. Eds. Elizabeth Hormann and Felicity Savage WHO, Geneva PP: 1-38 WHO/CMS/CAH/98-14, 1998.
- 3) Banapurmath CR, Banapurmath SC, Kesaree N. Initiation of Relactation. *Indian Pediatr* 1993; 30: 1329-1332.
- 4) Bose CL, D'Evcole AJ, Lester AG, Hunter RS, Barrett JR. Relactation by mothers of sick and premature infant. *Pediatrics* 1981; 67: 565-569.
- 5) Glasier AS, McNeilly AS, Howie PW. The prolactin response to suckling. *Clinical Endocrinology* 1984; 21: 109-116.
- 6) Wilde CJ, Prentice A, Peaker M. Breastfeeding: Matching supply with demand in human lactation. *Proc Nut Soc* 1995; 54: 401-6.
- 7) Philip O. Anderson and Veronica Valdes; A Critical Review of Pharmaceutical Galactagogues; *Breastfeeding Medicine*; 2007; Volume-2, Number 4.
- 8) Banapurmath CR, Banapurmath S, and Kesaree N, Successful Induced Non-puerperal Lactation in Surrogate Mothers. *Indian J. Pediatr.* 1993; 60: 639-643.
- 9) Lang S, Lawrence CJ, L'E Orme R. Cup feeding: an alternative method of infant feeding. *Arch Dis Chld* 1994; 71: 365-369.
- 10) Seema AK, Patwari L, Satyanarayana. Relactation: An effective Intervention to Promote Exclusive Breastfeeding . *J Trop Paediatr* 1997; 43: 213-216.
- 11) Fisher C, Inch S. Nipple confusion – who is confused? *J Pediatr* 1996; 127; 174
- 12) Slome C. Non-puerperal lactation in grandmothers. *Journal of Pediatrics* 1956; 9: 550-552.

INDUCED LACTATION

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Induced lactation assumes importance as the adopted babies achieve security, comfort and close bonding with the adoptive mother, apart from nutritional benefit.¹ Without this source of high quality nutrition, the infant is more likely to succumb to morbidity and mortality. Anthropologists have made observations in pre-industrialized societies of women who have not borne children, that after a few weeks of placing the suckling infant to the breast, they were able to produce adequate milk to nourish the infant.²

The most important factor for continued production of milk is stimulation of nipple and areola.³ During pregnancy the breast is prepared by ductular and alveolar proliferation. A similar preparation is needed for induced lactation to be successful. At least a month preparation prior to the arrival of the newborn is suggested by manual mechanical stimulation. Milk production typically begins between 1-4 weeks after initiating mechanical stimulation. At first, the mother may see only drops. During the time that milk production is building, women may notice changes in the color of the nipples and areolar tissue. Breasts may become tender and fuller. Some women report increased thirst and changes in their menstrual cycle

METHODS

Mechanical Stimulation: Mothers are encouraged to stimulate the nipple by nipple stroking, massaging the breast or rolling the nipple between thumb and fingers while anticipating infant. Mothers are advised to suckle the infants as often as possible in first two weeks, i.e. 6-8 times per day and when ever baby demands at night.⁴

Hormonal therapy: It generally consists of administration of estrogen to simulate the high-estrogen state of pregnancy. The estrogen is then abruptly withdrawn to mimic the rapid hormonal changes following delivery. A course of a prolactin-enhancing drug such as metaclopramide is then instituted.

Milk is poured by Drop & Drip method⁵ on the mother's breast by a nurse or an attendant. Babies are fed top milk with palada or small steel cup till breast-feeding is established. Mothers in western countries use 'Lact-Aid' as nursing trainer, which works on the principle of an external milk duct.⁴ A flexible tube attached to a bag containing formula or human milk is positioned near the mothers nipple. As the infant suckles at the breast, he simultaneously draws fluid through the tube and is thereby rewarded for work at the breast.

Gradually top milk is reduced, growth monitoring is done, urine output is checked daily. Mothers are given Metaclopramide / Domperidone to increase the production of milk.

Mothers should be encouraged to suckle, since suckling leads to rise in prolactin and oxytocin levels.⁶ *Basically, it is important to remember that both prolactin and oxytocin, the hormones which govern lactation, are pituitary, not ovarian hormones.* Both are produced in response to nipple stimulation. While there are now several regimens which use hormone therapy to assist bringing in milk, many women have induced lactation with only mechanical stimulation.

STUDIES

The authors studied Induced Lactation in 1993. The process of induced lactation was tried in 10 well nourished mothers who were non-lactating, non puerperal and motivated. All the 10 babies had good sucking reflex. Six of them were spoon fed and 4 babies were bottle fed. It was difficult to initiate breastfeeding in babies who were bottle fed. Bottle feeding requires a completely different mechanism to suck, and hence babies find it difficult to adopt to two ways of suckling.⁷ To initiate suckling milk was poured over the breast drop by drop using a spoon and allowing the milk to flow to the tip of the nipple for the first 3 to 4 days.⁵

The mothers, who did not succeed, did not continue their effort after 2 weeks. Out of 5 mothers, one was a working mother with no leave at her credit, another considered breastfeeding to be very tiring; the other 3 mothers were lost to follow up after 15 days. In the group where mothers were successful, 4 among 5 babies were less than three weeks. In contrast, where mothers were not successful, 4 among 5 babies were older than 3 weeks. Even in study of 240 women who did adoptive nursing, mothers were more successful if the babies were younger.⁴

Two mothers achieved complete breastfeeding, and the other 3 mothers were able to achieve partial breastfeeding. Tension in the mother can inhibit milk ejection reflex, and in turn milk production.⁸ Anti infective properties become important even though total nourishment may not be possible with breast milk alone. Case 1 was a five month old infant suffering from protracted diarrhea. His diarrhea resolved after attempted breastfeeding. It has been shown that breast milk is useful in management of protracted diarrhea.⁹

There have been numerous instances of nulliparous women successfully breastfeeding adopted infants, and even from our country a case has been reported where a 43 year old grand mother relactated after period of 23 years since her last pregnancy.⁽¹⁰⁻¹⁴⁾ In a study of 37 non-puerperal women aged 19 to 55 years, all 11 women who had never previously lactated were successfully induced for lactation. Of the three mothers in whom induction was unsuccessful, two obtained a bottle from other sources and both their children were malnourished. This study indicates that given a high degree of motivation combined with medication, support, and encouragement lactation induction is likely to succeed.¹¹



Is human milk produced in such circumstances adequate for infant growth?

In a study from New Guinea, 24 infants of mothers inducing lactation were found to be well-nourished at follow-up. A study done by Kleinman et al, looked at the chemical composition of milk produced by non-biological mothers. Two of the studied women had previously delivered babies; three had never been pregnant. Milk samples were collected from five women with adopted infants who had induced lactation by infant sucking. Milk production was established within 11 days without medication. Milk samples were collected during the first five days of milk production and compared with samples of milk from five biological mothers. The mean protein concentration in the induced lactating women was identical to that of transitional milk of post-partum donors. There were differences in the concentration of albumin, IgA and lactalbumin concentrations in the milk produced during the days immediately following birth. Levels of these constituents were higher in the colostrums of the biological mothers. Sucking alone is apparently not sufficient to produce colostrums; other hormonal influences associated with pregnancy seem to be involved. The milk brought in by non-biological mothers, in other words, skips the colostrum phase and more closely resembles transitional and mature breastmilk. Kleinman's study does not look at other nutritional characteristics (such as fats, carbohydrates, or micronutrients).¹²

CONCLUSION

The adoptive mother seeking to induce lactation is a unique client in need of highly tailored and personalized care.¹³ Physicians can help their patients understand the current tools available to assist them with this unique endeavor.¹⁴

Induced lactation is life saving, it helps to create mother infant bonding through nursing, which is a matter of great importance. In places where maternal mortality is high, induced lactation assumes paramount importance. With induced lactation we are giving a best chance to the baby. The technique is very simple. A healthy and willing woman, vigorously suckling baby and an adequate support group to motivate and help the mothers can achieve induced lactation.

(See related article on “Relactation”)

REFERENCES

- 1) Avery JL. Induced Lactation: A Guide for Counseling and Management, Denver: Resources in Human Nurturing International, 1979.
- 2) Ruth A Lawrence. Breast-feeding : A Guide for the Medical Profession. St. Louis : CV Mosby Co. 1989; 431-449.
- 3) Jelliffe DB. Hormonal control of lactation. In: Schams D, ed. Ciba foundation symposium No, 45, Breast-feeding and the Mother, Amsterdam, Elsevier Scientific Publishing Co, 1976.
- 4) Auerbach KG, Avery JL. Induced Lactation: A study of adoptive nursing by 240 women. Am J Dis Child 1981; 135: 340-343.
- 5) Kesaree N. Drop and Drip method. Indian Pediatr 1993; 30: 277-278.
- 6) Brown RE. Relactation : An overview. Pediatrics 1977; 60: 116-120.
- 7) Woolridge MW. The 'anatomy' of infant sucking. Mid Wifery 1986; 431-449.
- 8) Auerbach KG, Avery JL. Relactation : A study of 366 cases. Pediatrics 1980; 65: 236-242.
- 9) Macfarlane PI, Miller V. Human milk in the management of protracted diarrhea of infancy. Arch Dis Child 1984; 59: 260-265.
- 10) Chaturvedi P, Dubey AP. Induced not puerperal lactation. Indian J Pediatr 1985; 52: 319-320.
- 11) Nemba K, Induced Lactation: A Study of 37 Non-puerperal Mothers, Journal of Tropical Pediatrics, 1994, 40:240-242.
- 12) Kleinman R, et al Protein Values of Milk Samples from Mothers without Biological Pregnancies, Journal of Pediatrics, 1980, 97:612-615.
- 13) Wittig SL, Spatz DL, Induced lactation: gaining a better understanding. MCN Am J Matern Child Nurs. 2008 Mar-Apr; 33(2): 76-81; quiz 82-3.
- 14) Bryant CA. Nursing the adopted infant. J Am Board Fam Med. 2006 Jul-Aug; 19(4): 374-9.

COMPLEMENTARY FEEDING

Dr. Roopa Bellad

Complementary feeding (CF) is defined as the process starting when breast milk is no longer sufficient to meet the nutritional requirements of infants, and therefore other foods and liquids are needed, along with breast milk¹. It replaces the term 'weaning' which means stopping breastfeeding, but CF is clearly defined that, the foods and liquids are given to 'complement', not to replace on-going breastfeeding.

Importance of complementary feeding

Malnutrition has been responsible, directly or indirectly, for 60% of all deaths among children under five years annually. Over 2/3 of these deaths are often associated with inappropriate feeding practices and occur during the first year of life². Malnutrition strikes the most in infancy beginning at 3 to 4 month, 11-12 % at 0-6 months, reaches 37% at 12 months, peaks by 23 months. Infants and young children are at increased risk of malnutrition from six months of age onwards, when breast milk alone is no longer sufficient to meet all nutritional requirements and complementary feeding needs to be started³. First year is the most critical phase because infants grow at a very rapid rate and in order to achieve optimum growth and development, there is an increased demand for a regular supply of raw material in the form of better nutrition. Adequate complementary feeding from six months of age while continuing breastfeeding is extremely important for sustaining growth and development of the infant

Complementary feeding practices in India

Poor breastfeeding and faulty complementary feeding practices are widespread. Worldwide, it is estimated that only 34.8% of infants are exclusively breastfed for the first 6 months of life, the majority receiving some other food or fluid in the early months. Complementary foods are often introduced too early or too late and are often nutritionally inadequate and unsafe.⁴ In India, according to National Family Health Survey 3 (NFHS 3) data, introduction of complementary feeding along with continued breastfeeding at 6-9 month age is only 55.8%.⁵ More recently, the District Level Household & Facility Survey-3 (DLHS 3) data reveals it to be only 23.9%, a rise of only about 20% over 6-7 years.⁶

National Guidelines on Infant and Young Child feeding

In 2002, the WHO and UNICEF adopted the *Global Strategy for Infant and Young Child Feeding* and India also has issued the National Guidelines on Infant and Young Child Feeding in 2006 which recommends, complementary feeding to be started Timely, Nutritionally Adequate, Safe and Responsively fed.⁷

TIMELY: WHEN TO BEGIN?

Complementary feeding should be started at six months of age. From the age of 6 months, an infant's need for energy and nutrients starts to exceed what is provided by breast milk, and complementary feeding becomes necessary to fill the energy and nutrient gap. At 6 months the infant is also ready for chewing food. If complementary foods are not introduced at this age or if they are given inappropriately i.e. introducing before 6 months or after 9-12 months, an infant's growth may falter and also increases the risk and severity of infections like diarrhoea and ARI. Since breast milk is replaced by less nutritious food, it predisposes the child to malnutrition.⁸ Thus, 6 months is the recommended appropriate age at which to introduce complementary foods

Development and complementary feeding

By 6 months an infant can voluntarily control suckling and swallowing, and biting movements begin. The tendency to push solids out of mouth also decreases. By the age of nine months a child can use the lips to clear a spoon and use the tongue to move food between the teeth. At this age solids can be chewed. This implies that from about 6 months a child can eat soft and starchy foods such as cereals. By 9 months infants can be given mashed and chopped foods.

NUTRITIONALLY ADEQUATE: WHAT FOODS TO GIVE? ⁹

The complementary food should be: -

1. Semisolid in consistency but not watery
2. Inexpensive and easy to prepare, preferably from food available at home
3. Easy to digest, freshly prepared and clean
4. High in calorie density and provide proteins, iron, and vitamins A and C, the nutrients which are usually deficient.

A cereal based semisolid food is usually the first food to be introduced. This can vary from "ragi" (a food used in South India), "suji kheer", or "moong dal" cooked, mashed, and strained. A "mashed banana" is also an excellent first complementary food available all over India. "Khichri"

and “dalia” are other popular and appropriate complementary foods. Curd, rice, kheer, and porridge are other foods that can be used to introduce the child to semisolids.

WHAT TO GIVE EACH DAY

Frequent breast feeds plus

What ever is the “staple” eaten by the family such as rice, maize, potato, or wheat

Légumes /Pulses (lentils, grams, beans, peas etc.)

Vegetables with most meals

Fruit as a snack or with meals

Milk products (curd & cheese)

Nut pastes particularly important for vegetarians

Animal- source foods (meat, poultry, fish or egg) if not daily, then, as often as possible even if the amounts are small

Commercial Baby Foods

Commercial baby foods are convenient and can be helpful and are quick and easy to prepare. But they are expensive & may contain inappropriate fillers and additives and, the nutritional content of commercial baby foods is far lower than recommended. Moreover, these foods are usually of same taste, colour, consistency and texture so it becomes difficult for the child to change from commercial formula to homemade & so are not recommended.

Some examples of complementary food

Semisolid gruel made of roasted whole wheat flour or flour of other cereals like jawar, bajra, ragi etc (any local staple) or suji and milk.

Mashed potatoes, soft fruits like banana, mango, papaya or any other seasonal fruit

Soft cooked and mashed rice and dals

FREQUENCY, AMOUNT & CONSISTENCY


Feeding amount and frequency is an important factor that affects a child’s nutritional status. Given the small stomach sizes, young children need to be fed frequently during the day to ensure adequate food consumption. Start with 1 to 2 teaspoonfuls and gradually increase the amount of food. Over 3 - 4 weeks, increase to 50 to 60 g or half a cup (or one banana). Feed 2 to 3 times a day till about

9 months age, after which the feeds can be increased from 3 to 6 times a day. The fewer the feedings, the higher is the caloric needs per feeding. Continue breastfeeding and preferably give semisolids after breastfeeding. Consistency should be such that the feed does not run down the spoon on inverting it but the drop should stick to the spoon for some time

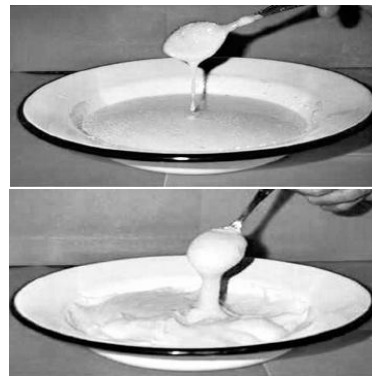
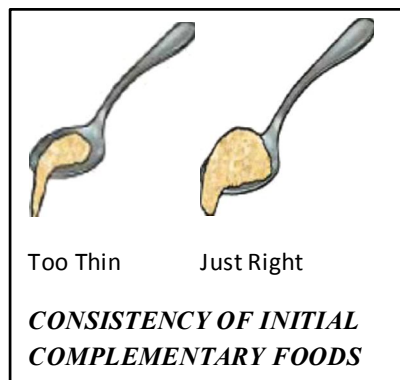
Complementary foods should have a greater energy density than breast milk, that is, 0.8–1.0 kcal per gram. If a complementary food is more energy dense, then a smaller amount is needed to cover the energy gap. A complementary food that is more energy-dilute needs a larger volume to cover the energy gap.

Frequency, Amount & Consistency of Complimentary Food

At 7-9 months, At 7-9 months, child should be given at least ½ katori of food at each sitting, 4 times a day (total 2 katoris of food each day).



At 10-12 months, child should be given at least ½ katori of food at each sitting, 5 times a day (total 2½ katoris of food each day).



CONSISTENCY OF INITIAL COMPLEMENTARY FOODS

How to make foods more energy and nutrient rich?

By making the porridge thicker

Replacing some of the cooking water with fresh or soured milk, coconut milk or cream

Stirring in ground nut paste (peanut butter) or sesame seeds paste (tahini)

Adding a spoonful of ghee or oil makes the food softer and energy dense

Sugar and jaggery make the food energy rich

Foods to be avoided

Marketed packets of fried savoury snacks are of poor nutritional value and much too salty.

Sugary foods, sweets, fizzy drinks and colas provide energy but no nutrients. They can also lead to tooth decay.

Dal water, juices, teas, soups, - these are not nutritious as they are not energy dense and fill the small capacity stomach with hardly any calories

Honey sometimes contains bacteria, which produce toxins leading to infant botulism.

SAFE: PREPARING AND FEEDING HYGIENICALLY

Safe preparation and storage of complementary foods can prevent contamination and reduce the risk of diarrhoea. The five main routes of contamination should be taken care

Hands & utensils: Before preparing and serving food, the hands should be carefully washed (preferably with soap and water). All utensils should be washed and scrubbed thoroughly and kept in the sun for drying.

Raw food & ingredients: Complementary foods should be as fresh as possible and prepared immediately before they are to be eaten. The foods should be cooked or boiled well. This helps in destroying germs, improving flavour and making it more palatable. Badly or overcooked food can cause loss of nutrients.

Storing cooked food: Stored in a cool shady place in clean covered containers that keep out flies and other insects. The complementary foods should not be stored for more than two hours if possible.

Water: The cleanest water available should be used for making the complementary foods and washing uncooked foods.

Storage & surfaces: The cooking place and tables/chopping boards should also be clean

Five keys to safer food

Keep clean

Separate raw and cooked

Cook thoroughly

Keep food at safe temperatures

Use safe water and raw materials

RESPONSIVELY FED: SENSITIVE TO CHILD'S NEEDS

Optimal complementary feeding depends not only on what is fed but also on how, when, where and by whom a child is fed. The term “*responsive feeding*” is used to describe care giving that applies the principles of psychosocial care

Feed infants directly and assist older children when they feed themselves. Feed slowly and patiently, and encourage children to eat, but do not force them.

If children refuse many foods, experiment with different food combinations, tastes, textures and methods of encouragement.

Minimize distractions during meals if the child loses interest easily.

Remember that feeding times are periods of learning and love – talk to children during feeding, with eye-to-eye contact.

GUIDING PRINCIPLES FOR COMPLEMENTARY FEEDING OF THE BREASTFED CHILD

The ‘*guiding principles for complementary feeding of the breastfed child*’, set standards for developing locally appropriate feeding recommendations². They provide guidance on desired feeding behaviours as well as on the amount, consistency, frequency, energy density and nutrient content of foods

1. Practise exclusive breastfeeding from birth to 6 months of age, and introduce complementary foods at 6 months of age (180 days) while continuing to breastfeed.
2. Continue frequent, on-demand breastfeeding until 2 years of age or beyond.
3. Practise responsive feeding, applying the principles of psychosocial care.
4. Practise good hygiene and proper food handling.
5. Gradually increase food consistency and variety as the infant grows older, adapting to the infant’s requirements and abilities.
6. Increase the number of times that the child is fed complementary foods as the child gets older.
7. Feed a variety of nutrient-rich foods to ensure that all nutrient needs are met.
8. Use fortified complementary foods or vitamin-mineral supplements for the infant, as needed

9. Increase fluid intake during illness, including more frequent breastfeeding, and encourage the child to eat soft, favourite foods. After illness, give food more often than usual and encourage the child to eat more.

STRATEGIES TO PROMOTE APPROPRIATE & ADEQUATE COMPLEMENTARY FEEDING

Optimal breastfeeding and complementary feeding has an impact on the child survival.¹⁰ One of the key effective strategies of the WHO to achieve the Millennium development goal (MDG) on reducing child mortality is to achieve high rates of exclusive breastfeeding for the first six months and appropriate complementary feeding. Ensuring adequate and timely introduction of complementary feeding along with continued breastfeeding has shown to be an effective intervention to reduce the risk of deaths occurring in children less than 5 years of age by 6%, in addition to 13% by optimal breastfeeding & also reduces stunting and anemia.¹¹

A meta-analysis of complementary feeding strategies and linear growth showed that education strategies alone are of most benefit in populations that have sufficient means to procure appropriate food, whereas in populations without this security, educational interventions are of benefit when combined with food supplements. It further concludes that improvement of complementary feeding through strategies such as counselling about nutrition for food secure populations and nutrition counselling, food supplements, or a combination of these, in food-insecure populations could substantially reduce stunting and related burden of disease. Putting in practice the recommendations and comprehensively using all sets of strategies which include interventions by health and related sectors would definitely improve the status of infant feeding practices.

REFERENCES

1. Infant and young child feeding: model chapter for textbooks for medical students and allied health professionals. WHO 2009. Available at <http://www.who.int/nutrition/publications/infantfeeding/9789241597494/en/index.html>
2. WHO/UNICEF Global Strategy for Infant and Young Child Feeding, World Health Organization (WHO), 2002. Available at: http://www.who.int/child-adolescent-health/NUTRITION/global_strategy.htm.
3. Summary of guiding principles for complementary feeding of the breastfed child Complementary feeding: report of the global consultation (2003) <http://www.who.int/nutrition/publications/infantfeeding/924154614X/en/index.html>
4. WHO Global Data Bank on Infant and Young Child Feeding, 2009

5. National Family Health Survey - 3. International Institute for Population Sciences. Available at: http://www.nfhsindia.org/nfhs3_national_report.html
6. International Institute for Population Sciences. District level household and facility survey, DLHS - 3 Fact Sheets 2007-2008. Available at: (http://nrhmmis.nic.in/ui/Reports/DLHSIII/dlhs08_release_1.htm#BR). Accessed on 27 September 2009.
7. Ministry of Women and Child Development – Government of India. National guidelines on IYCF, 2006. Available from: URL: <http://wcd.nic.in/> accessed on September 15, 2009.
8. *World breastfeeding week theme brochure 2005 available at*. <http://www.bpni.org>
9. Breastfeeding Promotion Network of India. Introducing Solids. (Complementary Feeding). <http://www.bpni.org/cgi/Introducing.asp>
10. Gupta A, Dadhich JP, Faridi MM. Breastfeeding and complementary feeding as a public health intervention for child survival in India. *Indian J Pediatr*. 2010 Apr; 77(4):413-8. Epub 2010 Mar 19. International Baby Food Action Network-Asia, New Delhi, India. arun.ibfan@gmail.com
11. Jones G, Steketee RW, Black RE, Bhutta ZA, Morris SS, and the Bellagio Child Survival Study Group. How many child deaths can we prevent this year? *Lancet* 2003; 362: 65-71
12. Bhutta ZA, Ahmed T, Black RE *et al*. What works? Interventions for maternal and child under nutrition and survival. *Lancet* 2008; 371 : 417-440

COMMUNICATION SKILLS FOR HEALTH WORKERS

Dr. M.M.A. Faridi

BACKGROUND

Education can be defined as “a process to bring about a desired change in an individual”. It has three components namely:

Cognitive domain: Related to knowledge of the subject;

Psychomotor domain: Encompasses skills and capacity to perform a task

Affective domain: Dealing with the ways and manners one communicates with others, exhibits human virtues and shows respect to culture and values.

Being privy to privacy and secrets of body and behavior a health worker enjoys extreme confidence of the patients and commands enormous respect. Therefore, a health worker must possess ability of empathizing and accepting what patients feel and think without agreeing or disagreeing with them.

Praising patients for what they are doing right pays rich dividend in terms of good compliance of the advice, boosting of confidence and improving follow up.

For example: a mother may be complaining of ‘inadequacy’ of breast milk and wants to start bottle feeding. Mother’s thinking that she does not have enough breast milk is a mistaken idea but telling her that ‘no, breast milk is never inadequate, you need to breastfeed frequently’ or ‘this is wrong; you just breastfeed and everything will be alright’, will not help the situation. Disagreement will not only result into stiffening and resistance by the mother in accepting the advice given by the health worker but will also cause loss of confidence and feeling of shame in her as she will think that she is wrong and does not have enough knowledge about breastfeeding. However, if health worker says to the mother, ‘you think so’ or ‘how did you get this idea’ or ‘are you sure of that’ might help her better.

All these are neutral responses without agreeing or disagreeing with the mother. Health worker should, therefore, be a good listener and be able to provide relevant information in a positive manner.

Adult learning is different from that of children. Bringing changes in the attitudes and life style of the adult clients, will require special skills in the health care worker. S/he will need skills to help empower patient to understand and take appropriate action for good. In the context to breastfeeding the health worker should be able to support mother for successful breastfeeding and complementary feeding. Thus one expects a health worker to be a good communicator who can give *few suggestions, not commands, in simple language* that can be understood by the mother. In other words health worker should be an efficient counselor.

Oxford Dictionary and Thesaurus-2001, defines counseling as i) *advise or recommend*, ii) *give professional help and advice to someone* (with personal or psychological problems). *Counsel* is defined as advise, discuss (with), give help, guide, listen to your views. *Counselor* is a person trained to give advice on personal or psychological problems. However, counseling goes beyond advice. Counseling truly aims at empowering a person to understand nuances of the subject matter and enabling her/him to take an appropriate action most suited to her/his situation.

Counseling

Following description is available for counseling.

Guidance: something that provides direction or advice as to a decision or course of action

A detailed plan or explanation to guide someone in setting standards or determining a course of action;

The act of exchanging opinions and ideas; consultation.

TECHNIQUE OF COUNSELING

The basic skills include patterns of sessions, active listening, body language, tone, open ended and closed questions, paraphrasing, summarizing, note taking, homework, the 'goodie bag' and other fun and informative stuff. *Active listening* happens when one "listens for meaning". The listener says very little but conveys much interest. The listener only speaks to find out if a statement has been correctly heard and understood.

For a successful counseling what is most important is that the client feels s/he was listened to, was heard, and that, because you are there and you care, there is hope that , there is a future, and s/he will be able to take best suited decision for her/his situation.

There are three attributes for communication. When these are used together and judiciously by the counselor, s/he can effectively empower a mother.

1. Listening and learning skills
2. Confidence building skills
3. Checking understanding skills

LISTENING AND LEARNING SKILLS

These can be summarized as follows:

1. Non-verbal helpful communication skills.
2. Asking *open* questions.
3. Expressing gestures and responses.
4. Reflecting back.
5. Showing empathy.
6. Avoiding use of judging words.

Non-verbal helpful communication skills

These are very important skills for reassuring mother and the family and making them interested in the communication and counseling process. There are six of them:

Keeping head at same level. The counselor and mother both should either be sitting on the floor or chairs. If she is accompanied by her husband and/or mother-in-law, they should also be offered chair at the same place.

Keeping appropriate distance. The mother and health worker should sit facing each other at a comfortable distance. The health worker should neither sit too near, so that mother may feel embarrassed, nor be far away from the mother that both have to talk very loudly to be heard.

Making eye to eye contact. The health worker should face the mother giving impression that s/he is interested in her problem and wants to help her. S/he should not look here and there while talking and listening to her.

Removing barriers. Keeping papers, notebook and pictures in the hands may be barriers. Similarly taking notes while listening and talking will be a barrier. Therefore, notes should be written after the session is over. However few words may be jotted down.

Having time for the mother. The health worker must exhibit mannerism that assures the mother and other family members that s/he has all the time for her. Just looking at your watch while listening/talking to the mother will convey a message that you are in hurry and this will

shut any further meaningful counseling session. Similarly giving instructions to other persons or sifting files in between conversation gives an impression that health worker is not interested and is in haste. Avoid such body language.

Touching appropriately. Touching a person conveys a very personal feeling of comfort and soothing and bolsters her/his morale. However, in Indian culture it is not appreciated that a man touches a woman. A male health worker may refrain from touching mother but he can always touch her child and say that your baby is so beautiful and so well dressed.

Asking open questions

An **open question** is one that is used to gather lots of information. It is asked with the intent of getting a long answer. The question usually *starts with what, how, whom, why* etc.

A **closed question** is one used to gather specific information. It can normally be answered with either a single word, like yes or no, or a short phrase. For example if a health worker asks from the mother, 'do you breastfeed', the answer will be either yes or no. If mother says yes, it will not show whether it is exclusive breastfeeding. One has to ask another question to clarify. However, if health worker asks mother, 'how are you feeding your baby'? (Open question) Then the mother will give more information.

Expressing gestures and responses

In order to continue conversation with the mother it will help health worker if s/he evinces interest and expresses it by nodding, smiling or eye/facial movements. S/he may also say '*oh! I see*', '*achchha*', '*oo-hoon,*' etc. Gestures should be positive, never make negative gestures even if you do not like what the mother is saying.

Reflecting back

It is a skill by which health worker assures the mother that s/he has understood what she thinks. It can be achieved by simply repeating what a mother says. For example if a mother says that 'it is only few hours after delivery. My breasts are empty, there is no milk there'. Health worker can say to the mother, 'you think milk has not come yet'. Now mother will give some reason why she thinks so. It will help health worker to understand the situation of the mother and in offering relevant information to her.

Showing empathy

Empathy is showing to a person that you understand his/her feelings. It is very reassuring to a person in distress. For example if mother complains that her baby has been crying all night and

looks anxious, a health worker may say to the mother, 'I can see you must be worried about your baby'. Empathy is different from sympathy. Sympathy is to express helplessness and feel poorly of her. It does not help a mother.

Avoiding usage of judging words

Well, enough, normal, '*theek hai*', are some of the judging words very often and commonly used while talking to the mother. Like when you ask from the mother, 'is baby breastfeeding normally'? Now mother may not understand what do you mean by 'breastfeeding normally' or may understand differently what a health worker wants to know. If you note, this is closed question. Therefore, whenever a judging word is used the question becomes closed question. By asking an open question you will also avoid using judging words.

CONFIDENCE BUILDING SKILLS

There are six of them and all must be used to boost up morale and self-esteem of the mother. A confident mother will be in a better disposition to understand and choose a correct decision.

1. Accept what a mother thinks or feels
2. Praise what a mother and baby are doing right
3. Give some practical help
4. Provide relevant information
5. Use simple language
6. Give few suggestions, not commands

Accept what a mother thinks or feels

Mother may harbor some wrong ideas or misplaced notions about breastfeeding and complementary feeding. This may change her behavior e.g. about early initiation or practicing exclusive breastfeeding and introduction of some family foods to the child.

Agreeing with the thinking or feelings of the mother will make correction of mistaken ideas difficult later on. Similarly disagreement with her makes her rigid and downs her confidence.

Expression of a neutral statement is the most helpful in such situations. For example if a mother complains that 'baby cries a lot and her sister-in-law says that she does not have enough breast milk; she should better start bottle feeding'. A health worker can say 'your sister-in-law says that you do not have sufficient milk'. This statement will not put onus on her. If health worker says that

no, it never happens, mother always has enough milk. This amounts to disagreement. Mother will think this health worker does not understand her situation. She may lose confidence in herself too thinking that she is so ignorant. On the other hand if health worker says that 'ya', some mothers may find that they do not produce good amount of milk, then it will be very difficult for the mother to practice exclusive breastfeeding when health worker suggests her to breastfeed more often after assessing and observing breastfeeding and giving relevant information.

Praise what a mother and baby are doing right

Praising mother for doing something good helps in terms of, i) boosting confidence, ii) continuance of the good practice and iii) opening her for accepting suggestions made by the health worker.

Health worker should find out any good practice by the mother or good thing about the baby and praise. If a mother brings old weight record while coming for immunization, then health worker can appreciate her for that by saying that old records help in assessing the growth of the baby. Mother will feel happy. She will try to maintain weight record in future and will listen to suggestions of the counselor. Similarly if baby has gained weight, the health worker can say to the mother that 'your baby is gaining weight just on your milk'. It will be very satisfying for the mother and she will continue exclusive breastfeeding.

Give some practical help

While counseling session is about to start a health worker can offer a glass of water, switch on fan or help put baby in the mother's lap. This little practical help breaks inhibitions and give a sense of friendliness, familiarity and acquaintance.

Provide relevant information

It is very important that scientific facts about breast milk and breastfeeding and complementary feeding are given to the mother. Factual information should be relevant for the occasion, crisp in nature and not too much at a time. Information should be provided in general, not necessarily addressing the mother and baby in particular who is seeking the help. □:

It is better to give information in a positive manner which does not seem threatening. E.g. health worker should tell mother that thick consistency family food that stays on the spoon, fills and nourishes a baby well and should be given to the child after completion of 6 months of age. Negative information will be that delayed complementary feeding or thin consistency foods will make your baby malnourished. Similarly a statement 'breastfeeding makes baby grow healthy and strong' will be positive information rather than telling a mother that if you do not breastfeed then your baby will get infections which is a negative way of giving information.

Use simple language

Almost all mothers, including well educated women, do not understand medical terminology. So health worker should avoid medical terms and complicated physiology while explaining or giving information. It will be good wisdom saying that baby can obtain milk comfortably if s/he takes mouthful of breast rather than saying if baby takes whole areola in to the mouth then breastfeeding will be easy for him/her.

Give few suggestions, not commands

Doctors and nurses are often tuned to give orders. An order or command takes away mother's opinion or options whereas suggestion gives a choice to the mother for adopting different options best suited for her. We generally say to mothers 'come after 4 weeks for second dose of immunization' or 'give breastfeeding only till 6 months. Do not give even water'. All these statement are commands or orders. If you say 'three doses of DPT vaccines are required by the baby. Second dose will be due after 4 weeks on (date). How do you think getting it on (date)?' This statement makes mother to think for further immunization. Few mothers may not find feasible to come on that date for various reasons like festival, function etc. Health worker can suggest further. Likewise suggestion for exclusive breastfeeding can be given as 'mother's milk is sufficient for the baby for 6 months of age as it provides all food and water. Is it possible for you to give only breastfeeding till 6 months of age or many mothers do exclusive breastfeeding, how do you think?'

Again few suggestions should be given at a time.

CHECKING UNDERSTANDING SKILLS

It is extremely important that whatever health worker has told and demonstrated, the mother should be able to do by her. There is no point of making a good position for breastfeeding by the health worker in the health facility which mother cannot make and practice at home. At the end of the counseling session the health worker must ensure that mother has understood and she will be able to do that task by herself. There are six skills for checking the understanding.

Arranging supply

Making mother comfortable

Asking open questions about knowledge (cognitive domain)

Filling up gaps while mother is explaining a task

Asking open question for demonstration (psychomotor domain)

Helping in performing task and praise

Arranging supply

Once health worker has counseled the mother it should be ascertained whether she has grasped the knowledge and skills required for breastfeeding and expression of breast milk etc. The first step is to arrange all supply which is needed to perform a task; say doll, breast model, cup or bowl with wide mouth, syringe pump, cooked food items, plate and spoon etc.

Making mother comfortable

The health worker should use listening and learning skills as described above. Mother should be sitting on the chair/stool facing the counselor at an appropriate distance without any barrier in between them. If husband and/or mother-in-law are accompanying they may also be offered chairs. Mother may feel comfortable in the presence of family members. The baby may also be with the mother. Enquire if mother needs personal time or wants rest; carry out understanding check at some other time. The conversation should start with general questions to the mother like how are you feeling, how is breastfeeding going on? She may be informed that you will now give her time to reconstruct and recollect whatever has been discussed.

Asking open questions about knowledge (cognitive domain)

Now, as an example, health worker may say to the mother ‘let us revise what are the advantages of breastfeeding’ or ‘will you like to describe what is responsive feeding’. Avoid asking ‘can you enumerate steps of expression milk correctly’ as it is a closed question and answer will be either yes or no.

Filling up gaps while mother is explaining a task

It is very important that mother should not feel that she is being examined. Otherwise her confidence will take a nose dive. While she is enumerating or explaining about a task the health worker should encourage her and complement anything which she has forgotten. If mother is telling advantages of breastfeeding, health worker can add that mother also has freedom to carry out small homely chores while baby is breastfeeding, or delay in next pregnancy.

Asking open question for demonstration (psychomotor domain)

If health worker is checking understanding of the mother for good positioning, s/he may ask ‘when will you feed your baby again? Will you show me how you breastfeed?’ After her willingness she may be requested to put the baby on the breast. Let her place the baby naturally without comments and hurry. Observe and take note of what and how is she doing a job.

Helping mother in performing task and praise

While mother is performing a task the health worker should encourage and praise her for doing difficult things. If she does any step incorrectly then health worker can say: ‘there are other methods also of doing it or can I show you some other way of doing it?’ Let mother do most of the demonstration. Help should be provided only when she is uncomfortable of carrying out a task.

At the end do not forget to say thank you to mother and other relatives for patience and cooperation.

MYTHS AND BREASTFEEDING

Dr. Rajinder Gulati

Myth #1:

☞ *Gurti should be given at birth*

Fact: The traditional practice of giving *gurti* (honey, jaggery, butter with sugar etc) at birth is unscientific. It is more of a belief that the personality traits of the person giving *ghurti* will appear in the newborn when s/he grows. Actually, *ghurti* suppresses hunger, inhibits the sucking reflex resulting in decrease production of breast milk & above all, may give infection.

Myth #2:

☞ *Breast milk is not enough during the first few days after birth*

Fact: The fluid requirement of healthy newborn is quite less in first day or two. In fact, it is natural to loose about 5 to 7% weight during that by losing fluid from the body. Hence it is nature's mandate that produces less breast milk in initial days. Breast milk production is directly linked to how often & how effectively the baby is suckling. Breast milk increases between 2 to 4 days after delivery, making the breasts feel full; the milk is then said to have "come in". On the third day, an infant is normally taking about 300–400 ml per 24 hours, & on the fifth day 500–800 ml.

Myth #3:

☞ *Pre-lacteal feeds are necessary as breast milk will not "come in" immediately after birth*

Fact: Foods and drinks given to a newborn baby before breastfeeding has started are called *prelacteal feeds*. Giving these feeds increases the risk of illnesses such as diarrhoea and other infections and allergies, particularly if they are given before the baby has had colostrum. *e:Prelacteal feeds* satisfy a baby's hunger and thirst, making him or her less interested in feeding at the breast, so there is less stimulation of breast milk production.

Myth #4:

☞ *Breastfeeding is not possible after cesarean section birth*

Fact: It is usually possible for a mother to breastfeed within about 4 hours, or even within first hour in most cases, after a cesarean section. It also depends upon the type of anesthesia given during cesarean section. After epidural anesthesia, a newborn can often breastfeed earlier as the mother is fully conscious. For the first 24 hours she can breastfeed lying on her back, during the next 24 hours she can breastfeed by turning from side to side and from day three onwards, she can sit up with the pillows support for breastfeeding. It is important to nurse in a way that does not put pressure on the incision sight.

Myth #5:

☞ *A baby should be on the breast for sufficient time (? 5, 10, 20 minutes or longer) on each side.*

Fact: To ensure adequate breast milk production and flow a baby needs to be feed as often and for as long as s/he wants, both day and night. This is called *demand feeding*, *unrestricted feeding*, or *baby-led feeding*. Babies feed with different frequencies, and take different amounts of breast milk at each feed. Infants who are feeding on demand according to their appetite obtain what they need for satisfactory growth. They do not empty the breast, but remove only 63–72% of available milk. More milk can always be removed, showing that the infant stops feeding because of satiety not because the breast is empty. It is thus important not to restrict the duration or the frequency of feeds – provided the baby is well attached to the breast. If a baby stays on the breast for a very long time for every feed or if s/he wants to feed very often (more often than every 1–1½ hours each time) then the baby’s attachment needs to be checked and improved to enhance milk transfer.

Myth #6:

☞ *Many women do not produce enough milk*

Fact: The commonest difficulty that mothers describe is a feeling that they do not have enough breast milk. It is not true. In many cases, the baby is in fact getting all the milk that s/he needs, and the problem is the mother’s perception that the milk supply is insufficient. In others the problem is most likely not with milk production but with the baby getting access to the milk. The usual reason that the baby does not get the milk that is available is that s/he is poorly attached onto the breast. This is why it is so important that the mothers who believe that they do not have enough breast milk should be shown how to attach a baby properly by a skilled person.

Myth #7:

☞ Baby remains hungry/keeps crying even after sufficient time is given to suckle

Fact: Poor attachment is the most important and common reason which results in inadequate milk transfer to the baby. So the baby remains hungry even after sufficient time is given to suckle. Other reasons of crying could be uncomfortable baby i.e. the moment baby is removed from the breast, s/he starts crying. The baby might be wet/soiled, surrounding temperature might be hot or cold (uncomfortable), baby is sick or in pain, colic etc.

Myth #8:

☞ There is no way to know how much breast milk the baby is getting

Fact: Adequate weight gain and passing dilute urine about six times in 24 hours are the signs of adequate milk transfer. Babies who do not recover birth weight at the end of the second week and who do not gain about 500 g to 1 kg or more each month thereafter, need to be assessed. If a baby is passing urine less than 6 times a day, especially if the urine is dark yellow and strong smelling, then s/he is not getting enough breast milk. However, it is not useful if the baby is having other drinks in addition to breast milk.

Pumping out breast milk is a NOT a good way of knowing how much milk the mother has. The baby who nurses well can get much more breast milk than her/his mother can pump.

Myth #9:

☞ Milk production is directly related to the size / heaviness of the breast

Fact: The size of a breast is determined by the amount of fatty tissue it contains; whereas the amount of milk it produces is determined by the number of milk-producing glands it has. Most breasts have the same number of milk glands, regardless of their size. The size / heaviness / fullness sensation of breasts does not directly correlate with the amount of milk they produce. However, breasts seem to vary in their capacity for storing milk. The breast is never “empty”. Also, it produces milk as the baby nurses. More the baby nurses, more is the breast milk produced.

Myth #10:

☞ Breastfeeding is painful

Fact: Suckling is comfortable and often pleasurable for the mother. It is not painful. Some increased sensitivity & mild tenderness during the first few days is relatively common. When a baby is well attached his mouth and tongue do not rub or traumatize the skin of the nipple and areola. Any pain that is more than mild is abnormal and is almost always due to the baby attaching poorly or breast

pathology. For management see article on “Problems related to breastfeeding (Mother)” in this book.

Myth #11:

☞ *Baby on exclusive breastfeeding needs extra water in hot weather.*

Fact: Several studies have shown that healthy infants do not need additional water during the first 6 months if they are exclusively breastfed, even in a hot climate. Breast milk itself is 88% water, and is enough to satisfy a baby’s thirst. Extra fluids displace breast milk. The practice of giving water and other fluids to infants is associated with a two-fold increased risk of diarrhea besides affecting breast milk production.

Myth #12:

☞ *Breastfeeding newborns need vitamins and minerals/Iron supplements*

Fact: At least until the baby is 6 months old, the breast milk provides for all of nutritional needs including vitamins, minerals and iron, unless the mother herself is deficient. The exception is vitamin D. The infant needs exposure to sunlight to generate endogenous vitamin D. Iron and zinc are present in relatively low concentration, but their bioavailability is high. When maternal iron status is adequate, full term infants are born with a store of iron to supply their needs; only infants born with low birth weight may need supplements before 6 months.

Myth #13:

☞ *If the baby has diarrhea/vomiting the mother should stop breastfeeding*

Fact: The best medicine for a baby’s GIT infections is breast milk. Breast milk is the only fluid which the baby requires during diarrhea and/or vomiting up to 6 months, except under exceptional circumstances. Lactose intolerance due to gastroenteritis is not of much concern as it disappears with time. Lactose free formula is not better than breastfeeding. Sick children above 6 months often need extra water and food during illness. A sick child may prefer breastfeeding than to eating other foods. Do not withhold breast milk from a sick child. Diarrhoea has been found to be more common and more severe in children who are artificially fed, and is responsible for many of these deaths.

Myth #14:

☞ *If the mother has an infection/disease she should stop giving breastfeeding*

Fact: Breast milk contains many factors that help to protect an infant against infection. The protection provided by these factors is uniquely valuable for an infant as they protect without causing the

effects of inflammation, such as fever. sIgA in breastmilk contains antibodies formed in the mother's body against her infection and it protects against that infectious agent which likely to be in the baby's environment. Nevertheless, a small number of health conditions may justify stopping breastfeed temporarily or permanently^{1,2}. For details see article on "Breastfeeding" in this book.

Myth #15:

☞ *If the mother is taking medicine she should not breastfeed.*

Fact: Some medications taken by a mother may pass into her milk. There are very few medicines for which breastfeeding is absolutely contra-indicated. However there are some medicines that can cause side-effects in the baby – they may warrant use of a safer alternative. Remember to ask the doctor about non-prescription drugs³. It should be noted that, most prescription drugs instructions automatically caution against being taken by pregnant or breastfeeding mothers. This warning is issued to prevent liability, and is often overly cautious. For details see article on "Breastfeeding and Medications"

Hormonal methods (birth control pill) can have an effect on lactation, and reduce breast-milk production. None should be used within 6 weeks of delivery. *Progestogen-only* methods can be used from 6 weeks after delivery. *Combined oestrogen-progesterone* methods such as the "combined pill" or the monthly injection are the least suitable, as they may sometimes reduce a mother's milk supply even after 6 weeks. It is better to avoid them altogether if possible.

Myth #16:

☞ *A mother should wash her nipples each time before feeding the baby*

Fact: Montgomery's glands secrete an oily fluid that protects the skin of the nipple and areola during lactation. Washing nipples each time before feeding the baby removes the protective oil. Routine daily bath and clean clothing including undershirt is all that is required from the breastfeeding mother.

Myth #17:

☞ *A mother will not get pregnant if she is breastfeeding*

Fact: Hormones produced when a baby suckles prevent ovulation, and so delay the return of menstruation and fertility after childbirth. This is called the *Lactation Amenorrhoea Method (LAM) of pregnancy prevention*. LAM is effective under the following three conditions

The mother must be amenorrhoeic – that is, she must not be menstruating.

The baby must breastfeed exclusively,

The baby must be less than 6 months old.

If these three conditions are met, then a woman's risk of becoming pregnant is less than 2%, which is as reliable as other family planning methods. It is not necessary to use another method for contraception. Even after 6 months, if the woman has not menstruated and the baby is still breastfeeding frequently, she is partially protected. This can be useful if she cannot use another method. However, if she menstruates at any time, then she is not protected at all. If she wishes to avoid pregnancy she should start another method immediately. A few women do start to menstruate 2 or 3 months after delivery, even though they are breastfeeding exclusively.

Myth #18:

☞ A mother must wean if she gets pregnant

Fact: There is no particular reason of weaning unless the mother has a history of preterm labor. A woman can continue nursing the older child even after delivery of the new baby. It is interesting to note that some children do wean themselves once their mother becomes pregnant, possibly because the milk supply drops, or they detect a change in the taste of the breast milk which does not please them.

Myth #19:

☞ Mother should have a good diet or her milk won't nourish the baby properly

Fact: The quality and quantity of breast milk is maintained even in malnourished mothers. But it is not favorable to restrict diet while breastfeeding. Needless to say, it's best to eat a healthy, balanced diet during pregnancy and lactation. Occasional lapses, however, are nothing to worry about. A breastfeeding mother does not need to drink milk in order to make milk. A breastfeeding mother does not need to avoid spicy/oily foods, garlic, cabbage etc. Although there are situations when something the mother eats may affect the baby, this is unusual.

Myth #20:

☞ Breastfed babies will not sleep through the night until weaned.

Fact: Breastfed babies do feed throughout day and night for the first few months in order to get nutrition. Not feeding a baby during night may be disadvantageous for both mother and child. Moreover, breast milk is so easily digested that babies want to feed sooner than they would on a formula feed. More prolactin is produced at night, so breastfeeding at night is especially helpful for keeping up the milk supply. Prolactin seems to make a mother feel relaxed and sleepy, so she remains relaxed even if she breastfeeds at night.

Myth #21:

☞ *Baby will get ear infection if breastfed whilst lying down.*

Fact: It is not true. Research has shown that the relative risk of ear infection in artificially fed children is 2.4 times more than breastfed. When a child uses a typical feeding bottle a vacuum (negative pressure) is created during sucking. Negative pressure generated in the mouth is transmitted up the Eustachian tube and into the middle ear where, as a result, fluid can build up there, which can cause infection. Breastfeeding, does not create any kind of vacuum.

While breastfeeding, the milk will flow only when the baby sucks, whereas, milk may leak out of the feeding bottle nipple even when the child has stopped sucking and is sleeping.

Myth #22:

☞ *Night nursing causes dental problems*

Fact: It is not true. Rather, it is other way round. The human nipple delivers the milk further toward the back of the mouth, past the teeth whereas artificial nipples deliver the milk into the front and middle of the mouth where it can cause decay. Moreover feeding bottles drip milk all night if left in the baby's mouth resulting unlimited access of harmful bacteria to the sugary medium that thrive in the baby's mouth.

Myth #23:

☞ *Breastfeeding limits the freedom of the mother.*

Fact: It is true that breastfed babies are dependent upon their mothers for their nutrition. This does not mean that a breastfeeding mother must remain housebound. A baby can be nursed anywhere, anytime. Mothers do not have the added burden of caring around all that formula milk paraphernalia. Thus breastfeeding is more liberating for the mother.

Myth #24:

☞ *Breastfeeding ruins the figure/shape of the breasts*

Fact: Breasts sag for all sorts of reasons, age, genetics, body type, etc and nothing can be done about them. Some breasts sag more than others. Pregnancy itself, and not breastfeeding, can cause breasts to sag. In order to maintain the shape of the breasts, the mother should tone up the muscles that support the breasts and avoid large and sudden weight gain or loss (pregnancy related or other wise).

Breastfeeding will certainly not prevent the mother from getting back to the pre-pregnancy figure/weight. In fact, breastfeeding uses an extra 300 to 500 calories every day. It's up to the mother how many of those calories she chooses to obtain through eating additional food or through burning off her available body fat.

Myth #25:

☞ *A working mother can't breastfeed.*

Fact: If a mother is planning to return to work, there are several different ways to approach the situation without weaning the child. First of all, it may be possible to schedule the work with a lunch break during which the mother may return home, or go to the child's daycare center to nurse. Alternatively, the caregiver might bring the child to mom's work place. If this is not possible, expressing and appropriately storing breast milk which can be given to the baby with cup by the caretaker in the absence of the mother can be done. In such a situation the mother should however breastfeed early in the morning, breastfeed just before leaving for work and breastfeed frequently after returning and during night.

Myth #26:

☞ *It is easier to bottle feed than to breastfeed.*

☞ *Babies need to know how to take a bottle. Therefore a bottle should always be introduced before the baby refuses to take one.*

Fact: With the right education and advice, breastfeeding can be a lot more convenient than bottle feeding. Breastfeeding is certainly less time-consuming and less cumbersome than to get up, prepare the formula milk then finally return to the crying child, offer the bottle. Of course, at this point it is tempting for an exhausted mother or father to prop up the bottle and leave the baby alone to finish it. This is an extremely dangerous as the baby can easily get choked. It is worth mentioning that the, formula feeding mothers need to put in extra time and money for trips to the store to buy supplies, as well as possible extra trips to the doctor's office because of more incidence of infections in formula/bottle fed baby.

Though many mothers decide to introduce a bottle for various reasons, there is no reason a baby must learn how to use one. Moreover, breastfeeding offers a new mother an amazing chance to bond with her child. It is important to note that a baby who is bottle fed for the first two weeks of life, will usually refuse to take the breast, even if the mother has an abundant supply.

Myth #27to::

☞ *Modern formulas are almost the same as/better than breast milk*

Fact: Infant formula is usually made from industrially modified cow milk or soy products. During the manufacturing process the quantities of nutrients are adjusted to make them more comparable to breast milk. However, the qualitative differences in the fat and protein cannot be altered, and the absence of anti-infective and bio-active factors remains. Powdered infant formula is not a sterile product, and may be unsafe in other ways. Life threatening infections in newborns have been traced to contamination with pathogenic bacteria, such as *Enterobacter sakazakii*, found in powdered formula. Soy formula contains *phyto-oestrogens*, with activity similar to the human hormone oestrogen, which could potentially reduce fertility in boys and bring early puberty in girls. Moreover, formulas do not vary from the beginning of the feed to the end of the feed, or from day 1 to day 7 to day 30, or from woman to woman, or from baby to baby. Remember, breast milk is tailored to suit the individual baby (customized) whereas formulas are made to suit every baby (universal), and thus no baby.

Myth #28:

☞ *After a year, breast milk loses all its nutritional value*

Fact: Even after complementary foods have been introduced, breastfeeding remains a critical source of nutrients and anti-infective factors for the young infant and child. It can provide about one half of an infant's energy needs up to the age of one year, and up to one third during the second year of life. Breast milk continues to supply higher quality nutrients than complementary foods, and also protective factors and hormones. It is therefore recommended that breastfeeding on demand continues with adequate complementary feeding up to 2 years or beyond.

Myth #29

☞ *Presence of chemical residues in breast milk is a reason not to breastfeed?*

Fact: No. Exposure to chemical residues before and during pregnancy is a greater risk to the fetus. The existence of chemical residues in breast milk is not a reason for limiting breastfeeding. In fact, it is a reason to breastfeed because breast milk helps the child develop a stronger immune system and gives protection against environmental pollutants and pathogens. Breastfeeding can help limit the damage caused by fetal exposure.

Even in areas where the contamination is very high, the risks of artificial feeding is greater than breastfeeding. Artificial baby milks and baby feeding bottles contain a wide range of harmful contaminants than breast milk, but in general, these are different from the residues of compounds detected in breast milk. Feeding bottles and nipples have been found to contain phthalates and bisphenol A; powdered milk can contain aluminium and heavy metals, GM (genetically modified) ingredients, phytoestrogens as well as pathogenic bacteria such as *Enterobacter sakazakii*. Heavy

metals such as lead, aluminum, cadmium and mercury, chemical residues from pesticides and fertilizers have all been found in commercial infant foods.

Myth #30

☞ *Breastfeeding mothers should have their breast milk tested for chemicals?*

Fact: Chemicals accumulate in different body parts including adipose tissue, brain, bone, blood, liver, placenta and semen, and are also found in breast milk. Chemical residues accumulate in the body fat which is used to produce breast milk. Because breast milk is convenient and inexpensive, to test for those contaminants stored in body fat it is often used to monitor human exposure to chemicals that should not be in our bodies. Chemical residues found in breast milk are like the messenger, the canary in the mine, telling us about the body burdens found in everyone. Breast milk testing is not necessary unless a mother has been exposed to excessive amounts of chemicals during an industrial accident, or during long periods of workplace exposure involving the mishandling of pesticides.

Myth #31:

☞ *Women with flat or inverted nipples cannot breastfeed.*

Fact: Most flat nipples are *protractile* – if the mother pulls them out with her fingers, they stretch, in the same way that they have to stretch in the baby’s mouth. A baby should have no difficulty suckling from a protractile nipple. Moreover, babies do not suckling work on nipples; they do it on the areola. Though it may be easier for a baby to attach on to a breast with a prominent nipple, it is not necessary for nipples to stick out. Sometimes an inverted nipple is *non-protractile* and does not stretch out when pulled; instead, the tip goes in. Protractility often improves during pregnancy and in the first week or so after a baby is born. If the baby does not take the breast at first, with proper help, s/he will often take the breast later. For details see article on “Problems related to breastfeeding (Mother)”

Myth #32:

☞ *Babies with cleft lip and/or palate cannot breastfeed.*

Fact: In babies with cleft lip and/or palate attachment and suckling may be difficult because of the anatomical gap. If only the lip is affected, the breast covers the cleft, and the baby may be able to suckle effectively. Sometimes a baby with a cleft palate can suckle quite well, if there is enough palate for the tongue to press the nipple against. The mother can be helped to hold the baby in an upright sitting position at the breast with the baby’s legs on either side of the mother’s thigh. This makes swallowing easier and may help the baby to breastfeed, fully or partially. If the baby needs

to be fed, but is not able to attach properly, the mother can express her milk and feed it to baby by a cup or feeding devices until surgical help is available.

Myth #33:

☞ *Breastfeeding twins are too difficult to manage.*

Fact: Breastfeeding twins are easier to manage than bottle feeding twins, if breastfeeding is going well. Mother needs help to find the best way to hold two babies to suckle, either at the same time, or one at a time. She may like to give each baby one breast, or to vary the side. Holding one or both babies in the underarm position for feeding, and support for the babies with pillows or folded clothes is often helpful. Building the mother's confidence that she can make enough milk for two and encouraging relatives to help with other household duties may help her to avoid trying to feed the babies artificially. Many women have breastfed triplets exclusively. This obviously takes a lot of work and time

Myth #34:

☞ *If the baby is off the breast for a prolonged time, the breast milk "sours".*

Fact: The milk in the breast is as good as it ever was. Milk in the breast is not milk or formula in a bottle that will get sour. Most women can relactate any number of years after their last child, but it is easier for women who stopped breastfeeding recently, or if the infant still suckles sometimes.

Myth #35:

☞ *After exercise/heavy work a mother should not breastfeed.*

Fact: There is absolutely no reason why a mother would not be able to breastfeed after exercising.

Myth #36:

☞ *Breastfeeding is blamed for everything the mother suffers.*

Fact: Family, health professionals, neighbors, friends and relatives will blame breastfeeding if the mother is tired, nervous, weepy, sick, has pain in her knees, has difficulty sleeping, is always sleepy, feels dizzy, is anemic, has a relapse of her arthritis (migraines, or any chronic problem), complains of hair loss, change of vision, ringing in the ears or itchy skin OR for that matter anything which mother complains of during lactation. Breastfeeding at times will be blamed as the cause of marriage problems. And whenever there is something that does not fit the "picture book" life, the mother will be advised by everyone that it will be better if she stops breastfeeding. BUT IT IS NOT TRUE!

Myth #37:

☞ *Babies who are breastfed are likely to be “colicky”. “Janam Ghutti” relieves the colic pain.*

Fact: ‘Colic’ occurs at certain times of day, typically the evening. The baby cries and may pull up his/her legs as if in pain. It is difficult to comfort. There is no single consistent cause for colic that experts all agree upon. One of the most common unscientific remedy is to give ‘*janam ghutti*’, as it has been an age-old remedy for colic in most Indian households. Babies with colic usually grow well, and the crying decreases after 3–4 months. Carrying the baby more, using a gentle rocking movement, and pressure on the abdomen with the hands, or against the shoulder, may help. Sometimes, excessive crying due to infant colic can be improved by changing breastfeeding techniques, rather than changing the mother’s diet. Use of *Janam Ghutti* can do more harm than good by giving infection and/or inducing sleep.

Myth #38:

☞ *Premature babies need to learn to take bottles before they can start breastfeeding.*

Fact: Feeding a baby from a bottle with an artificial teat may make it more difficult for the baby to learn to attach well at the breast leading to difficulty in establishing breastfeed satisfactorily. Moreover, a baby’s own mother’s milk is best for Low Birth Weight (LBW) of all gestational ages. Breast milk is especially adapted to the nutritional needs of LBW infants. Actually, weight or gestational age does not matter as much as the baby’s readiness to suck. Baby as small as 1200 grams or even smaller can start at the breast as soon as s/he is stable though some may not attach well for several weeks. For infants who are not able to breastfeed effectively, feeds have to be given by an alternative, oral feeding method (cup/paladai/spoon/direct expression into mouth) or by intra-gastric tube feeding. There is no reason to give bottles to premature babies which on the contrary are potential source of infection & nipple confusion leading to difficulty in breastfeeding later.

Myth #39:

☞ *A mother who has mastitis or breast abscess should not breastfeed.*

Fact: See article “Problems related to Breastfeeding (Mother)”

Myth #40:

☞ *A mother who smokes/drinks alcohol should not breastfeed.*

Fact: It would be better if the mother do not smoke. Smoking can reduce breast milk production temporarily. If the mother cannot stop or cut down smoking, then it is better she smoke and

breastfeed rather than smoke and formula feed. Breastfeeding has been shown to decrease the negative effects of cigarette smoke on the baby's lungs.

As is the case with most drugs, very little alcohol comes out in the breast milk. Alcohol consumption can reduce breast milk production temporarily, so mothers should be encouraged not to use alcohol and be given the opportunities and support to abstain.

FURTHER READING

1. Infant and young child feeding: Model chapter for textbooks for medical students and allied health professionals. World Health Organization, 2009.
2. BFHI-Section I: Background and Implementation. Baby-friendly hospital initiative: Revised, Updated and Expanded for Integrated Care. World Health Organization, UNICEF, 2009. *Acceptable medical reasons for use of breast-milk substitutes*. 43-48.
3. Guidelines on HIV and infant feeding: Principles and recommendations for infant feeding in the context of HIV and a summary of evidence. World Health Organization, 2010.
4. Breastfeeding and maternal medication: Recommendations for drugs in the eleventh WHO model list of essential drugs. World Health Organization, UNICEF, 2002.

Section III

FEEDING IN DIFFICULT CIRCUMSTANCES

FEEDING OF LOW BIRTH WEIGHT NEONATES

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The global prevalence of Low Birth Weight (LBW) is 15.5%, i.e., about 20.6 million such infants are born each year, 96.5% of them in developing countries.¹ Term LBW defines a heterogeneous group of infants. It can be a consequence of pre-term birth or due to small size for gestational age (SGA), or both. It is generally recognized that being born with a LBW is a disadvantage for the infant. Pre-term birth is a direct cause of 27% of the 4 million neonatal deaths that occur globally every year and LBW directly or indirectly may contribute up to 60–80% of all neonatal deaths.²

NUTRITIONAL REQUIREMENT OF PRETERM NEONATES

The European Society of Pediatrics Gastroenterology and Nutrition (ESPGAN)³ has recently published the guidelines and recommendations on nutrition and ranges of enteral intakes for stable-growing preterm infants up to a weight of approximately 1800 g (Table-1). One should be aware that at higher energy intakes, the individual nutrient should not exceed an acceptable maximum level of intake.

TABLE-1: Recommended intakes for macro- and micronutrients expressed per mg/kg/day and per 100 kcal unless otherwise denoted	
	Min-max (per kg/day)
Energy, kcal	110–135
Protein, g	1–1.8 kg body weight
Lipids, g (MCT <40%)	4.8–6.6
Linolenic acid, mg [†]	385–1540
α -linolenic acid, mg	>55 (0.9% of fatty acids)
DHA, mg	12–30
AA, mg #	18–42
Carbohydrate, g	11.6–13.2
Sodium, mg	69–115
Potassium, mg	66–132
Chloride, mg	105–177
Calcium salt, mg###	120–140
Phosphate, mg	60–90

TABLE-1: Recommended intakes for macro- and micronutrients expressed per mg/kg/day and per 100 kcal unless otherwise denoted	
	Min-max (per kg/day)
Magnesium, mg	8-15
Iron, mg	2-3
Zinc, mg####	1.1-2.0
Copper, µg	100-132
Selenium, µg	5-10
Manganese, µg	≈27.5
Fluoride, µg	1.5-60
Iodine, µg	11-55
Chromium, ng	30-1230
Molybdenum, µg	0.3-5
Thiamin, µg	140-300
Riboflavin, µg	200-400
Niacin, µg	380-5500
Pantothenic acid, mg	0.33-2.1
Pyridoxine, µg	45-300
Cobalamin, µg	0.1-0.77
Folic acid, µg	35-100
L-ascorbic acid, mg	11-46
Biotin, µg	1.7-16.5
Vitamin A, µg RE, 1µg = 3.33 IU	400-1000
Vitamin D, IU/day	800-1000
Vitamin E, mg (α-tocopherol equivalents)	2.2-11
Vitamin K1, µg	4.4-28

AA=arachidonic acid; DHA=docosahexaenoic acid; IU=international unit; MCT=medium-chain triacylglycerols.

**The linoleic acid to α-linolenic acid ratio is in the range of 5 to 15:1 (wt/wt).*

The ratio of AA to DHA should be in the range of 1.0-2.0 to 1 (wt/wt), and eicosapentaenoic acid (20:5n-3) supply should not exceed 30% of DHA supply.

Calcium to phosphorus ratio should be between 1.5 and 2.0

The zinc to copper molar ratio should not exceed 20.

INITIAL FEEDING METHOD

Initial feeding method in a LBW infant is based on the birth weight and development of feeding ability. All infants born at a particular gestation may not have same feeding skills. Birth weight, gestation, presence or absence of sickness and individual feeding effort of the baby should determine the decision as to how a LBW neonate should be provided fluids and nutrition. In general, at approximately 28 weeks gestation, there is a distinct increase in the level of alertness. The gag

reflex is evident at 25–27 weeks although organized esophageal activity does not develop until about 32 weeks gestation and is not coordinated with swallowing until about 33–34 weeks. By 33–34 weeks gestation, pre-term infants are also mature enough to coordinate a swallow and breathe pattern. The choice of initial feeding method in LBW infants has been described in Table-2.

Gestational age	Initial feeding method
< 28 weeks	Intravenous fluids
28-31 weeks	Oro-gastric (or naso-gastric) tube feeding with occasional spoon/ paladai feeding
32-34 weeks	Feeding by spoon/paladai/cup
>34 weeks	Breastfeeding

If the neonate is hemodynamically stable, the following feeding schedule should be followed. Orogastric tube (OG) feeding is preferred over nasogastric tube (NG) feeding as NG increases the airway impedance and the work of breathing in very preterm infants. Moreover, as neonates are essential nose breathers it is better to keep the nostrils free.

<28 weeks:

- a. Start IV fluids and total parenteral nutrition (5-10% dextrose as soon as the neonate is admitted in NICU, 10% amino acid solution on Day-1 and 20% lipid solution on Day-2). When the neonate is hemodynamically stable add trophic feeding with expressed breast milk (EBM) by OG tube (10-15 mL/kg/day; divided into equal aliquots and administered by gavage feeding in a 3-6 hourly schedule). This practice of giving minute volumes of feeds to the baby in order to stimulate the development of the immature gastrointestinal tract is known as *minimal enteral nutrition (MEN)*. MEN has several advantages, it shortens time to regain birth weight, improves feeding tolerance, enhances enzyme maturation, improves gastrointestinal motility, improves mineral absorption and lowers incidence of cholestasis. MEN is not relevant for infants of >32 weeks gestation because they usually tolerate maintenance enteral feeding from the first day of life.
- b. Monitoring should be done for any evidence of feed intolerance by measuring abdominal girth, pre-feed gastric aspirate or clinical signs of necrotizing enterocolitis (NEC). If the abdominal girth increases by 2 cm, gastric residual volume should be checked. Feeding should be stopped in the presence of significant aspirate (>25% of feed or >3 mL whichever is more) and/or bilious or blood stained aspirates.

- c. Progression to full feeds: As baby gains clinical stability, feeds are advanced at the rate of 10-20 mL/Kg/ day and the interval is decreased to 2 hourly feeding. Faster rates of increase in feeding volumes (20–35 mL/kg/day compared with 10–20 mL/kg/day) may decrease the time to full enteral feeds and may increase weight gain. There is limited information regarding safety for incidence of NEC and the effect on length of hospital stay.
- d. Once the baby starts tolerating OG feeding check for sucking reflex. Try cup/spoon feeding once or twice a day. Also put the baby on the mother's breast and try non-nutritive sucking.
- e. Gradually increase the frequency of cup/spoon feeding and ultimately switch the baby to breastfeeding.

28-31 weeks:

- a. Start IV fluids. OG feeding should be started as soon as the neonate is hemodynamically stable. Once the baby starts tolerating OG feed, routine aspiration of gastric contents before giving next feed is not necessary, better way is to monitor the abdominal girth every 2 hours for an increase by >2 cm from the baseline.
- b. Gradually increase the feed volume and switch over to cup/spoon feeding and breastfeeding.

32-34 weeks: Baby can be started directly on cup/spoon feeding and gradually shifted to breastfeeding.

>34 weeks: Initiate breastfeeding from the beginning. Observe for effective suck for a period of 10-15 minutes, if not possible, supplement with cup/spoon feeding.

Severe IUGR babies with antenatally detected Doppler flow abnormalities: Foetuses with abnormal Doppler flow e.g. absent / reversed end-diastolic flow in the umbilical artery are likely to have had mesenteric ischemia in-utero. After birth, they have a significant risk of developing feed intolerance and NEC. In these neonates enteral feeding may be delayed up to 48-72 hours.

Infants on CPAP/ventilation: These babies can be started on OG tube feeds once they are hemodynamically stable. Careful monitoring is necessary.

Amount of milk is to be given

The volume of feed plus fluid or only feed, whichever is being given should be as per the daily fluid requirement of the baby. Extreme preterm infants need more fluids in the initial weeks of life because of the high insensible water loss. Initial requirements of fluid are 80 mL and 60 mL/kg/day

for infants birth weights of <1500g and ≥1500 g respectively. Further requirements are calculated by daily estimation of weight loss/gain, serum sodium, urine output and specific gravity. The usual daily increment is 15-20 mL/kg/day so that by the end of first week 150 mL/kg/day is reached in both the categories. When the neonate is taking oral feeds only, a maximum of 180-200 mL/kg/day can be given.

NUTRITIONAL SOURCES FOR LBW INFANTS

Human milk

Breast milk meets almost all requirements of a LBW baby. There may be specific need of additional minerals and vitamins for breastfed LBW infants during certain periods of life. Mother's own milk can be provided to the infant via breastfeeding or expression and feeding by an alternative method.

Human milk supplements

Nutritional supplements, to be given separately from breast milk, are available as single vitamin preparations (vitamin A, vitamin D, vitamin K) or single mineral preparations (iron, zinc, calcium and phosphorus). Multivitamin preparations are also available which contain vitamin A, vitamin D, thiamine, riboflavin, pyridoxine, nicotinamide, ascorbic acid. Care is needed in administering the correct dose. Multivitamin preparations must be protected from light and refrigerated below 25°C after opening.

Nutritional supplements are also available as additives to be mixed with EBM. Commonly known as 'human milk fortifiers (HMF)', they are commercially available and can be multi-component (with added protein, carbohydrate, fat, calcium, phosphorus, sodium, vitamins A, D, E, K, riboflavin, folic acid and zinc) or single component (protein, carbohydrate, fat, calcium, phosphorus or sodium). Multi-component fortifiers are available in powdered or liquid form. HMF is started once the neonates reach full enteral feeds (150 mL/kg/day) in the dose recommended by the manufacturer (1 sachet or 2g per 50 mL of EBM). Preterm VLBW infants on expressed breast milk fortified with HMF do not require any other supplementation except iron.

Human milk supplements for infants with birth weights of 1500-2500g

These infants are more likely to be born at term or near term gestation (>34 weeks); hence, they do not require multi-nutrient supplementation or fortification of breastmilk. However, vitamin D

and iron might still have to be supplemented in them. While iron supplementation is mandatory for all infants, vitamin D is contentious because of the paucity of the data regarding its levels and deficiency status in different populations. However, because LBW infants are more at risk of osteopenia than healthy term infants, most neonatal units tend to supplement vitamin D and iron in infants with birth weights of 1500-2499 grams; vitamin D is started at 2 weeks and iron at 2 months of life; both are continued till 1 year of age.⁴

Human milk supplements for infants with birth weights <1500 g

These infants who are usually born before 32-34 weeks gestation have inadequate body stores of most of the nutrients. EBM has inadequate amounts of protein, energy, calcium, phosphorus, trace elements (iron, zinc) and vitamins (D, E & K) that are unable to meet their daily recommended intakes. Hence, these infants need multi-nutrient supplementation till they reach term gestation (40 weeks postmenstrual age). After this period, their requirements are similar to those infants with birth weights of 1500-2499 grams. Multi-nutrient supplementation can be done by supplementation of individual nutrients – e.g., calcium, phosphorus, vitamin D, vitamin B complex and zinc, fortification of EBM with HMF or by fortification with preterm formula. The recommended concentration of HMF 0.4g per 10-mL of breast milk. HMF should be continued till the infant reaches 40 weeks post-menstrual age or attains 2 kg, whichever is later. Prophylactic enteral iron supplementation (2-3 mg/kg) should be started at 2 to 6 weeks of age (2–4 weeks in extremely-low-birth weight infants). Infants who receive erythropoietin treatment and infants who have had significant, uncompensated blood losses may initially need a higher dose. Enteral iron doses >5 mg/kg/day should be avoided in preterm infants because of the possible risk of retinopathy of prematurity. Iron supplementation should be delayed in infants who have received multiple blood transfusions and have high serum ferritin concentrations. Vitamin D and iron supplementation should be continued till the age of 1 year.

GROWTH MONITORING OF LBW BABIES

Regular growth monitoring is necessary to assess the nutritional status, adequacy of feeding and early identification of inadequate weight gain. All LBW infants should be weighed daily till the time of discharge from the hospital. Both term and preterm LBW infants tend to lose weight (about 10% and 15% respectively) in the first 7 days of life; they regain their birth weight by 10-14 days. Thereafter, the weight gain should be at least 15-20g/kg/ day till a weight of 2-2.5 kg is reached. After this, a gain of 20 to 30 g/day is considered appropriate.⁵

Discharge for a VLBW baby should be done only after the baby regains her birth weight and shows consistent weight gain for at least 3 consecutive days. Other anthropometric parameters such as length and head circumference should be recorded weekly. Growth should be monitored by using growth charts where individual growth can be compared with a reference standard. Wright's and Ehrenkranz' charts^{6,7} are commonly used growth chart for VLBW babies till the post-conceptual age of 40 weeks following which WHO growth charts should be used for growth monitoring.

Inadequate weight gain

Inadequate weight gain is a common problem in LBW infants. Common causes of inadequate weight gain which should be taken care include:

I. Inadequate intake

Incorrect breastfeeding method (improper positioning/attachment), less frequent breastfeeding, not feeding in the night hours

Feeding the baby only on foremilk by prematurely removing the baby from the breast before the infant completes feeds

Incorrect method of feeding e.g., excess spilling during cup/spoon feeding

Feeding with less amount and infrequent feeding

Not fortifying the milk in VLBW infants

Premature shift to spoon feeds/breast feeds when the baby is not yet ready thereby increasing energy expenditure

II. Increased demands

Hypothermia/cold stress

Illnesses such as bronchopulmonary dysplasia, patent ductus arteriosus

Underlying disease/pathological conditions like anemia, hyponatremia, late metabolic acidosis, late onset sepsis, gastro-intestinal reflux

CONCLUSION

Optimal feeding of LBW infants is important for the immediate survival as well as for subsequent growth. Unlike their normal birth weight counterparts, these infants have vastly different feeding

abilities and nutritional requirements. Increased demand for growth and organ development create a challenge in nutritional management of these neonates. The stress of critical illness and development of feeding intolerance further complicates the delivery of adequate nutrients. It is important for all health care providers caring for such infants to be well versant with the necessary skills required for feeding them since adequacy of nutritional management at birth makes a major difference in prognosis.

REFERENCES

1. WHO & UNICEF. Low birthweight: Country, regional and global estimates. Geneva, United Nations Children's Fund and World Health Organization, 2004.
2. Lawn JE, Cousens S, Zupan J. 4 million neonatal deaths: when? Where? Why? *Lancet*, 2005, 365:891–900.
3. Agostoni C, Buonocore yG, Carnielli zVP. Enteral Nutrient Supply for Preterm Infants: Commentary From the European Society for Paediatric Gastroenterology, Hepatology, and Nutrition Committee on Nutrition. *JPGN* 2010;50:85-91.
4. Jeeva Sankar M, Agarwal R, Mishra S, Deorari AK, Paul VK. Feeding of Low Birth Weight Infants. *Indian J Pediatr* 2008;75:459-469.
5. Schanler RJ. Enteral Nutrition for the High-Risk Neonate. *In: Taeusch HW, Ballard RA, Gleason CA eds. Avery's Diseases of the Newborn*, 8th ed. Philadelphia, Saunders, 2005; 1043-60.
6. Wright K, Dawson JP, Fallis D, Vogt E, Lorch V. New postnatal growth grids for very low birth weight infants. *Pediatrics* 1993;91:922-926.
7. Ehrenkranz RA, Younes N, Lemons JA, Fanaroff AA, Donovan EF, Wright LL *et al.* Longitudinal growth of hospitalized very low birth weight infants. *Pediatrics* 1999;104:280-289.

BREASTFEEDING IN SPECIAL CONDITIONS

Dr. V. P. Goswami, Dr. Sharad Thora

Feeding Babies in Special Conditions that may be related to problems with the infants or the mother is quite different from feeding healthy babies. Breast milk promotes physical, mental and emotional growth of the baby. So all full term babies, preterm babies on enteral feeds and sick babies on enteral feeds should receive their own mother's milk(1)

IMPORTANT CONSIDERATIONS RELATED TO INFANTS

Feeding LBW babies

A baby not able to take any oral feed for first few days may require intravenous fluids; feeds should be started as soon as baby tolerates them.

Babies who are less than 30-32 weeks gestational age to be fed EBM by nasogastric tube. In such cases skin to skin contact helps bonding and breast milk production.

Babies between 32-34 gestational age can take feeds from a small cup or from a spoon, start giving feeds once or twice per day plus feeding via tube also. If baby takes cup feed well, start reducing tube feed. Such babies are also able to start suckling on the breast, he may only root for the nipple or lick it at first or may suckle a little. When the baby start to suckle effectively, he may pause during feeds, so it is important not to take him off the breast too quickly, offer him cup feed after the breast feed or offer alternate breast feed and cup feed.

Baby about 34-36 week gestational age, can often take breast feed as per their need, directly from the breast. If they cannot suckle, give EBM via cup feeding.(1,3,4)

Breast-Feeding Positions



Cradle hold



Cross-cradle hold



Football hold



Lying down

Feeding in multiple births

Most mothers have enough breast milk to feed twins. The best way to breast feed requires a lot of support and encouragement for the mother to believe that, they can breast feed both of them.

Reassure the mother that she can produce enough milk for two babies. Remind her that more suckling makes more milk. So if two babies suckle, there will be enough milk for the two.

Talk to the family members about how they can help with other work, so that she is free to breast feed the babies.

Sometime one twin is weaker than the other; encourage her to make sure that the weaker twin gets enough breast milk. If necessary she can express milk for him.

Help her to find the best position for her and best method to hold the baby for feeding.



Different Positions for Holding Twins for Breastfeeding.

Baby with cleft lip or palate

A mother whose baby has a cleft lip or palate also needs extra encouragement and support. A Cleft lip can usually be corrected when baby is about 3 months old and a cleft palate when the baby is about 1 year old. The problem is to feed him, so that he grows and become strong enough for the operative procedure.

If the cleft is of the lips and gums only the baby should be able to breastfeed successfully. Encourage his mother to try, help the baby to suckle in a better position. If he takes enough of the breast into his mouth, the breast may close over the cleft, so that he can suckle well.

If the cleft involves the palate, Suckling is more difficult. Breastfeeding is successful if the cleft is on one side only. It is more difficult if the cleft is on both sides. Sometimes the baby seems to choke and the milk may leak through the nose, choking is less if she holds him in more upright sitting position.

Some babies have to be fed EBM by tube or with cup or spoon, until they are able to suckle well enough at the breast. (1)

Baby with tongue tie

Occasionally a baby with tongue tie, cannot put his tongue far enough forward to remove milk affectively, so it has to be treated if a baby is having feeding problem.

A baby with jaundice

Early Jaundice: A baby may look yellow in first week of life which usually clears by 10th day. It is usually multifactorial. Early jaundice is not a reason to stop breast feeding. In fact jaundice is partly caused by the baby not getting enough breast milk. The baby may not have started to breast feed soon enough or for long enough. Colostrum helps to clear meconium and helps to prevent jaundice. If the baby gets enough breastmilk, it can help to clear early jaundice. A baby with good suckling should continue to be breast fed more frequently and if not suckling enough, cup feeds should be given. (1)

Prolonged Jaundice: Sometimes jaundice starts at the end of first week of life and continue for several weeks and this can be due to serious illnesses in the baby. Often prolonged jaundice is not

serious but is due to reaction to substances in the breast milk. If the mother continues breast feeding, jaundice clears after 3 to 10 weeks without treatment.

If jaundice is very severe, investigate for any other problem. Mother may be asked to stop breast feed for 48 hrs, if the jaundice is due to breastmilk, it clears. The mother can then continue to breast feed without any problem. (1)

Feeding a sick child

Babies, who are sick, recover more quickly if they continue to take breastmilk during illnesses. *If the baby is in hospital*, admit his mother too, so that she can breast feed him.

If the baby can suckle well, encourage his mother to breast feed more often. If the mother offers him breasts more frequently, he may take as much milk as he would have taken before the illness.

If the baby suckles but suckling is less than normal at each feed, give more frequent feeds even if they are shorter. With poor suckling, give cup feeding and if the baby is unable to take EBM from cup, give it through nasogastric tube.

If the baby cannot take oral feeds, encourage his mother to express breast milk to keep up the supply for when her baby can take oral feeds again. As soon as her baby recovers he can start to breast feed again. (1)

IMPORTANT CONSIDERATIONS RELATED TO MOTHER

When the mother is ill, a common reason for a mother to stop breast feeding is because, she thinks that her illness may harm the baby. So reassure her, that she can continue to breast feed the baby even during her illnesses. If she has infectious illness, even then she can breastfeed the baby as her breast milk probably contains antibodies which are the best protection for the baby. If she is absolutely unwilling to breastfeed, ask her to express her milk.

Mother who says that her milk dried up when she was ill: Encourage her to continue breast feeding if possible, drink plenty of fluids, express her milk and let the baby breast feed again as soon as possible.

Mother with tuberculosis, leprosy, typhoid: Keep the baby and mother together, protect the baby with immunization, if necessary; treat him too for the infection. EBM can be given to such babies by cup feeding.

If the mother is mentally ill: Keep the baby with the mother if possible, let her breast feed the baby with the family supporter who can be with her all the time to make sure that, she does not neglect or injure the baby.

Mother with HIV infection: Refer to article on “HIV and Infant Feeding” in this book

Mother with breast problem, flat and inverted nipples: Build the mother’s confidence, explain that the babies suckle breasts not nipple. Let baby explore breast skin to skin. Help mother to position her baby, try a different position, e.g. under arm. Help her to make nipple stand out more, use pump and syringe. For first few days, EBM can be given with Cup Feeding.

Breast engorgement, Blocked duct and mastitis , Sore nipple – to breastfeed in the presence of these maternal problems refer to the chapter on “Problems related to breastfeeding (Mother)”

Maternal malnutrition

Mothers with mild to moderate chronic malnutrition can fully breast feed their infant. Only with severe malnutrition, a woman may produce smaller amount of milk. By improving mother’s diet, this problem can be solved. (4)

Maternal drug therapy

Majority of commonly used drugs are compatible with safe breast feeding. A lactating woman should preferably take drugs during or immediately after breast feeding to avoid the period of maximum concentration in the blood and milk. Only few drugs necessitate discontinuation of breastfeeding like anticancer, antithyroid drugs, radioactive preparations, gold salts, lithium etc. (4)

Working Mother

Mother employed outside the home should initiate breast feeding like all other mothers, & should not introduce bottle feeding. If the mother cannot take her baby with her to work, she can express her milk by hand and leave it for a helper to feed the baby in her absence, which is to be given to the baby from a clean small glass or a cup. Feeding bottle should not be used because they are hard to clean and their use makes the baby less eager to suckle at the breast. The EBM can be stored at room temperature for up to 6 hrs and up to 24 hrs if kept refrigerated. If EBM milk separates, it can be shaken up, it remain good for use. (1,2)

Mother with caesarian section

It is possible for a mother to breastfeed the baby soon after a caesarean as soon as she regains consciousness. After epidural anesthesia, babies can often breastfeed within half to an hour. A baby can room in with his mother in routine way, and she can feed him whenever he is hungry. (2,4)

Often a mother finds it easier to breastfed lying down at first.

She may lie on her back, with her baby on top of her.

She may find it easier to lie on her side, with the baby lying beside her and facing her. This prevents the baby pressing her wound. She may need help to turn over, and to move her baby from one side to the other

Later, she may like to sit and hold her baby across her abdomen above the operation wound, or under her arm. Whatever position a mother uses, make sure that her baby is in good position facing her breast, so that he is well attached to her breast.

REFERENCES & FURTHER READING

1. Felicity Salvage King (1987). Helping mother to breastfed.
2. Participants manual (2010) Infant and Young Child Feeding Counseling; A Training Course. The 3 in 1 course.
3. Helen Armstrong (1992) Training Guide in lactation management.
4. RK Anand, SP Srivastava. Infant and Young Child Feeding IAP Textbook of Pediatrics, 4th edition 2009; VOL1; q127-130.

INFANT FEEDING IN EMERGENCIES

Dr. Shyamkumar Laishram

Emergency, natural or man made can come at any time and at any place even when least expected. At that time normal life is disturbed and there may be population displacement, unavailability of safe drinking water, unsterile environment, food scarcity, disrupted communication, collapsed health facility or/and power failure.

At the time of emergencies mothers & children suffer most. The morbidity and mortality of infants and under five children are higher than any age group and the younger the infant the higher is the risk.

Why infants are vulnerable during emergencies?

Infants have specific nutritional needs and their immune system is not well developed. hence infants and young children are particularly more vulnerable to serious illnesses during emergency when the food supply is severely compromised and there may be no clean water and fuel to sterilize infant formula milk, feeding bottles and nipples. Babies may be orphaned or may be separated from their mothers or mothers may be too sick. Infants with diarrhea easily become malnourished and dehydrated and are at risk of death. Nearly 95% of child deaths in emergencies result from diarrhea due to contaminated water supply and unsanitary environment. Infant formula has been linked to an increase in infant diseases and diarrhea and death. Breastfeeding provides both nutrition and immune support thereby protecting from the worst of emergency.

PROTECTION AND SUPPORT OF BREASTFEEDING WOMEN DURING EMERGENCIES

During any emergency many lactating mothers are under stress regarding the safety of their young infants. The maternal false perception of breast milk insufficiency is rather an important factor in a woman's decision for early termination of breastfeeding than true lack of breast milk secretion. Once both the mother and baby are kept together and breastfeeding is started, oxytocin reflex that is temporarily inhibited due to stress is stimulated.

During any emergency, mothers and young children should be given priority in support to facilitate breastfeeding. The basic intervention includes shelter, food, security, water and sanitation. Specific

space should be provided in the form of room or a separate corner for mothers and infants for starting and maintaining lactation and relactation.

Mother's milk is readily available and is a valuable natural resource and food security for the vulnerable baby that not only protects from diseases but can also promote psychological health and comfort in the mother during stressful time. Many babies' lives are saved everyday by mothers who breastfeed them in spite of natural disasters.

One problem frequently faced during emergencies is that mothers who are traumatized and depressed may have difficulty responding to their infants and needs special support in the form of one-to-one counseling, mother-to-mother support and counseling by skilled counselors trained for trauma, depression and infant and young child feeding (IYCF). Every effort should be made to identify ways to breastfeed infants and young children who are separated from their mothers, for example breastfeeding by a 'wet-nurse'. If wet-nurse is not feasible and not acceptable feeding with breast milk substitutes (BMS) and in addition appropriate complementary foods if above six months should be done in the safest possible way to protect them from infection.

Governments and partners should be pursued and urged to include capacity building on IYCF as part of the emergency preparedness and planning and to commit financial and human resources for appropriate and timely support during emergencies. Identify community resources to assist breastfeeding e.g. lactation consultants, medical professionals, lay support group and state and local breastfeeding promoters.

FEEDING OF INFANTS LESS THAN SIX MONTHS OF AGE IN EMERGENCIES

In the confusing situations during any emergency, the top priority is protection, promotion and support of breastfeeding. The first step is to identify infants who are or should be breastfed and further identifying any infants who are temporarily or permanently without their mothers. Ultimately three groups of infants can be established "those needing only breastfeeding support, those requiring intense relactation and help and those needing Breast Milk Substitute(BMS) after careful management.

The triage program prepared by Infant Feeding in Emergencies: Policy, Strategy and Practice will be helpful in decision making and is given below in the form of diagram.

FEEDING OF THE NON-BREASTFED INFANTS LESS THAN 6 MONTHS IN EMERGENCY

During emergencies, infants less than six months of age who are not breastfed need urgent identification and targeted for skilled support as they have more risks of infection. The priority to feed these infants should be relactation. If relactation fails, wet nursing or breast milk from breast milk bank can be used, though the later is usually not practicable because of power failure. Artificial feeding in emergency carries higher risks of malnutrition, diseases and death. Feeding with BMS must be accompanied by training of mothers or caregivers on correct dilution and hygienic preparation to give proper nutrition and to have minimal associated risks. *Bottle feeding should never be done and mother or caregiver should be encouraged and taught how to feed with a cup and spoon.* Showing mothers or caregivers how to use BMS safely and hygienically by appropriately skilled staff will help in minimizing the risk associated with artificial milk feeding

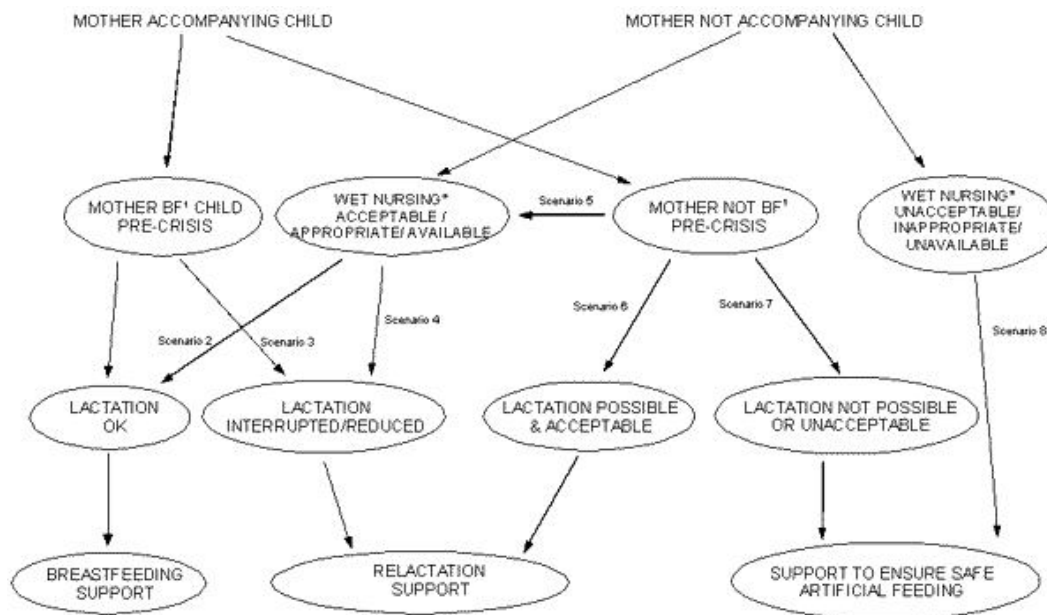


Diagram: Feeding infants < 6 months in emergencies: a triage approach to decision making

COMPLEMENTARY FEEDING OF CHILDREN ABOVE SIX MONTHS OF AGE

After six months of age in addition to breast milk the baby needs complementary foods. When cooking facilities are virtually non-existent or severely limited, ready-to-use therapeutic feeds (RUTF) are an option. In such situations where preparations are unsafe, on site reconstitution and

consumption ('wet' feeding) should be initiated. Micronutrient powders can be added to locally available foods, emergency rations or blended foods that have been sent as part of general ration or supplementary food and this will also improve dietary quality. Once cooking facilities have been set up, provision of fortified blended foods or micronutrient (vitamins, zinc) supplement is recommended.

MISCONCEPTIONS ABOUT BREASTFEEDING IN EMERGENCIES

There are many misconceptions about breastfeeding in emergencies that may undermine sustenance of lactation. The common misconceptions are

- Stress makes milk dry up.
- Malnourished mothers cannot breastfeed.
- Weaning cannot be reversed.
- General promotion of breastfeeding is enough.
- BMS is a necessary response to an emergency.

Prolactin secretion in lactating women helps her to reduce stress. The quantity and quality of breast milk is unaffected except in extremely malnourished women (1.5% of women). When a malnourished mother breastfeeds she suffers herself and not the infant. The mother needs more food. Giving supplements to infants decreases sucking thereby decreasing oxytocin and prolactin reflexes. The treatment is breastfeeding frequently and for longer duration. Relactation is possible with much suckling, hand expression and counseling by an expert on IYCF. It may take several days to weeks but with much encouragement, supply of food and water and protection from stress, relactation will be successful.

Most of the health care providers have little knowledge on IYCF. Mothers need help, not just motivational messages. Relief agencies and field workers too need training on IYCF. Providing BMS is extremely risky and should be undertaken only after careful considerations and full awareness of the consequences. BMS is limited to special circumstances and should be accompanied by additional health care, water, and fuel and diarrhea treatment generated for the lifetime of an emergency. From the outset of an emergency, plan should be done for reestablishment of optimal feeding. The safest food in an emergency is mother's own milk. Donor human milk or wet nurse is the second option. BMS is the last option.

DONATION AND PROCUREMENT OF BMS AND OTHER MILK PRODUCTS

Good guidelines are there on the use of human milk substitutes and other milk products in emergencies. They are guidelines prepared in the 47th World Health Assembly Resolution WHA

47.5 (May 9, 1994), UNHCR guidelines on use of milk substitutes (July 25, 1989) and the International Code of Marketing of Breast-milk Substitutes, WHO (1981).

The Operational guidance on Infant Feeding Emergencies goes further than the Code and clearly states that “Donated (free) or subsidized supplies of breast milk substitutes (e.g. infant formula) should be avoided, bottles and teats should be placed under the control of a single designated agency”.

As per internationally accepted guidelines, donation of infant formula, powder or liquid milk and milk products and feeding bottles and nipples should not be done. Any need of BMS should adhere to Codex Alimentarius Standards and procured locally in an efficient manner, in coordination with UNICEF. Any distribution and use of BMS should be carefully monitored to ensure that only the designated infants receive the product. Experience with past emergencies has definitely shown that excessive quantity of products, which are poorly targeted, endangers lives of infants and young children.

BMS should be used only under strict control, monitoring and hygienic conditions. Donors and aid agencies should comply with the International Code of Marketing of Breast Milk Substitutes and relevant WHA resolutions. All donor agencies, NGOs, media, other partners and individuals wishing to help should avoid calls for sending donations of BMS, bottles and teats and refuse any unsolicited donations of these products. Though these donations are done under good intentions, the risks linked due to forsaking of breastfeeding and unhygienic preparation in unsanitary conditions during emergency are more damaging. As a rule, relatively expensive commercial baby food products have no place in emergency relief. Those who wish to support mothers and caregivers and infants and young children should donate funds rather than sending BMS as these products are often distributed in an uncontrolled way and used by mothers who would otherwise breastfeed their babies resulting into unnecessary illnesses and deaths.

ROLE OF MEDIA IN PROTECTING INFANTS DURING EMERGENCIES

The massive amount of infant formula and powdered milk commonly donated during any emergency deliberately or unknowingly against the Code is many a time due to direct result of media appeal for infant formula. These may originate from aid agencies, government or from individual efforts to help. Media coverage also may generate public pressure on governments to bring in formula.

The media has an important role to play in protecting babies in emergency situations by disseminating information that will protect breastfeeding and promote the appropriate use of infant formula and powdered milk and on abiding the Code. Members of the media can assist by their informed write

up about the needs of □ infants in emergency and thus give a far reaching impact on the infants affected by an emergency.

REFERENCES

1. Call for support for appropriate infant and young child feeding in Haiti. Joint statement of UNICEF, WHO and WFP. Available at: http://www.unicef.org/media/media_52555.html
2. Operational Guidance for Emergency Relief Staff and Programme Managers on Infant and Young Child Feeding in Emergencies. developed by IFE Core Group. Version 2.1, February 2007. Available at: www.enonline.net/ife/view.aspx?resid=6
3. Module 2 for health and nutrition workers in emergency situations. Version 1.1. December 2007. ENN, IBFAN, Foundation Terr des homes, UNICEF, UNHCR, WHO, WFP. Available at: <http://www.enonline.net/ife>
4. Breastfeeding: A Vital Emergency Response. Are you ready? World Breastfeeding Week 2009 theme. Available at: www.worldbreastfeedingweek.org
5. Infant feeding in Emergencies: Policy, Strategy & Practice. Report of the Adhoc Group on Feeding Emergencies: May 1999. Available at: <http://www.enonline.net/ife/index.html>
6. WHO/UNICEF. Infant and Young Child feeding Counseling: an Integrated Course. 2007 Available at: www.who.int/nutrition/iycf_integrated_course/en/index.html
7. Wellstart International's Expanded Promotion of Breastfeeding Program (1996); revised and updated, 2005. Available at: http://wellstart.org/infant_feed_emergency
8. The International Code of Marketing of Breast-milk Substitutes and subsequent relevant WHA resolutions. WHO, 1981. <http://www.ibfan.org/English/resource/who/fullcode.html>, Available at: http://www.who.int/nut/documents/code_english
9. Protecting infants in emergencies: Information for the Media; Briefing prepared with the support of the NICEF-led Inter-Agency Standing Committee (IASC) Nutrition Cluster. Available at: <http://www.unhcr.org/4b761/fb9.html>
10. The Code and Infant feeding in emergencies, ICDC FOCUS, May 2009 Available at: http://www.breastfeedingweek.net/wbw_2009/images/icdc_%20focus
11. Policy of the on the acceptance, distribution and use of milk products in refugee settings (2006). Available at: <http://www.enonline.net>

INFANT FEEDING IN DISEASES

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Ensuring optimum intake of calories, protein and other nutrients during illness is challenging. During the disease state, the food ingested will not be properly absorbed and utilized because of defective functioning of organs and systems. Hence a modification in the diet is essential. The treating pediatrician should be aware of such problems and appropriate dietary modification should be done depending on the disease, age and social custom of the child.

DIET IN RESPIRATORY DISEASES

The nutritional problems are secondary to increased metabolic status, persistent vomiting and poor intake due to severe anorexia. Diet modifications have to be done both in acute and chronic respiratory diseases of infants and young children.

The following guidelines can be adopted

Continue breastfeeding as long as possible.

Warm fluids help in expectoration and have soothing effect on the throat.

Encourage small frequent feeds from the family pot.

10 to 20% extra calories are needed.

During convalescence they should get 1 to 2 extra feeds.

Vitamin A, Vitamin E and Zn supplementation are known to decrease morbidity.

Avoid sweets, chocolates which may stick to tonsillar crypts and teeth. It may act as a nidus for infection.

DIET IN CARDIAC DISEASE

Growth failure in heart disease has a multifactorial etiology. Acute under nutrition or wasting affect up to one third of children with cardiac diseases and chronic under nutrition or stunting may be found in two thirds of patients. Under nutrition occurs when metabolic demands for protein and energy exceed intake. Total daily energy expenditure is increased significantly in children with heart

disease. Severe malnutrition may occur in intractable congestive cardiac failure associated with various congenital heart diseases.

Nutritional Support Goals

- Provide sufficient energy to stop catabolism of lean body mass
- Provide sufficient protein to match nitrogen loss
- Provide additional nutrients (electrolytes, minerals and micronutrients)
- Provide enteral feeds to replace parenteral nutrition
- Develop and maintain oral feeding competence to enable voluntary independent feeding

Energy Requirements

Around 150 kcal/kg/day (RDA for age + 10 to 30% extra) is needed for linear growth and to increase the subcutaneous fat and muscle in infants with CHD and CHF. Energy provided must be distributed between fat and carbohydrate, with fat providing at least 30 % of the total caloric intake and at least 6% of the fat should be long chain triglycerides and some linolenic acid to provide essential fatty acids. In preterm and term neonates with CHD, there is a higher incidence of necrotizing enterocolitis. Therefore feeds must be gradually advanced in the newborn period and tolerance to feeds should be monitored.

Protein intake

Protein intake should be RDA for age or up to 10 to 15 % of total calories as protein of high biological value. The ratio of energy to protein in infant formulas is 30 to 50 kcal/gm of protein. Thus a child receiving 140 kcal/kg/day of energy would receive 2.9 to 4.25 g/kg of protein, if derived from standard or concentrated formula, with protein constituting 8 to 12% of total calories. Therefore on the basis of ideal body weight for length additional energy requirements above 120 kcal/kg should be provided by either starch or by fat added to the formula to avoid excessive hepatic protein metabolic and renal solute load.

Electrolyte, Minerals and Micronutrients

Sodium intake should be restricted to 0.5 to 1 gm/day. Rigorous diuretic use in patients with CHD makes electrolyte depletion a possibility. Infants at times may need to have their feeds supplemented with sodium. 24 hr urine sodium balance should be performed to establish urinary sodium losses. Potassium and chloride depletion may also occur and may require supplementation. Calcium, magnesium, zinc supplementation is also necessary.

Fluids

A majority of the patients are on restricted fluid intake with or without diuretic treatment. Therefore a concentrated formula is required which provides adequate Calories while restricting fluids.

DIET IN RENAL DISEASE

Individuals with kidney disease have less latitude in their nutritional choices because of decreased renal waste excretion and increased renal tubular losses of certain substances. In addition these infants and children may have decreased appetite and insufficient energy intake which further limits nutrition and growth. Nutritional prescription can be complex & it is often necessary to restrict the intake of some substances while at same time other nutrients necessary to maintain homeostasis and support growth may have to be supplemented.

Nephrotic Syndrome

A balanced diet adequate in protein and calories is recommended. Energy intake needs to be restricted if the child gains excessive weight on corticosteroid therapy. Children with severe and prolonged edema need to be evaluated for malabsorption as the gut and surrounding tissues may be edematous and does not function properly. Protein intake of 1.5 to 2.0 g/kg/day is recommended. Patients with persistent nephrotic range proteinuria are prone to malnutrition and should receive 2 to 2.5g/kg/day of protein. Fat intake should account for a maximum of 30% of the total calories and intake of saturated fats should be reduced. Salt restriction is not necessary in most patients with steroid responsive nephrotic syndrome unless patient has gross edema. When marked edema is present, modest salt restriction of up to 3g/day is recommended. This can be achieved by avoiding addition of salt to any food item on the table - "no added salt" and avoiding snacks with high salt content.

Glomerulonephritis

Sodium and water restriction is required in the setting of hypervolemia and hypertension in acute glomerulonephritis. In chronic glomerulonephritis the principles of diet are as for chronic kidney disease.

Chronic Kidney Disease (CKD)**Energy**

When renal function declines and the GFR is less than 60ml/min/1.73m² changes in blood chemistries become apparent & growth failure becomes more likely. Spontaneous food (energy) intake is low in children with CKD. Energy intake should be provided at approximately 100% to 120% of the daily recommended intake for the age.

Protein

There is no evidence that restricting protein intake to less than the daily recommended intake is effective in delaying the progression of renal insufficiency and in infants, low protein intakes may actually inhibit growth. Because high protein intakes should also be avoided in CKD, the most appropriate recommendation is for protein intake to be kept at the recommended daily intake for the age.

Sodium and Potassium

The kidneys have remarkable ability to excrete potassium but as renal function declines it is prudent to limit the intake of foods with high potassium content. Children with significant chronic renal disease may need more stringent potassium restriction. In the absence of hypertension or volume overload it is reasonable to limit sodium intake to a maximum of 4 grams/day. When volume overload is present sodium intake should be further curtailed.

Acute Renal Failure

Children with ARF are highly catabolic. The catabolic state is usually multifactorial and is due to anorexia, catabolic nature of the underlying disorder (sepsis), increased breakdown and reduced synthesis of muscle protein, nutrient losses in drainage fluids or dialysis and decreased access to food. Nutritional support aims to provide sufficient energy to avoid catabolism, starvation, ketosis and to control metabolic abnormalities. Nutrition intervention for children with ARF depends on the line of management (conservative versus dialysis), biochemical assessment and cause of ARF.

Fluids

The fluid allowance during conservative treatment is based on estimated fluid losses including insensible losses of about 400ml/m²/day (or 20 ml/kg/day). In general in patients with ARF the physician should be watchful in prescription of fluid to maintain a euvolemic state as the kidneys in ARF have limited ability to modulate the urine output commensurate with the needs of the body. When hypertension and volume overload are the concern Sodium and water intake should be

limited. Potassium and Phosphorus intakes are often restricted with allowable intakes based on the clinical setting and continuous assessment.

Protein

Although there may be good reasons to limit excess protein intake, a minimum protein intake of about 1g/kg/day is recommended to minimize endogenous protein catabolism. Enteral nutrition is preferred and parenteral nutrition should be resorted to only if absolutely necessary.

DIET IN DIABETES MELLITUS

The goal of nutrition is to maintain optimal growth and development of these children. The nutrition should be adjusted to the age, height, weight and the type of food used at home and social customs and traditions. Nutrition chart should be provided to the family and regular nutrition monitoring has to be done. Nutrition, exercise and growth monitoring are essential components in the management of diabetic child.

Meal planning

- 1) Maintain adequate carbohydrate, fat and protein ratio with Carbohydrate 55 to 60%; Protein 10 to 15%; Fat 20 to 30%
- 2) High fibre low fat with adequate carbohydrate and protein is ideal
- 3) Carbohydrates:
 - a) Should suffice 55 to 60% of total needs
 - b) Avoid simple carbohydrates (e.g. sugar, jaggery, beverages) yielding fast sugar. Use more complex carbohydrates (e.g. starch) yielding slow glucose.
- 4) Low fat diet:
 - a) Should supply 20 to 30% of calorie needs
 - b) Reduce dietary fats derived from animal sources and replace by fat from vegetable sources. E.g. use vegetable oil in cooking, use less of egg yolk
- 5) Fibre: sufficient intake of fibre is 20 to 30%. High fibre diet increases insulin receptors and reduces the need of insulin. Wheat, coriander, carrots, brinjal, cauliflower, ladies finger, ragi, pulses should be encouraged
- 6) Fruits and vegetables:

- a) Encourage fruits and vegetables which yields less than 5% carbohydrates e.g. watermelon, tomato, cabbage, brinjal, bittergourd, cucumber, drumstick and papaya.
 - b) When blood glucose levels are under normal limits fruits like mosambi, orange, grapes, lime can be given if required.
 - c) Avoid potatoes, jack fruit, banana
- 7) Supply the chart which provides proportion of carbohydrates, protein and fat in common food items.

Item	Carbohydrate %	Protein %	Fats %
Rice	78	7	0.5
Whole wheat	70	11	1.7
Ragi	72	7	1
Pulses	60	22	0.7
Bread	52	8	6.7
Milk	4.5	3	4
Papad	0.4	18	0.3
Banana	27	1.2	0.3
Fish	-	20	1.9
Chicken	-	26	0.6
Egg	-	13	13
Mutton	-	18	13

- 8) Avoid fasting and feasting
- 9) Ensure normal growth with FBS < 115mg/dl, Serum cholesterol < 200mg%, Serum LDL < 130 mg% and glycated Hb within normal limits
- 10) Although in children there is concern about the potential cumulative effects of saccharin, Available data do not support an association of moderate amount with bladder cancer. Sorbitone and Xylitol should not be used as artificial sweeteners.

DIET IN LIVER DISEASES

Chronic Liver Diseases

In chronic liver disease, ensure RDA plus 10 to 20 % extra calories for malabsorption and altered liver function. Protein enough to meet RDA can be given unless in there is hepatic coma.

Special Nutritional Demands In Chronic Liver Disease	
<i>Deficiency</i>	<i>Management</i>
Fat malabsorption	MCT as coconut oil/ MCT formula
Fat soluble vitamins	
<i>Vitamin-A</i>	Water soluble Vitamin-A 10,000 to 15,000 IU/day
<i>Vitamin-E</i>	50-400 IU/day as Tocopherol or TPGS (Tocopherol polyethylene glycol 1000 succinate) maintain Vitamin E : serum lipid ration of 6 mg/g in children
<i>Vitamin-D</i>	5000-8000 IU/day of D3 or 3-5 mcg/kg/day of 25-OH cholecalciferol or 1-2mcg of Calcitriol
<i>Vitamin-K</i>	2.5-5 mg/on alternate day as water soluble Menadione orally or injection Vitamin-K 5mg twice a month
Water soluble Vitamins	Twice the requirement daily
Retention of cholesterol and bile acids (itching,xanthomas)	Choleretics/UDCA. (Urso DeoxyCholic Acid) 15-20 mg /kg/day or Cholesttyramine 8-16 g/day.

DIET IN INBORN ERRORS OF METABOLISM

Phenylketonuria

Diet Principles in PKU

Avoid fish, egg, meat, cheese etc. Limit medium protein item, give cereals, pulses bread etc. Liberal use of vegetables, fruits, cucumber, mangoes, apple, grapes.

Recommended Nutrient Intake (Age Related) For Beginning Therapy						
Nutrients to modify	0.0<0.5 yr	0.5<1 yr	1<4 yr	4<7 yr	7<11 yr	11<19 yr
PHE (mg)	55/kg	30/kg	325/kg	425/kg	450/kg	500/kg
TYR (mg)	195/kg	185/kg	2800/kg	3150/kg	3500/kg	3850/kg
Protein (g)	3.5-3/kg	3-2.5/kg	=30/d	=35/d	=40/d	50-65/d
Energy (kcal)	120/kg	110/kg	900-1800/d	1300-2300/d	1650-3300/d	1500-3300/d

Maple Syrup Urine Disease

Enzyme deficient: Branched-chain 2-ketoacid dehydrogenase enzyme complex. There is elevation of branched chain amino acids in blood. MSUD formula low in branched chain amino acids is available. Foods with low protein (leucine) content should be encouraged.

- Fats** : Butter, ghee, solid vegetable fat, vegetable oils
- Sugar and starches** : Corn flour, custard powder (not instant), sago, tapioca, arrowroot Vegetarian jelly, glucose Jam, honey
- Sweets** : Sweets with 0.3 g protein/100 g
- Desserts** : Ice-cream wafers with 0.3 g protein/100 g. Dessert sauces with 1.5 g protein/100 g
- Drinks** : Flavoured fizzy drinks, e.g. lemonade, cola

Homocystinuria

Enzyme deficient : Cystathionine β synthase (CBS)
Dietary restriction of methionine (20-25mg/kg), large doses of Vitamin B-12 (1-2 mg/day), B-6 (200-1000mg /day) and folic acid (1-5mg/day) are beneficial.

Restrict Methionine rich diets : Meat, Milk, Egg

Encourage low Methionine food items: Fruits, Vegetable, Breads, Green, Sugar, Jaggery

Galactosemia.

This metabolic disorder is characterized by galactosemia and galactosuria. It may result from deficiency of enzyme galactokinase or galactose 1- phosphate uridyl transferase deficiency or uridine diphosphate 4 – epimerase. The main treatment of this disorder is exclusion of dietary galactose. The diet changes needs to be continued for life long and without any relaxation.

Food items to be included and excluded in Galactosemia		
<i>Item</i>	<i>Include</i>	<i>Exclude</i>
Milk group	Soya protein milk, Non diary creams of soya protein (avoid whole soya flour)	All milk and milk products including breast milk and sodium caseinate
Cereals & Pulses	Cereals, pulses sparingly	Exclude all pulses if erythrocyte enzyme is low,
Fats	Oil, nut, margarine without milk	Butter, cream, cheese, ghee, margarine with milk
Fruits & vegetables	Fresh fruits and Vegetables	Peas, vegetables canned or processed with lactose
Meat group	Muscle, egg, fish	Liver

Glycogen Storage Diseases

Dietary energy is provided as 60–70% from carbohydrate (CHO), 20–25% from fat and 10–15% from protein. Fat intake is decreased to compensate for increased carbohydrate intake. Replacement of saturated fat with polyunsaturated fat is recommended by some in an attempt to improve the hyperlipidaemia.

Provide at least 50% of carbohydrate as uncooked corn starch every 4 hours during the day and via continuous tube feeding at night. During the first 3 months of life, feed every 2 hourly and use polycose instead of uncooked corn starch; gradually change to raw corn starch over 3 months

Diet in Childhood Cancers

Malnutrition and cancer cachexia are frequent consequences of paediatric cancer and its therapy. Nutritional support may enhance therapy, decrease complications, improve immunologic status and hopefully improve survival.

Nutritional risk factors

2. Total weight loss of 5 %
3. Weight for height <90 %
4. Serum albumin 3.2 mmol/L (in absence of recent acute metabolic stress)
5. Triceps skin-fold thickness <5th percentile
6. Anticipated gut dysfunction

7. Bone marrow transplant as a treatment for any tumour.

Advice On Nutritional Problems Associated With Cancer And Its Treatment	
<i>Problem</i>	<i>Suggested dietary advice</i>
Loss of appetite	Offer small amounts of food at a time Offer dry foods, Avoid very sweet, hot and spicy foods
Nausea	Give mouth washes to help to remove the taste Avoid fluids or food until vomiting is controlled Dry foods may be better tolerated
Vomiting	Offer soft, moist foods, blended/puréed foods Use straws for drinking Keep foods moist Avoid citrus fruits
Sore mouth/throat	Offer frequent drinks Sucking fruit drops or boiled mints may stimulate saliva production
Dry mouth	Keep foods moist by using butter, sauces,
Taste changes and loss of taste	Try alternate foods Offer foods familiar to and liked by the child Vary the colour and texture of the foods
Diarrhoea	Ensure the child continues to drink plenty, but not chilled drinks Avoid any specific foods known to aggravate the diarrhea
Intermittent Constipation	Encourage foods high in fibre and plenty of fluids
Malabsorption	A low fat, low residue or lactose free diet In some cases the child will require total parenteral nutrition Give carbohydrate based meals rather than protein based meals

REFERENCES

1. Nelson Textbook Of Pediatrics -18th Edition
2. IAP – Textbook Of Pediatrics.
3. Nutrition And Child Development- K E Elizabeth- 3rd Ed
4. Clinical Pediatric Dietetics Edited By Vanessa Shaw And Margaret Lawson - Third Edition
5. Pediatric Nutrition- Edited By – R.M.Reifen, A .Lerner
6. Iraj Rezvani, Davids Metabolic Diseases
7. Andria Fernandes, Saudubeay, Van Den Berghe G. Inborn Metabolic Disorders-Diagnosis And Treatment
8. Escott-Stump-Nutrition And Diagnosis-Related Care- 6th Ed
9. Pediatric Nutrition Handbook -6th Edition – American Academy Of Pediatrics

HIV AND INFANT FEEDING

Dr. V. P. Goswami, Dr. Sharad Thora

WHO recommendations on Infant Feeding and HIV were revised in 2010. Overall transmission rate of HIV through breastfeeding varies from 5 to 20 % depending on duration of breastfeeding and maternal health status. Evidence has been reported that antiretro-viral (ARV) interventions to either the HIV-infected mother or HIV-exposed infant can significantly reduce the risk of postnatal transmission of HIV through breastfeeding up to 2%, with 100% adherence to the drugs. This has major implications for how women living with HIV might choose to feed their infants and how health workers should counsel mothers when making these choices. The potential of ARV interventions to reduce HIV transmission throughout the period of breastfeeding also highlights the need for guidance on how child health services should communicate information about ARV interventions to prevent transmission through breastfeeding and the implications for feeding of HIV exposed infants through the first two years of life.

HIV –POSITIVE MOTHER IN TROPICAL COUNTRIES

For HIV positive women in low and middle income countries, advice on infant feeding differs from high income countries due to limited resources and infrastructure. As most HIV positive women in these countries cannot safely formula feed their infants, breastfeeding is the only realistic option available.

The latest 2010 guidelines by the WHO^{1,2} which are increasingly followed by individual countries recommend that in order to reduce the risk of the baby becoming infected, mother, or their infant(s), is advised to take a course of antiretroviral drugs throughout the breastfeeding period. While both mother and infant will take a course of antiretroviral drugs, who takes the longer course of ARV drugs is a decision left for the national body but either option has a very high success rate. Mothers are also advised to exclusively breastfeed their infant for 6 months and then, introduce other foods while continuing to breastfeed for up to a year.^{3,4}

In countries where it is not possible for HIV positive women to access a regular supply of antiretroviral drugs, it is recommended that in general they follow the recommendations included in the WHO 2006 HIV & Infant Feeding Update.^{5,6}

WHO INFANT FEEDING GUIDELINES 2006 AND 2010

In 2006 the WHO recommended that HIV positive mothers exclusively breastfeed their infants for 6 months and then rapidly wean.

This 2006 advice was replaced in 2010 to reflect the fact that HIV positive women were confused about feeding methods and mixed feeding continued to be widespread. As extended breastfeeding and mixed feeding is only safe when antiretroviral drugs are taken, there is now an emphasis on using antiretroviral drugs to prevent the baby becoming infected as well as an emphasis on breastfeeding.

These changes are summarized in the table below:

2006 WHO INFANT FEEDING GUIDELINES	2010 WHO INFANT FEEDING GUIDELINES
Mother takes ARVs from 28th week of pregnancy until 1 week after labour or for an indefinite amount of time if the mother is taking ARVs for their own health.	Mother takes ARVs from 14th week of pregnancy until 1 week after labour or for an indefinite amount of time if the mother is taking ARVs for their own health.
Short ARV regimen during breastfeeding period for either mother and/or infant	Long ARV regimen during breastfeeding period for either mother and/or infant
Exclusive breastfeeding for 6 months	Exclusive breastfeeding for 6 months
Complementary feeds to be started after 6 months.	Complementary feeds to be started after 6 months
Rapidly / abruptly wean from breast milk	Gradually wean from breast milk
No mixed feeding (Breastfeeding + replacement feeding i.e. animal or formula milk)	After 6 months of exclusive breastfeeding, or even before 6 months when the mother decides to stop breast feeding, mixed feeding accepted for about a month when breastfeeding is being weaned and replacement feeding is being introduced gradually
Not recommended to breastfeed after 6 months	Recommended to breastfeed till 12 months of age, in conjunction with ARVs

FAQ: SURVIVAL OF A CHILD OF A MOTHER LIVING WITH HIV IN DEVELOPING COUNTRY LIKE INDIA.

Breastfeeding, which is essential for child survival has posed an enormous dilemma for mothers living with HIV. Now, WHO states that mothers may safely breastfeed provided that they or their infants receive ARV drugs during the breastfeeding period.^{7,8} This has been shown to give infants the best chance to be protected from HIV transmission in settings where breastfeeding is the best option. Mothers known to be HIV-infected should be provided with lifelong antiretroviral therapy or antiretroviral prophylaxis interventions to reduce HIV transmission through breastfeeding according to WHO recommendations.⁹

What are the key WHO recommendations regarding feeding for infants born to mothers known to be HIV-infected, for the great-est chance of HIV-free survival?

The following key recommendations are for settings where national or sub-national authorities have decided that the Maternal, Newborn and Child Health services will principally promote and support breastfeeding and ARV interventions as the strategy that will most likely give infants born to mothers known to be HIV-infected the great-est chance of HIV-free survival.

What are the revised WHO Recommendations on the use of antiretroviral drugs for treating pregnant women and preventing HIV infection in infants (2009)?

The 2009 recommendations provide two alternative options for women who are not on ART and breastfeed in resource-limited settings:

If a woman received AZT during pregnancy, daily Nevirapine is recommended for her child from birth until the end of the breastfeeding period.

OR

If a woman received a three-drug regimen during pregnancy, a continued regimen of triple therapy is recommended until one week after all exposure to the breast milk has ended.

Which breastfeeding practices and for how long?

Mothers known to be HIV-infected (and whose infants are HIV uninfected or of unknown HIV status) should exclusively breastfeed their infants for the first 6 months of life, introducing appropriate complementary foods thereafter, and continue breast-feeding for the first 12 months of life.

Breastfeeding should then only stop once a nutritionally adequate and safe diet without breast milk can be provided.

When mothers decide to stop breastfeeding?

Mothers known to be HIV-infected who decide to stop breastfeeding at any time should stop gradually within one month. Mothers or infants who have been receiving ARV prophylaxis should continue prophylaxis for one week after breastfeeding is fully stopped.

Stopping breastfeeding abruptly is not advisable.

What to feed infants when mothers stop breastfeeding?

When mothers known to be HIV-infected decide to stop breastfeeding at any time, infants should be provided with safe and adequate replacement feeds to enable normal growth and development. Alternatives to breastfeeding include:

For infants less than 6 months of age:

Expressed, heat-treated breast milk

Unmodified animal milk

Commercial infant formula milk

(The choice / selection shall be based on AFASS criteria) (AFASS criteria = Acceptability, Feasibility, Affordability, Safety and Sustainability)

For children over 6 months of age:

Animal milk (boiled, for infants under 12 months), as part of a diet providing adequate micronutrient intake. Meals, including milk-only feeds, other foods and combination of milk feeds and other foods, should be provided four or five times per day.

Commercial infant formula milk as long as AFASS criteria for formula feeding are fulfilled.

All children need complementary foods from six months of age.

What preconditions are needed to safely formula feed?

Mothers known to be HIV-infected should only give commercial infant formula milk as a replacement feed to their HIV uninfected infants or infants who are of un-known HIV status, when specific conditions are met:

(Referred to as AFASS – affordable, feasible, acceptable, sustainable and safe in the 2006 WHO recommendations on HIV and Infant Feeding)

safe water and sanitation are assured at the household level and in the community, **and,**

the mother, or other caregiver can reliably provide sufficient infant formula milk to support normal growth and development of the infant, **and,**

the mother or caregiver can prepare it cleanly and frequently enough so that it is safe and carries a low risk of diarrhoea and malnutrition, **and,**

the mother or caregiver can, in the first six months, exclusively give infant formula milk, **and,**

the family is supportive of this practice, **and,**

The mother or caregiver can access health care that offers comprehensive child health services.

What are indications for heat-treated, expressed breast milk?

Mothers known to be HIV-infected may consider expressing and heat-treating breast milk *as an interim feeding strategy*:

In special circumstances such as when the infant is born with low birth weight or is otherwise ill in the neonatal period and unable to breastfeed; or

When the mother is unwell and temporarily unable to breastfeed or has a tempo-rary breast health problem such as mastitis; or

To assist mothers to stop breastfeeding early, or if antiretroviral drugs are temporarily given during breastfeeding.

What is the policy when the infant is HIV infected?

If infants and young children are known to be HIV-infected, mothers are strongly encouraged to exclusively breastfeed for the first 6 months of life and continue breast-feeding as per the recommendations for the general population that is up to two years or beyond.

DISCUSSION

Breastfeeding should be promoted as ideal for most babies exclusively for 6 months after that along with complementary feeding up to 1 yr of age, along with the ARV interventions. As evidence has reported that ARV interventions to either HIV infected mother or HIV exposed infant can

significantly reduce the risk of transmission of HIV through breastfeeding from 14% up to 2% skilled counselling and support in appropriate infant feeding practices and ARV interventions to promote HIV free survival of infant should be available to all pregnant women and mothers.^{10&11}

Unfortunately, access to high quality counselling is scarce in much of the world, resulting in many mothers making inappropriate feeding decisions. There is a desperate need for more resources and better training of counsellors. Good quality programmes have the potential to save many thousands of infant lives.

REFERENCES

1. WHO 2010, Guidelines on HIV and infant feeding 2010: Principles and recommendations for infant feeding in the context of HIV and a summary of evidence.
2. Chasela et al., 2010, 'Maternal or Infant Antiretroviral Drugs to reduce HIV-1 Transmission', New England Journal of Medicine; 362; 2271-81
3. Arrive, Elise, 2007, 'Prevalence of resistance to Nevirapine in mothers and children after single-dose exposure to prevent vertical transmission of HIV -1: a meta-analysis'. International Journal of Epidemiology, 2007;36; 1009-1021
4. The SWEN Team, 'Extended-dose Nevirapine to 6 weeks of age for infants to prevent HIV transmission via breastfeeding in Ethiopia, India, and Uganda: an analysis of three randomized controlled trials', The Lancet, Volume 372, Issue 9635, Pages 300 - 313, 26 July 2008
5. Kuhn L, et al, 2008, 'Effects of early, abrupt cessation of breastfeeding on HIV-free survival of children in Zambia.' N Engl J Med; 359: 130-141
6. Doherty et al, "Effectiveness of the WHO/UNICEF guidelines on infant feeding for HIV-positive women: results from a prospective cohort study in South Africa", AIDS 21(13), 20 August 2007
7. Rapid advice. Use of antiretroviral drugs for treating pregnant women and preventing HIV infection in infant. WHO, November 2009. www.who.int/child-adolescent-health.
8. HIV and infant feeding. Revised principles and recommendations. Rapid advice. WHO, November 2009, www.who.int/child-adolescent-health
9. Coovadia et al, "Mother-to-child transmission of HIV-1 infection during exclusive breastfeeding in the first 6 months of life: an intervention cohort study", The Lancet 369(9567), 31 March 2007

10. Kilewo C, et al. 2008 'Prevention of mother to child transmission of HIV-1 through breast-feeding by treating infants prophylactically with Lamivudine in Dar es Salaam. Tanzania: the MITRA Study'. *J. Acquir Immune Defic Synd*, Jul 1:48 (3): 237-40

11. Kesho Bora Study Group, 2009, 'Triple-antiretroviral prophylaxis during pregnancy and breastfeeding compared to short-ARV prophylaxis to prevent mother-to-child transmission of HIV-1: the Kesho Bora randomized controlled clinical trial in 5 sites in Burkina Faso, Kenya and South Africa'. 5th IAS Conference on HIV Treatment, Pathogenesis and Prevention, Cape Town, abstract LBPEC01

INFANT FEEDING DURING DIARRHEA

Dr. Subodh S Gupta, Dr. Paul P Francis

Diarrheal diseases are a leading cause of childhood morbidity and mortality in developing countries, and an important cause of malnutrition¹. Children who die from diarrhea, despite good management of dehydration, are usually malnourished². The cumulative difference in weight, among six-month age cohorts up to 84 months of age, amounted to 11% between children with low and children with high frequency rates of diarrhea³. On average, young children in developing countries experience five episodes of diarrhea each year². Growth faltering during the episode of diarrhea worsens any pre-existing malnutrition. In turn, malnutrition contributes to frequent episodes of diarrhea which is more severe and prolonged, thus resulting in a vicious cycle. Frequent episodes of diarrhea and other common illnesses are one of the important causes of high prevalence of malnutrition in developing countries¹⁻³.

The mechanisms by which diarrhea can cause weight loss and failure to grow are⁴

1. Reduced food and water intake due to anorexia
2. Biological mechanisms causing diminished absorption and utilization of ingested food; increased nutrient and water losses; and higher nutritional requirements due to increased metabolic demands
3. Intentional reduction or complete withholding of food

1) Reduced food and water intake due to anorexia: In controlled studies, food intake during the acute stage of diarrhea was found to be 40% to 64% of the estimated energy requirements, even after correction of dehydration. The reduced food intake depended on the etiology of the diarrhea and it was found to be highest in cases of rotavirus infection. Vomiting is a common accompanying symptom during initial stages of diarrhea and reduces the dietary intake of children further⁴. The food intake can get further reduced due to dry buccal mucosa resulting from dehydration in severe diarrhea and infection of tongue and buccal mucosa which is common among children with severe protein-energy malnutrition⁴.

It is interesting to note, however, that diarrhea or other acute infectious illnesses may have little nutritional impact for infants who receive most of their dietary energy in the form of

breast milk. However, a considerable reduction in energy intake during infection may result in older children, who customarily receive more than half of their energy via solid foods⁴⁻⁵.

2) Biological mechanisms for growth faltering during diarrhea: Malabsorption of fats, carbohydrates and proteins are well-documented in diarrhea. There may be increased permeability of the intestinal mucosa allowing leakage of endogenous nutrients between the intestinal cells³⁻⁵.

Parents and health providers may consider the presence of undigested foods or an excess of fat in the stool as a valid reason for limiting a child's food intake. What needs to be remembered is that the important point is not stool composition but what is retained by the body. Even in severe cases where up to 30-40% of ingested nutrients are lost through the feces, 60-70% are still absorbed and utilized. It has also been demonstrated that fasting or reduced food intake per se can be responsible for the malabsorption of nutrients³⁻⁴.

3) Intentional reduction or complete withholding of food: In Indian culture, there are strong beliefs about withholding food and inappropriateness of different foods during diarrhea². Moreover, families may withhold food during diarrhea because of their belief that it is caused due to indigestion and apparent logic of 'less in, less out'. Vomiting is also one of the reasons why mothers are afraid to feed their children during the periods of acute infection. Sometimes, even the health providers have mistaken beliefs. They may advise mothers to delay feeding, dilute foods, or avoid giving milk. Health providers may reinforce family member's beliefs.

Moreover, fasting may have a highly negative effect on the concentration of intestinal enzymes resulting in malabsorption of nutrients as the presence of substrates in the intestinal lumen stimulates recovery from temporary enzyme deficiencies. It becomes significant where conditions are prolonged or acute episodes are frequent. The effect of fasting and diarrhea associated with it can be cumulative and may lead to severe malnutrition^{2,4}.

According to National Family Health Survey (NFHS) -3 conducted in 2005-06 in India, approximately half of the children who suffered an episode of diarrhea in 2 weeks preceding the survey were offered less food or no food at all during the illness⁷.

PRINCIPLES OF OPTIMAL FEEDING

Optimal feeding, both during and after diarrhea, is critical not only for recovery from a current illness but also to prevent a child from succumbing to the vicious cycle of diarrhea and malnutrition^{2,3,4,7,8}. Continued feeding during an episode of diarrhea speeds the recovery of normal intestinal function, including the ability to digest and absorb various nutrients. In contrast, children whose food is restricted or diluted lose weight, have diarrhea of longer duration, and recover intestinal function more slowly³⁻⁵. These optimal feeding behaviours present challenges for both the

family and the health provider. At the same time, illness is an important moment of opportunity for providing support to improve feeding practices². Box-1 summarizes the key principles of optimal feeding during diarrhea and during recovery.

Integrated Management of Neonatal and Childhood Illness (IMNCI) protocol provides a local “food box” with feeding recommendations during sickness. (Figure-1) The principles of optimal feeding behaviour during an episode of diarrhea include; a) Continue feeding and increase fluids; b) Increase the amount of foods after illness until the child regains weight and is growing well, and 3) Be responsive to the child’s need and provide extra attention and care during sickness.

In case of severe diarrhea with dehydration or persistent diarrhea, the child’s usual diet and the age determines the appropriate dietary management. The type of food to be offered depends on the child’s age, food preferences and pre-illness feeding pattern; cultural practices are also important.

Infants 0-6 months

If an exclusively breast-fed infant is at risk of dehydration or has already developed dehydration due to diarrhea, the prevention and/or management of dehydration and electrolyte imbalance, is the first priority. These infants should be managed by increasing the frequency of breast-feeding¹.

In a study⁴ which compared the effect of interrupting or maintaining breast-feeding during the initial 24 hours of oral rehydration therapy, infants who were breastfed during the early phase of acute diarrhea had fewer, and a smaller volume of, diarrheal stools, they required less oral rehydration fluid, and they recovered from diarrhea sooner than those infants for whom breastfeeding was interrupted.

Top-fed infants and children receiving foods other than milk are at much greater risk of infection from contaminated foods and utensils. Correction of dehydration and electrolyte imbalance helps in appetite recovery and, therefore, is essential for the rapid reintroduction of full-strength milk. The best course of action for sick top-fed infants is to increase breast milk intake in order to replace entirely any substitute that is being given. Full-strength milk can be resumed immediately after a period of no more than 6-8 hours, during which time the children are being rehydrated or should not be interrupted at all if they are not dehydrated and maintain a good appetite⁴.

Children 6-24 months

In communities, parents and health providers advice severe dietary restriction to infant and young children who are already receiving a mixed diet. In such situation, milk and solid foods, typically those with the highest nutritional value, are often withheld entirely, and dietary intake is limited to low energy food items^{2,4}.

Evidence show that rapid re-feeding of the child using the habitual diet after only a few hours of oral rehydration therapy, shortens the duration of diarrhea and results in less weight loss and a quicker improvement in the child's general well-being. Correction of fluid and electrolyte imbalances is essential for successful and rapid reintroduction of the child's habitual diet⁴.

PERSISTENT DIARRHEA

Persistent diarrhea is defined as a diarrheal episode of presumed infectious etiology lasting fourteen or more number of days¹³. This operational definition identifies children with an elevated diarrheal burden and an elevated risk of nutritional insult. Persistent diarrhea usually accounts for less than 10% of all diarrheal episodes but is associated with 30-50% of deaths due to diarrhea¹⁴.

An International Working Group was constituted by WHO and Applied Diarrheal Disease Research Project, Harvard University to develop a protocol for management of persistent diarrhea. This multi-centric study demonstrated that persistent diarrhea can be successfully managed by nutritional therapy using inexpensive, locally available foods, vitamin and mineral supplementation, and antimicrobial therapy for specific infections is successful for the short-term management of children with persistent diarrhea^{14,15}.

The guidelines initially separated children into "unstable" and "stable" categories, based on level of dehydration. Unstable children were given oral rehydration therapy in order to make them stable enough to receive dietary therapy. Stable children were started on "Diet A", which included local, inexpensive and culturally acceptable foods, consisting mainly of cereals, legumes, vegetable oil and a small amount of milk products (<3.7g lactose /150 kcal). Children who showed an increase in stool weight, volume or number of watery stools at the end of seven days, or who failed to gain weight, were put on "Diet B." This diet substituted chicken or eggs for milk products, was lactose free, and had a lower cereal and legume content. Each centre designed its own Diet A to include locally available and culturally acceptable foods; with > 9.5% of total calories as proteins; animal protein (milk or yogurt), and energy density of >65 kcal/100g^{14,15}.

Micronutrient supplements were given to provide at least twice the US recommended daily requirements of vitamins and minerals. The pills were crushed and mixed with the study diets. Children were allowed to eat at least six times per day to reach a caloric target of 150 kcal/kg/day, and no restrictions were placed on children who wanted more food. Water was allowed as desired. Breast milk feeding was freely allowed to children who were still being breastfed at the time that they were admitted to the study. Antimicrobial therapy was given for clinically or laboratory diagnosed infections, including dysentery (bloody diarrhea), cholera, and giardiasis, urinary tract infection, and acute lower respiratory infection. The overall recovery rate for these children was 80%, defined by cessation of diarrhea and either weight greater than admission weight, or two consecutive days of weight gain exceeding 20 g/day^{14,15}.

MICRONUTRIENT SUPPLEMENTATION DURING DIARRHEA

In 2004, the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) issued a joint statement regarding the clinical management of acute diarrhea. This statement recommended the use of zinc treatment, as well as a new formulation of oral rehydration solution (ORS), as a two-pronged approach to treatment¹¹.

Zinc treatment is a simple, inexpensive, and critical new tool for treating diarrheal episodes among children in the developing world. Children lose zinc during diarrhea. Studies suggest that replenishing zinc with a 10 to 14 day course of treatment can reduce the duration and severity of diarrheal episodes and may also reduce the number of episodes of diarrhea in the 2-3 months after the supplementation^{11,12}. Vitamin-A supplementation is another important and low-cost intervention for controlling severe and potentially fatal diarrheal episodes.

FEEDING DURING CONVALESCENCE

After the episode of diarrhea is over and the child is recovering, the appetite improves and the child becomes eager to eat more food than usual. This provides an important opportunity to compensate for nutritional losses incurred and to correct possible deficiencies in the habitual diet. Children should be encouraged to eat more at every meal, and given an extra 'meal' each day (or extra snacks in between meals) at least two weeks or until the child has regained any weight lost and is growing well again^{2,4,7,8}.

The message to 'give extra meal during recovery' must be included during counselling for a child suffering from acute diarrhea.

REFERENCES:

1. WHO. A treatment of diarrhoea: A manual for physicians and other senior health workers, 4th revision. WHO/CAH/03.7. World Health Organization, Geneva, 2005.
2. LINKAGES. Facts for Feeding – Feeding Infants and Young Children During and After Illness. LINKAGES, Academy for Educational Development (AED) and Bureau for Global Health, United States Agency for International Development (USAID); [cited 2010 Oct 05]; Available from: URL: http://www.linkagesproject.org/media/publications/Facts-for-Feeding-Illness_11-21-06.pdf
3. Hirschhorn N. The treatment of acute diarrhea in children: An historical and physiological perspective. *Am J Clin Nutr* 1980. 33:637-663.
4. The infant and young child during periods of acute infection. *Bull World Health Organ*. 1989;67 Suppl:85-95.

5. Hoyle B, Yunus M, Chen LC. Breast-feeding and food intake among children with acute diarrheal disease. *Am J Clin Nutr*. 1980 Nov;33(11):2365-71.
6. Behrens RH, Lunn PG, Northrop CA, Hanlon PW, Neale G. Factors affecting the integrity of the intestinal mucosa of Gambian children. *Am J Clin Nutr*. 1987 Jun;45(6):1433-41.
7. International Institute for Population Sciences (IIPS) and Macro International. National Family Health Survey (NFHS-3), 2005-06; India: Volume 1. Mumbai: IIPS 2007.
8. Brown KH. Dietary management of acute diarrheal disease: contemporary scientific issues. *J Nutr* 1994; 124: 1455S-1460S.
9. MOST (The USAID Micronutrient Program) and World Health Organization. Diarrhoea treatment guidelines: including new recommendations for the use of ORS and zinc supplementation for clinic-based healthcare workers. MOST, USAID 2005.
10. Ministry of Health and Family Welfare, Government of India. Integrated management of Neonatal and Childhood Illness: Physician's Chartbooklet. Government of India 2006.
11. Bhutta ZA, Black RE, Brown KH, Gardner JM, Gore S, Hidayat A, et.al. Prevention of diarrhoea and pneumonia by zinc supplementation in children in developing countries: Pooled analysis of randomized controlled trials, Zinc Investigators' Collaborative Group. *Journal of Paediatrics*, 1999;135(6):689-697
12. WHO and UNICEF. WHO/ UNICEF Joint Statement on 'Clinical Management of Acute Diarrhea. World Health Organization, Geneva and United Nations Children's Fund, New York 2004.
13. Branth PV, Steinsland H, Santos G, Perch M, Begtrup K, Bhan MK, et al. Community-based controlled trial of dietary management of children with persistent diarrhea: sustained beneficial effect on ponderal and linear growth. *American Journal of Clinical Nutrition*, 2001; 73(5): 968-974.
14. International Working Group on Persistent Diarrhea. Evaluation of an algorithm for the treatment of persistent diarrhoea: a multicentre study. *Bulletin of the World Health Organization*, 1996, 74 (5): 479-489.
15. Child Health Research Project, USAID. Synopsis: persistent diarrhea algorithm. [cited 2010 Oct 05]; Available from: URL: http://pdf.usaid.gov/pdf_docs/PNACE664.pdf

Box-1: Optimal Feeding Behaviours During Diarrhea**OPTIMAL BEHAVIORS (FEEDING CHILDREN DURING AND AFTER ILLNESS)*****During Illness***

- Continue feeding and increase fluids
- For a child under 6 months (exclusively breastfed):
 - Breastfeed more frequently and longer at each feed
 - For a child under 6 months (top-fed in addition to breast milk)
 - Continue and increase breastfeeding in order to compensate for any top-feed
 - As the child recovers and the supply of breast milk increases, other foods should be decreased. If possible, the infant should become exclusively breastfed within 2-4 weeks depending on the quantity of top-feed given routinely.
 - If fluids other than breast milk are given, use a cup, not a bottle.
 - For a child under 6 months (not breastfed)
 - Continue the usual diet of the child; food should never be withheld or diluted, even for short periods
 - For a child 6-24 months old (fed on mixed diet):
 - Breastfeed more frequently & longer at each feed, increase fluid intake, & offer food
 - Give frequent, small feeds
 - Give nutrient-dense foods that are soft, varied, and the child's favorite foods
 - Give mashed or soft foods if the child has trouble swallowing (do not dilute foods or milk)
 - Feed the child slowly and patiently; encourage the child to eat but do not force
- If dehydration present, correct dehydration using IMNCI guidelines

During recovery





Increase the amount of food after illness until the child regains weight and is growing well

Continue to feed frequently: give an extra meal every day or snacks; be responsive to the recovering child's increased hunger.

Modified from: LINKAGES. Facts for Feeding – Feeding Infants and Young Children During and After Illness. LINKAGES, Academy for Educational Development (AED) and Bureau for Global Health, United States Agency for International Development (USAID); [cited 2010 Oct 05]; Available from: URL: http://www.linkagesproject.org/media/publications/Facts-for-Feeding-Illness_11-21-06.pdf

Figure 1: Feeding Recommendations as per Integrated Management of Neonatal and Childhood Illness

Feeding Recommendations During Sickness and Health

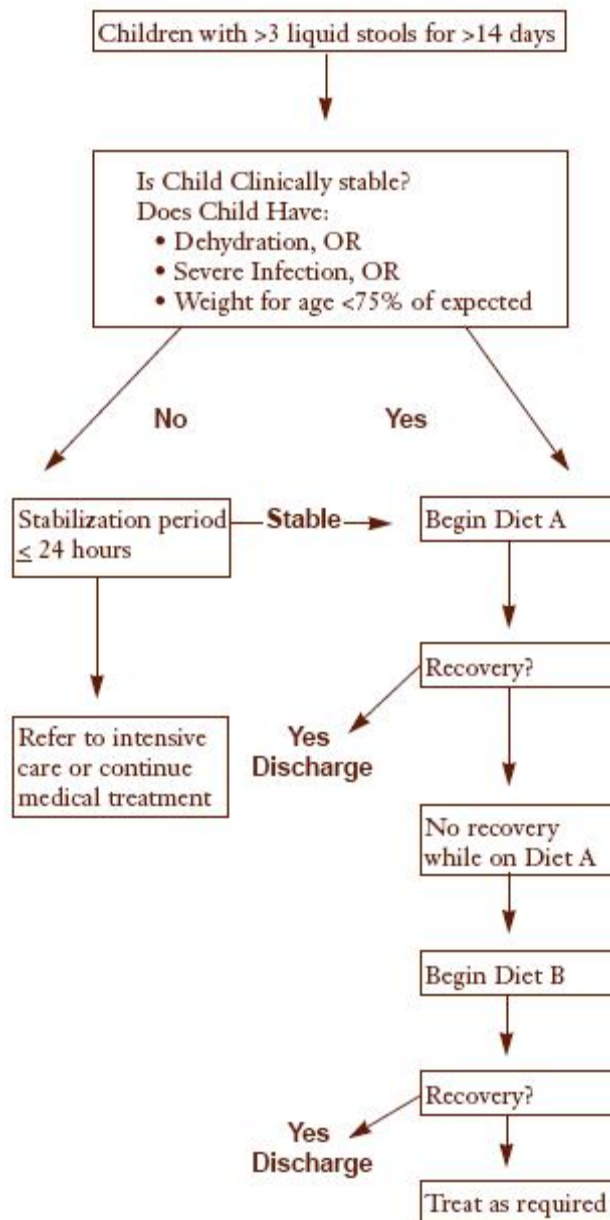
 Up to 6 Months of Age	<p>Breastfeed as often as the child wants, day and night, at least 8 times in 24 hours.</p> <ul style="list-style-type: none"> Do not give any other foods or fluids not even water 	 6 Months up to 12 Months	<p>Breastfeed as often as the child wants.</p> <ul style="list-style-type: none"> Give at least <u>one</u> katori serving* at a time of : <ul style="list-style-type: none"> Mashed rotli/ rice /bread/biscuit mixed in sweetened undiluted milk OR Mashed rotli/rice/bread mixed in thick dal with added ghee/oil or khichri with added oil/ghee. Add cooked vegetables also in the servings OR Sevian/dalia/halwa/kheer prepared in milk or any cereal porridge cooked in milk OR Mashed boiled/fried potatoes Offer banana/biscuit/ cheeko/ mango/ papaya <p>*3 times per day if breastfed 5 times per day if not breastfed.</p> <p>Remember:</p> <ul style="list-style-type: none"> Keep the child in your lap and feed with your own hands Wash your own and child's hands with soap and water every time before feeding
 12 Months up to 2 Years	<p>Breastfeed as often as the child wants.</p> <ul style="list-style-type: none"> Offer food from the family pot Give at least 1½ katori serving* at a time of : <ul style="list-style-type: none"> Mashed rotli/rice/bread mixed in thick dal with added ghee/oil or khichri with added oil/ghee. Add cooked vegetables also in the servings OR Mashed rotli/ rice /bread/biscuit mixed in sweetened undiluted milk OR Sevian/dalia/halwa/kheer prepared in milk or any cereal porridge cooked in milk OR Mashed boiled/fried potatoes Offer banana/biscuit/ cheeko/ mango/ papaya <p>* 5 times per day.</p> <p>Remember:</p> <ul style="list-style-type: none"> Sit by the side of child and help him to finish the serving Wash your child's hands with soap and water every time before feeding 	 2 Years and Older	<ul style="list-style-type: none"> Give family foods at 3 meals each day. Also, twice daily, give nutritious food between meals, such as: banana/biscuit/ cheeko/ mango/ papaya as snacks <p>Remember:</p> <ul style="list-style-type: none"> Ensure that the child finishes the serving Teach your child wash his hands with soap and water every time before feeding

Feeding Recommendations For a Child who Has PERSISTENT DIARRHOEA

- If still breastfeeding, give more frequent, longer breastfeeds, day and night.
- If taking other milk:
 - replace with increased breastfeeding OR
 - replace with fermented milk products, such as yoghurt OR
 - replace half the milk with nutrient-rich semisolid food.
 - Add cereals to milk (Rice, Wheat, Semolina)
- For other foods, follow feeding recommendations for the child's age.

Figure 2: Guidelines for Management Of Persistent Diarrhea

(Source: Child Health Research Project, USAID. Synopsis: persistent diarrhea algorithm. Available from:
 URL: http://pdf.usaid.gov/pdf_docs/PNACE664.pdf)



MATERNAL MEDICATIONS AND BREASTFEEDING

Dr. Sriparna Basu, Dr. B.D. Bhatia

Often there is a need to decide whether a mother who is breastfeeding and who needs treatment with drugs can take the necessary medication and still continue breastfeeding safely. There are very few kinds of treatment during which breastfeeding is absolutely contraindicated. However, there are some drugs which a mother may need to take which sometimes cause side-effects in the baby.

DRUG THERAPY OF THE LACTATING WOMAN¹

The following should be considered before prescribing drugs to lactating women:

1. Is drug therapy really necessary? If drugs are required, consultation between the pediatrician and the mother's physician can be most useful in determining what options to choose.
2. The safest drug should be chosen, for example, acetaminophen rather than aspirin for analgesia.
3. If there is a possibility that a drug may present a risk to the infant, consideration should be given to measurement of blood concentrations in the nursing infant.
4. Drug exposure to the nursing infant may be minimized by having the mother take the medication just after she has breastfed the infant or just before the infant is due to have a lengthy sleep period.
5. The safety of certain drugs also depends on the age of the infant. Premature babies and infants less than 1 month of age have a different capacity to absorb and excrete drugs than older infants.
6. Nursing mothers should not ingest drugs of abuse like amphetamine, cocaine, heroin, marijuana and phencyclidine because they are hazardous to the nursing infant and to the health of the mother.

HOW DRUGS ARE CLASSIFIED FOR BREASTFEEDING

The following classifications are used for drugs during breastfeeding:

1. Compatible with breastfeeding: Drugs are compatible with breastfeeding if there are no known or theoretical contraindications for their use, and it is considered safe for the mother to take the drug and continue to breastfeed.

2. Compatible with breastfeeding. Monitor infant for side-effects: Drugs could theoretically cause side-effects in the infant but have either not been observed to do so or have only occasionally caused mild side-effects. Inform the mother about any possible side-effects, reassure her that they are unusual, and ask her to return if they occur or if she is worried.

If side-effects do occur, stop giving the drug to the mother, and if necessary find an alternative. If the mother cannot stop taking the drug, she may need to stop breastfeeding and feed her baby artificially until her treatment is completed. Help her to express her breastmilk to keep up the supply so that she can breastfeed again after she stops taking the drug.

3. Avoid if possible. Monitor infant for side-effects: Drugs which have been reported to cause side-effects in the infant, especially if the side-effects could be serious. Use these drugs only when they are really essential for the mother's treatment and when no safer alternative is available. Allow the mother to continue breastfeeding but give her clear instructions about observing the baby and arrange for frequent follow-up. If side-effects occur, stop the drug. If it is not possible to stop giving the drug, stop breastfeeding and feed the baby artificially until treatment is completed. Help her to express her breastmilk to keep up the supply so that she can breastfeed again after stops taking the drug.

4. Avoid if possible, may inhibit lactation: Drugs which may reduce breastmilk production, if possible, should be avoided. However, if a mother has to take one of these drugs for a short period, she does not need to give artificial milk to her baby. She can off set the possible decrease in milk production by encouraging her baby to suckle more frequently.

5. Avoid: Drugs having dangerous side-effects on the baby. They should not be given to a mother while she is breastfeeding. If they are essential for treating the mother, she should stop breastfeeding until treatment is completed. If treatment is prolonged, she may need to stop breastfeeding altogether. There are very few drugs in this category apart from anticancer drugs and radioactive substances.

A preliminary guide for use of drugs during breastfeeding is provided below:

<i>Breastfeeding contraindicated:</i>	Anticancer drugs (antimetabolites); Radioactive substances (stop breastfeeding temporarily)
<i>Continue breastfeeding :</i>	
<i>Side-effects possible Monitor baby for drowsiness.</i>	Selected psychiatric drugs and anticonvulsants (see individual drug)
<i>Use alternative drug if possible</i>	Chloramphenicol, tetracyclines, metronidazole, quinolone antibiotics (e.g. ciprofloxacin)
<i>Monitor baby for jaundice.</i>	Sulfonamides, dapsone, sulfamethoxazole+trimethoprim (cotrimoxazole) sulfadoxine+pyrimethamine (fansidar)
<i>Use alternative drug (may inhibit lactation)</i>	Estrogens, including estrogen-containing contraceptives, thiazide diuretics, ergometrine
<i>Safe in usual dosage Monitor baby</i>	Most commonly used drugs: analgesics and antipyretics: short courses of paracetamol, acetylsalicylic acid, ibuprofen; occasional doses of morphine and pethidine. antibiotics: ampicillin, amoxicillin, cloxacillin and other penicillins, erythromycin, antituberculosis drugs, anti-leprosy drugs (see dapsone above). antimalarials (except mefloquine, Fansidar), anthelmintics, antifungals. bronchodilators (e.g. salbutamol), corticosteroids, antihistamines, antacids, drugs for diabetes, most antihypertensives, digoxin nutritional supplements of iodine, iron, vitamins.

As per American Academy of Pediatrics detailed guidelines of drug compatibility are provided in the Tables below³⁻⁶:

Table 2: Drugs for which the effect on nursing infants is unknown but may be of concern*	
Drug	Reported or Possible Effect
Anti-anxiety	
Alprazolam	None
Diazepam	None
Lorazepam	None
Midazolam	-
Prazepam†	None
Temazepam	-
Antidepressant	
Amitriptyline	None
Amoxapine	None
Clomipramine	None
Desipramine	None
Dothiepin	None
Doxepin	None
Fluoxetine	Colic, irritability, feeding and sleep disorders, slow weight gain
Fluvoxamine	-
Imipramine	None
Nortriptyline	None
Paroxetine	None
Sertraline†	None
Trazodone	None
Antipsychotic	
Chlorpromazine	Galactorrhea in mother; drowsiness and lethargy in infant; decline in developmental scores
Chlorprothixene	None
Clozapine†	None
Haloperidol	Decline in developmental scores
Mesoridazine	None
Trifluoperazine	None
Others	
Amiodarone	Possible hypothyroidism
Chloramphenicol	Possible idiosyncratic bone marrow suppression
Clofazimine	Potential for transfer of high percentage of maternal dose; possible increase in skin pigmentation
Lamotrigine	Potential therapeutic serum concentrations in infant
Metoclopramide†	None described; dopaminergic blocking agent
Metronidazole	In vitro mutagen; may discontinue breastfeeding for 12–24 h to allow excretion of dose when single-dose therapy given to mother
Tinidazole	Same as Metronidazole

* Psychotropic drugs, the compounds listed under anti-anxiety, antidepressant, and antipsychotic categories, are of special concern when given to nursing mothers for long periods. Although there are very few case reports of adverse effects in breastfeeding infants, these drugs do appear in human milk and, thus, could conceivably alter short-term and long-term central nervous system function.

† Drug is concentrated in human milk relative to simultaneous maternal plasma concentrations

As per American Academy of Pediatrics detailed guidelines of drug compatibility are provided in the Tables below³⁻⁶:

Table 3: Drugs that have been associated with significant effects on some nursing infants and should be given to nursing mothers with caution*	
Drug	Reported Effect
Acebutolol	Hypotension; bradycardia; tachypnea
5-Aminosalicylic acid	Diarrhea (1 case)
Atenolol	Cyanosis; bradycardia
Bromocriptine	Suppresses lactation; may be hazardous to the mother
Aspirin (salicylates)	Metabolic acidosis (1 case)
Clemastine	Drowsiness, irritability, refusal to feed, high-pitched cry, neck stiffness (1 case)
Ergotamine	Vomiting, diarrhea, convulsions (doses used in migraine medications)
Lithium	One-third to one-half therapeutic blood concentration in infants
Phenindione	Anticoagulant: increased prothrombin and partial thromboplastin time in 1 infant
Phenobarbital	Sedation; infantile spasms after weaning from milk containing phenobarbital, methemoglobinemia (1 case)
Primidone	Sedation, feeding problems
Sulfasalazine (salicylazosulfapyridine)	Bloody diarrhea (1 case)

Table 4: Maternal medication usually compatible with breastfeeding*	
Drug	Reported Sign or Symptom in Infant or Effect on Lactation
Acetaminophen	None
Acetazolamide	None
Acyclovir†	None
Alcohol (ethanol)	With large amounts, drowsiness, diaphoresis, deep sleep, weakness, decrease in linear growth, abnormal weight gain; maternal ingestion of 1 g/kg daily decreases milk ejection reflex
Amoxicillin	None
Atropine	None
Aztreonam	None
B1 (thiamin)	None
B6 (pyridoxine)	None
B12	None
Baclofen	None
Bendroflumethiazide	Suppresses lactation
Bishydroxycoumarin (dicumarol)	None
Bromide	Rash, weakness, absence of cry with maternal intake of 5.4 g/d
Butorphanol	None
Caffeine	Irritability, poor sleeping pattern, excreted slowly; no effect with moderate intake of caffeinated beverages (2–3 cups per day)
Captopril	None
Carbamazepine	None
Carbimazole	Goiter
Cefadroxil	None
Cefazolin	None
Cefotaxime	None
Ceftazidime	None
Ceftriaxone	None
Chloral hydrate	Sleepiness
Chloroform	None
Chloroquine	None
Chlorothiazide	None
Cimetidine†	None
Ciprofloxacin	None
Cisapride	None
Cisplatin	Not found in milk

Clindamycin	None
Codeine	None
Contraceptive pill with estrogen/progesterone D (vitamin)	Rare breast enlargement; decrease in milk production and protein content (not confirmed in several studies) None; follow up infant's serum calcium level if mother receives pharmacologic doses
Dapsone	None; sulfonamide detected in infant's urine
Digoxin	None
Diltiazem	None
Domperidone	None
Erythromycin†	None
Estradiol	Withdrawal, vaginal bleeding
Ethambutol	None
Ethosuximide	None, drug appears in infant serum
Fexofenadine	None
Fluconazole	None
Flufenamic acid	None
Folic acid	None
Gadopentetic (Gadolinium)	None
Gentamicin	None
Gold salts	None
Halothane	None
Hydralazine	None
Hydroxychloroquine†	None
Ibuprofen	None
Indomethacin	Seizure (1 case)
Iodine	Goiter
Isoniazid	None; acetyl (hepatotoxic) metabolite secreted but no hepatotoxicity reported in infants
Ivermectin	None
K1 (vitamin)	None
Kanamycin	None
Ketoconazole	None
Labetalol	None
Levothyroxine	None
Lidocaine	None
Loratadine	None
Magnesium sulfate	None
Medroxyprogesterone	None
Mefenamic acid	None
Meperidine	None

Methadone	None
Methimazole (active metabolite of carbimazole)	None
Methyldopa	None
Metoprolol†	None
Minoxidil	None
Morphine	None; infant may have measurable blood concentration
Moxalactam	None
Nalidixic acid	Hemolysis in infant with glucose-6-phosphate dehydrogenase (G-6-PD) deficiency
Nitrofurantoin	Hemolysis in infant with G-6-PD deficiency
Ofloxacin	None
Oxprenolol	None
Phenylbutazone	None
Phenytoin	Methemoglobinemia (1 case)
Piroxicam	None
Prednisolone	None
Prednisone	None
Procainamide	None
Progesterone	None
Propoxyphene	None
Propranolol	None
Propylthiouracil	None
Pseudoephedrine†	None
Pyridostigmine	None
Pyrimethamine	None
Quinidine	None
Quinine	None
Riboflavin	None
Rifampin	None
Secobarbital	None
Senna	None
Spirolactone	None
Streptomycin	None
Sulbactam	None
Sulfapyridine	Caution in infant with jaundice or G-6-PD deficiency and ill, stressed, or premature infant; appears in infant's milk
Sulfisoxazole	Caution in infant with jaundice or G-6-PD deficiency and ill, stressed, or premature infant; appears in infant's milk

Sumatriptan	None
Suprofen	None
Terbutaline	None
Terfenadine	None
Tetracycline	None; negligible absorption by infant
Theophylline	Irritability
Thiopental	None
Ticarcillin	None
Timolol	None
Tolbutamide	Possible jaundice
Tolmetin	None
Trimethoprim/sulfamethoxazole	None
Triprolidine	None
Valproic acid	None
Verapamil	None
Warfarin	None

* Drugs listed have been reported in the literature as having the effects listed or no effect. The word "none" means that no observable change was seen in the nursing infant while the mother was ingesting the compound. Dashes indicate no mention of clinical effect on the infant. It is emphasized that many of the literature citations concern single case reports or small series of infants.

† Drug is concentrated in human milk

Agent	Reported Sign or Symptom in Infant or Effect on Lactation
Aflatoxin	None
Aspartame	Caution if mother or infant has phenylketonuria
Bromide (photographic laboratory)	Potential absorption and bromide transfer into milk
Cadmium	None reported
Chlordane	None reported
Chocolate (theobromine)	Irritability or increased bowel activity if excess amounts (\$16 oz/d) consumed by mother
DDT, benzene hexachlorides, dieldrin, aldrin, heptachlorepoxyde	None
Fava beans	Hemolysis in patient with G-6-PD deficiency
Fluorides	None

Hexachlorobenzene	Skin rash, diarrhea, vomiting, dark urine, neurotoxicity, death
Hexachlorophene	None; possible contamination of milk from nipple washing
Lead	Possible neurotoxicity
Mercury, methylmercury	May affect neurodevelopment
Methylmethacrylate	None
Monosodium glutamate	None
Polychlorinated biphenyls and polybrominated biphenyls	Lack of endurance, hypotonia, sullen, expressionless facies
Silicone	Esophageal dysmotility
Tetrachloroethylene cleaning fluid (perchloroethylene)	Obstructive jaundice, dark urine
Vegetarian diet	Signs of B12 deficiency

REFERENCES:

1. *Breastfeeding counselling : A training course*. World Health Organization (WHO/CDR/93.3-6), 1993.
2. Eleventh Model List of Essential Drugs. In: *The Use of Essential Drugs*. Ninth report of the WHO Expert Committee (including the revised Model List of Essential Drugs). World Health Organization (Technical report Series No. 895), Geneva 2000.
3. American Academy of Pediatrics, Committee on Drugs. The Transfer of Drugs and Other Chemicals Into Human Milk. *Pediatrics*, 108:776-789, 2001.
4. *Physicians' Desk Reference*. Montvale, NJ: Medical Economics Company; 2001
5. US Pharmacopeia. *USP DI 2001: Information for the Health Care Professional, Volume I*. Hutchinson TA, ed. Englewood, CO: Micromedex; 2001.
6. US Pharmacopeia. *USP Dictionary of USAN and International Drug Names*. Rockville, MD: US Pharmacopeia; 2000

THE ETHICAL ISSUES OF INFANT FEEDING

Dr. Gadadhar Sarangi, Dr. R. K. Maheshwari

More than 2.4 million child deaths occur in India each year and two third of these deaths are related to inappropriate feeding practices. To protect infant health, India was one of the few Asian countries to implement the International Code of Marketing of Breast Milk Substitutes with the enactment of IMS Act in 1992. Subsequently in 2003 IMS Act got amended with broadening of its scope to impose ban on marketing of complementary foods and promotion of all forms of baby foods with ban on sponsorship to medical profession by the food industry. Inappropriate feeding practices lead to infant malnutrition resulting in increased morbidity and mortality. The protection of infant milk substitutes and related products has been more extensive and pervasive than the information concerning the advantages of mother's milk. The legal sanction of the country made it clear in IMS Act but there remained situations where breast milk may not be appropriate or scientifically undesirable or not available. In these circumstances one has to resort to formula or liquid milk. Persons empowered to advise are mostly from medical profession. Legal sanctions are not always false proof at the effectors point. Hence a lot of ethical restraint depending upon the moral conduct is highly desirable to improve child health in the country.

The terminology

To delineate ethical issues one needs to know what this term or allied terms do infer. We do have a legal binding but it is felt that it may not be full proof or good enough. Infant formula or other infant foods available are not bad by themselves but breast milk is better. So it is a question of choosing the better one.

Law in its genetic sense, is a body of rules of action or conduct prescribed by Controlling Authority, and followed by citizens subject to sanctions of legal consequences in law. The term legal is something confirming to law, according to law, required or permitted by law, not forbidden or discountenanced by law.

Ethics, on the other hand, can be defined as an action of an individual taken on himself to ensure his continued survival across the dynamics. It is a personal thing. When one is Ethical, it is something he does himself by his own choice. It is more applicable to the members of a profession as he has to fix standards for himself depending upon principles relating to conduct and morality.

The doctor is in a cross road in deciding the principles of feeding of an infant. Natural food like breast milk and supplementary food at home is very much available. Commercial baby food and milk substitutes are flooded in the market with a commercial motive. Natural liquid milk is very much available in the market. There is scientific and social reasoning to adopt one or the other and in taking this crucial decision social and commercial pressure is mounting and increasing day by day on the person whose decision is crucial and effect is far reaching.

The legal binding has its own lacunae. There is no clear directive as to how to go by in particular situation. All these calls for personal decision by a professional, depending on his scientific knowledge, moral values, conduct and feelings. The final decision of course rests upon the professional in making a valid conclusion.

ISSUES

Certain groups of individuals believe that the benefits of breastfeeding are so great that sales of standard infant formula products should be strongly discouraged if not banned.

1. Infant formula in developed countries

The 1930s Great Economic depression and post war malnutrition in babies stimulated Governments in US and Europe to encourage bottle feeding which was thought to be hygienic and to deliver higher calorie than breast milk to obtain good growth. Subsequently the immune protection of breast milk outweighed the supposed benefit of formula feeds and demand feeds took over to the time scheduling, so called training.

In both developed and developing countries women's right and education paved the path for mother to remain away from home for a long time. A maternity leave from work does not ensure the productive time and the women's right to work is underplayed or downplayed.

2. Use of infant formula in developing countries

The quality of drinking water being poor, sanitation is compromised. The use of formula or other milks may turn out hazardous. The infant formula is very expensive compared to the average family income. Introduction of formula in hospital with hygienic water supply with free samples and profit motives by all concerned will make the breast to dry up and the new born at home will be in precarious situation with marginalized family income, low sanitary condition and often no access to pure water.

But in India during the last decade the rapid economic growth paved way for women to enter in professional and business life. Without organized crèches and help near the work place just maternity leave for 3 months or at places 6 months is not going to address the problem.

3. The Concern

There was ongoing public concern about marketing breast milk substitutes and in 1976, War on Want, a charitable organization produced a report with the heading of “Baby Killer” which denounced the aggressive marketing policy of infant foods. In 1981 UNICEF and WHO devised a code of marketing of Breast Milk substitutes which was adopted in WHO’s 34th Assembly in May 1981.

4. HIV / AIDS and other infections

Prevalence of HIV / AIDS in the world with 2.5 million children suffering from it and 700,000 newly infected each year with a 20% chance of passing the virus through breast milk to babies, the ethical issues around breast milk reached a new dimension. Up to December 2000, 3.8 million children have died of AIDS with 3.4 million being infected by their mothers with about 1.1 to 17 million solely got infected through drinking breast milk.

In 2001 World Health Assembly resolved to access the available scientific evidence on the balance of risk of HIV transmission through breastfeeding compared with the risk of not breastfeeding and to facilitate the provision of information and informed decision making and to recognize that when replacement feeding is acceptable, feasible, affordable, sustainable and safe (AFASS), avoidance of all breastfeeding by HIV-Positive women is recommended. Otherwise, exclusive breastfeeding is recommended during the first months of life; and that those who choose other options should be encouraged to use them □ free from commercial influences.

Incorrectly prepared, over/under diluted formula can lead to malnutrition and subsequently become lethal.

Cytomegalovirus (CMV), Human T Cell lymphotropic Virus Typ-1, rubella virus, hepatitis B Virus and herpes simplex virus have been demonstrated in breast milk. The most troublesome is CMV as two-thirds of seronegative breast fed infants may become positive. In term infants the infection appears non-consequential but the infections and manifestation in preterms is substantially greater. This calls for judicious consideration and informed decision from the mother. Hepatitis B positive mothers can breast feed milk with Hepatitis B vaccine and immunoglobulin administered to the infant. Mothers having herpes simplex in and around the nipple should avoid breastfeeding temporarily.

The issue often not discussed is whether expressed breast milk can be sterilized by boiling and fed to the child? This may reduce the active antibody content but the cost factor will be reduced substantially.

Over dilution and water sanitation will not be a problem. To do this the mother needs to be motivated and convinced. We should not have difficulty in understanding that the world has changed and every life counts.

5. Water Availability

It is not the milk substitutes which is so much blamed than the impure water used for the preparation. It is estimated that 1.1 billion of world's population lack access to adequate clean water. Provision of clean water is a function of social upliftment, education and adequate sanitation.

6. Ethical issues relating to Breast-Milk Substitutes

Moral status of infant formula itself. Is it a bad thing like tobacco or alcohol? Obviously no. Theoretically infant formula may not be a bad thing in itself but in practice it is a substitute for a very good thing, i.e., Breast Milk. Therefore probably the word 'ban' is not coined rather caution in marketing is forwarded.

Infant formula in itself may not be the cause of death but adopting it to an economically weaker society with lack of clean drinking water results in catastrophe.

Should the infant formula be withdrawn from the market? Obviously there is a need and more so in situation already described. It calls for restraint and self imposed ethical standard with the prescribers. That is what the IMS Act intends to do, i.e., not to influence the medical fraternity while writing a prescription.

Another ethical question is that though there has been a massive improvement in the marketing standards used to promote infant formula in developing countries, is that enough? Is the sale of those products more focalized and restricted to those who need it most? It can be reflected from the amount of sale of it each year. Obviously the projections till date are not very appropriate.

Social responsibility considerations. Ethical issues concern broader social responsibility rather a narrow legalistic 'compliance' attitude. With enforcement of IMS act it was thought and believed that medical fraternity as well as producers of infant milk substitute will take up an ideological role model which probably has not materialized to the extent it should have been.

7. Pre lacteal feeds

Social advocacy for pre lacteal feeds is high. Medical fraternity at times argue / misargue of hypoglycemia in preterm or small for dates and even in normal babies. Early breastfeeding and reassurance may obviate this apprehension. The very introduction of milk substitutes may turn to

be catastrophic at a later date. Health education to the parents and persons around whose opinion matters in child rearing will help in the long run.

8. The functional claims

A string of low cost additives are added to the formula and argument is extended for their performance benefit. The exemplary notation could be breast milk is rather deficient in Vit A, Vit D, Iron, DHA etc. which are added to the formula to eliminate the deficient status in the infant. There are constant efforts to add pro biotic / symbiotic to infant food with questionable benefits. The middle order health professionals get simply carried away with the deemed advantages elaborated and quite often than not forget the hazards that it can bring in return. Scientific research is not unwanted but it's communication without verification by authorities who are the stake holder of infant care in the world can be damaging

9. Sponsorship of Medical CMEs

Before the IMS Act era a large chunk of sponsorship used to be extended from the infant food industry for conferences and CMEs. Institutions like Indian Academy of Pediatrics and other medical fraternity joined hands to refuse the huge chunk. However of late, the industry found alternate ways of delivering the same thing. Conducting CMEs with dignified personalities both from home and abroad became a regular phenomenon. There might not be any legal inhibition to arrange the CMEs but to influence the participants with travelling allowances and five star hosting does reflect the intentions and the issue clearly gets converted to an ethical one.

The other way to target the health facility and personnel's is through formation of a new scientific group or trust being assisted by the industry. The trust / foundation / society works to disseminate medical knowledge and understanding of infant food and health with an ulterior motive to promote their product and influence on the group whose opinion and action is vital in child survival as well as decision making of the parents. This is probably the greatest ethical challenge to the medical fraternity. How to go by clearly depends upon our conscience.

CONCLUSION

In India rules are made but seldom followed. BPNI, IAP, IMA, FOGSI and many others claim to follow the IMS act very closely. Barring occasional stray reporting, hardly those organizations reported or fought for legal action at any time. It is not unusual to see a tin of milk in the post natal ward neither it is alarming to the participants to see an infant food producing pharmaceutical taking part in the conferences. Law in any country is not full proof neither the loop holes can be effectively closed. Therefore there is an urgent need to express ethical concern to settle down the issues around infant food and infant food industries.

REFERENCES

1. Blacks Law Dictionary page 884 & page 892
2. @ en.wikipedia.org/wiki/Ethics(Scientology)
3. Choudhury P, Gupta A. Protections IMS Act: Balancing trade infant and child Health. Indian Pediatr. 2005; 42:211-213
4. The infant Milk substitute, feeding bottles and infant foods (Regulation of production, supply and distribution) Amendment Act 2003. What has changed? Indian Pediatr. 2003; 40 : 747-757.
5. Costello A, Sachdev HPS, Protecting breastfeeding from breast milk substitutes. BMJ 1998; 310: 1103.1104.
6. Elizabeth Preble, Ellen G Piwoz. HIV an infant feeding, September 1998
7. William C. Heird, Nutritional Requirements, Nelson Text Book of Pediatrics, 17th Edition.

Section IV

SUPPORT

IYCF IN THE CURRICULUM OF MEDICAL EDUCATION

Dr. S Aneja, Dr. AK Patwari

Optimal infant and young child feeding practices are among the most effective interventions to improve child health. The Bellagio Child Survival Study Group, constituted by Child Survival experts from all over the world, has provided sufficient grounds to believe that estimated under-five deaths can be prevented by 13% with a simple intervention like exclusive breastfeeding for first 6 months of life and by additional 6% with appropriate complementary feeding.(1) This strategy also prevents under-nutrition which is responsible for at least 35% of under-5 deaths. Suboptimal nutrition is also a major factor which prevents children who survive, to reach their full developmental potential.(2) Unless massive improvements in child nutrition are made, it will be difficult to achieve Millennium Development Goals related to child health i.e. MDG-1: *Eradicate extreme poverty and hunger* and MDG-4: *Reduce child mortality* by 2015.(3) Global Strategy of Infant and Young Child Feeding (IYCF) aims to improve the survival, health, nutritional status and growth & development of infants and young children through optimal feeding.(4,5)

The usefulness of counseling was borne by a research study in India which included eight communities randomized to either receive intervention in counseling on breastfeeding or no intervention. At three months, exclusive breastfeeding rates were 79% in the intervention and 48% in control communities.(6) In order to provide counseling and support to the mothers we need to have skilled health professionals.

Baby friendly Hospital Initiative (BFHI) recommends ten steps for successful breastfeeding. Training of all health care staff working (in hospitals) in skills necessary to support breastfeeding is one of these 10 steps.(7)

Health professionals often do not have updated knowledge and skills to effectively support infant and young child feeding. Besides, hospital practices and routines impede the initiation and continuation of appropriate feeding practices and these wrong practices are learnt by the nursing and medical students.

WHO and UNICEF have developed training material for upgrading the skills. These training courses are highly structured and labor intensive and require a lot of resources. The pre-service education on the other hand reaches greater number of providers with lesser resources.

It is therefore necessary to invest in improving knowledge and skills, through pre-service education of doctors, nurses and ANMs.

IYCF IN MEDICAL CURRICULUM

Curriculum in the context of education is the totality of learning activities that are designed to achieve specific educational outcomes. The curriculum refers to both a written document and the actual practice of implementing an academic program. The curriculum of medical students is based on the healthcare needs of the population it is designed to serve. It must be flexible enough to incorporate changing healthcare needs and an emerging evidence base.(8) In addition, it should be regularly revised based on ongoing monitoring and evaluation. The key to good curriculum is to make a logical links between desired outcome (e. g., core competencies), teaching and learning methods, and the assessment of student's learning.

The curriculum for undergraduate students is focused on the needs of normal mothers and their healthy infants. All professionals regardless of whether or not they normally provide care for mothers and infants should have this level of knowledge and skills. All doctors are expected to have a basic understanding about the scientific evidence, clinical management of the normal mother and newborn, to provide health care that supports breastfeeding initiation and maintenance, and optimal complementary feeding. All health care providers need to be aware of the principles of IYCF, and need to attain basic clinical expertise in that area. For example, a surgeon who treats a lactating patient needs to know how the surgical procedures and required medications will affect the patient's ability to breastfeed. He or she should be able to coordinate care with other providers so the mother's possibility of initiating or continuing breastfeeding is optimized. The surgeon should be able to ascertain the issues involved and make appropriate referrals.

All pediatricians, and obstetricians, nursing tutors and nurses working in maternity wards should have higher level of expertise. This includes routine prenatal and postpartum counseling and the management of common concerns and complications. *The postgraduate programs* of Pediatrics, Obstetrics and community medicine should impart higher level of expertise to their students. In all medical colleges and nursing colleges the faculty members of the concerned departments should have expertise to transfer IYCF related skills to their under graduates and postgraduate students. The nursing students should have broadly similar curriculum with minor differences. The student of ANM schools will need to have fewer competencies as they are expected to refer the complex cases to health facilities. The competencies of health care providers required at various levels has been detailed for in-service training and can serve as a reference point for ANMs and AWW.(9)

IYCF RELATED CORE COMPETENCIES

The main learning objective for infant and young child feeding is to prepare health professionals to *protect, promote and support* recommended IYCF practices in Indian context. Core or essential competencies are the aspects of a subject that are essential to practice, and essential to master in order to graduate from an academic program (MBBS/MD in this context) and enter into professional practice. Course outcome competencies include knowledge, skills, and affective (values and behaviors) domains (Box 1) that are observable and can be appraised.

Box-1: Domains of learning
Knowledge: What we know (the <i>cognitive</i> domain)
Skills: What we do or perform (the <i>psychomotor</i> domain)?
Attitudes: How we feel about what we know and do (the <i>affective learning</i> domain)

The competencies for undergraduate medical students are listed in Table-1.

The competencies (in addition to those in Table-1) which should be acquired by postgraduate students of Pediatrics are listed in Table-2. The postgraduate students of obstetrics also need to have similar level of competence especially with regard to breastfeeding and counseling of HIV positive women. The postgraduate student of community medicine need to have all skills related to ambulatory care of women and children and the academic program should be adapted suitably.

LEARNING PROCESS

The competencies imparted at undergraduate level require the co-ordination of departments of obstetrics, pediatrics and community medicine. It is important that there is consistency of information across these disciplines. The books recommended for the students including prescribed textbooks/materials for all these subjects should be reviewed and developed to ensure the levels of competency achieved in breastfeeding and complementary feeding meet best practice standards. WHO has published a model chapter on IYCF which is an excellent resource material for this purpose.(10)

The transfer of skills should be done in small group sessions at model practice sites. The teacher or instructor should first give background information and then demonstrate the correct method of doing a particular task followed by the students practicing the task while the teacher gives feedback. (Table-3) In view of high student/teacher ratio the live demonstrations can be supplemented by video demonstration. The students get ample opportunity during the clinical rotation to practice and observe these. The BFHI accredited hospitals should serve as model practice sites for undergraduate students. The counseling skills can be taught by simulated patients and role plays. The Integrated Management of Childhood Neonatal Illness (IMNCI) strategy integrates feeding

counseling into the case management process for major childhood diseases.(11) The Government of India has recommended that this strategy be incorporated in undergraduate medical and nursing curriculum. However IMNCI does not include all IYCF related skills especially those required for initiating and sustaining breastfeeding at health facility.

The postgraduate programs are generally students directed and do not have formal didactic lectures. The postgraduate programs in pediatrics should provide ample opportunity for IYCF related competencies listed above. Post graduate training in Obstetrics has section on neonatology and infant feeding though currently there is not enough focus on skill development. There is need for greater involvement of Obstetric department in IYCF related activities which would also generate more interest of the postgraduate students and help them acquire skills.

Besides the knowledge and skills medical education should be geared towards helping students to inculcate professionalism and maintain ethics in practice. Health professional should also develop the attitude of life long learning.

Assessment: Since IYCF has been identified as a critical child health intervention this section needs to be given priority in assessment of knowledge as well as skills during the final examination. The cognitive domain is relatively simpler to assess during theory examination by short questions/MCQs. It is recommended that the skills be tested by OSCE or by clinical case during practical exams.(Table-4)

Evidence base data suggests that exclusive breastfeeding rates are increased by support for mother and infant pair by professional support. (12,13). The PROBIT trial in which intervention was modeled on BFHI proved that training of health professional improved duration and exclusivity of breastfeeding and also made an impact on hospital practices.(14) The BFHI has made an impact on breastfeeding duration rates at a national level in high income country like Switzerland.(15). Community based intervention which make use of frontline workers and peer counselors need to be combined with hospital based initiative to get the desired outcome.(16). This observation underscores the importance of providing training to all categories of health workers.

It is expected that a strategy that addresses the pre-service competencies of future health care providers to effectively to effectively promote, support and protect breastfeeding would have the long term effect of improving the quality of support for breastfeeding and thereby help in reducing the infant mortality and improving the nutritional status of infants.

REFERENCES

1. Jones G *et al.* How many child deaths can we prevent this year? *Lancet*, 2003; 362:65-71.
2. Black R *et al.* Maternal and child undernutrition: global and regional exposures and health consequences. *Lancet*, 2008, 371(9608):243-260
3. World Health Organization. Health and Millenium development goals. WHO 2005
4. WHO/UNICEF. Global strategy on infant and young child feeding. Geneva, World Health Organization, 2003
5. PAHO/WHO. Guiding principles for complementary feeding of the breastfed child. Washington DC, Pan American Health Organization/World Health Organization, 2003
6. Bhandari N, Bahl R, Mazumdar S, Martines J, Black RE, Bhan MK and the other members of the Infant Feeding Study Group. Effect of community-based promotion of exclusive breastfeeding on diarrhoeal illness and growth: a cluster randomized controlled trial. *Lancet* 2003; 361: 1418–23
7. World Health Organization, United Nations Children’s Fund. Baby-Friendly Hospital Initiative (Revised, Updated and Expanded for Integrated Care). Geneva, Switzerland: World Health Organization; 2006
8. WHO/JHPIEGO. .Effective teaching A guide for educating health care providers World Health Organization 2005
9. WHO/UNICEF Infant and young child feeding counseling –An integrated course. Geneva World Health Organization 2007
10. Infant and young child feeding: model chapter for textbooks for medical students and allied health professionals. World Health Organization 2009
11. Integrated Management of Neonatal and Childhood Illness Handbook for medical students WHO/ Ministry of Health & Family welfare Government of India 2003
12. Britton C, Mccormick FM, Renfrew MJ, Wade A King SE Support for breastfeeding mothers. *Cochrane database of Systematic reviews*. 2007 Issue 1. Art no :CD 001141
13. Labarere J, Gelbert-Baudino N, Ayras AS *et al.* Efficacy of Breastfeeding support provided by trained clinicians during an early, routine, preventive visit: A prospective randomized open trial of 226 mother-infant pairs *Pediatrics* 2005;115:e139-e146
14. Kramer MS *et al.* Promotion of breastfeeding intervention trial (PROBIT): a randomized trial in the Republic of Belarus. *Journal of the American Medical Association*, 2001, 413–420
15. Merten S, Dratva J, Ackerman-Liebrich U. Do baby-friendly hospitals influence breastfeeding duration on a national level? *Pediatrics*, 2005, 116:702–708.
16. Coutinho S *et al.* Comparison of the effect of two systems of promotion of exclusive breastfeeding. *Lancet*, 2005, 366:1094–1100.

Table-1: Competencies to be acquired during MBBS program

<p>Use Good communication skills to counsel a mother</p> <p>Counsel a pregnant woman about breastfeeding</p> <p>Help a mother to initiate breastfeeding</p> <p>Assess a breastfeed</p> <p>Help a mother to position a baby at the breast (after normal delivery and LSCS)</p> <p>Help a mother to attach her baby to the breast</p> <p>Explain to a mother about the optimal pattern of breastfeeding</p> <p>Support exclusive breast feeding for the first six months of life</p> <p>Help a mother with 'not enough milk'</p> <p>Help a mother who has breast and nipple problems - inverted nipple, breast engorgement, breast abscess</p> <p>Help a mother to breastfeed a low-birth-weight baby or sick baby</p> <p>Help a mother to express her breast milk by hand</p> <p>Counsel and teach the working mother how she can continue exclusive breastfeeding even after joining back after maternity leave</p> <p>Plot and interpret a growth chart</p> <p>Take a feeding history for an infant 0-24 months</p> <p>Teach a mother the Key Messages for complementary feeding</p> <p>Identify feeding problem in a child 6-24 months and counsel the mother appropriately</p> <p>Identify a child with moderate acute malnutrition and counsel mother appropriately</p> <p>Identify a child with severe malnutrition and refer for therapeutic feeding</p>
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Table-2: Additional IYCF Core Competencies required during MD (Pediatrics)

<p>Help a mother to breastfeed a low-birth-weight baby or sick baby</p> <p>Help a mother to cup feed her baby</p> <p>Help a mother with twins to breastfeed</p> <p>Counsel an HIV positive woman antenatally about feeding choices</p> <p>Support an HIV positive mother in exclusive breast feeding</p> <p>Support an HIV positive mother in replacement feeding (RF)if she opts for replacement feeding</p> <p>Help an HIV-positive mother when she decides to breastfeeding and make a safe transition to replacement feeds</p> <p>Take a feeding history of infant 6-24 months using dietary recall /food frequency table</p> <p>Help mothers whose babies are over six months of age to give Complementary feeds</p> <p>Help a mother with a breastfed child over six months of age who is not growing well</p> <p>Identify a child with moderate acute malnutrition and counsel mother appropriately</p> <p>Identify a child with severe acute malnutrition and provide appropriate treatment</p>
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Table-3: Steps of Imparting Practical skill
Step 1: Give information Introduce the skill. State the objectives of the demonstration Give background information Explain when the skill is used and why.
Step 2: Demonstration Use visual aids and a variety of teaching method. Whenever possible, use videotapes, slide set, or photographs. Make sure that everyone can see Demonstrate the skill correctly. Do not deviate or use shortcuts during a demonstration. Demonstrate the skill as a whole, then break it down into its parts, then demonstrate the whole again. Discuss and review the skill after the demonstration.
Step 3: Practice and feedback Give students opportunities to practice. Depending on the type and complexity of the skill, students may practice in different ways, such as with other students, models (e.g. breast model/doll), simulated patients, or real patients. Interact with students as they practice. Listen, ask questions, give positive feedback, and help students to solve problems. After practice discuss with the students to share their views and give suggestions on how they could improve.

OBJECTIVES	TEACHING METHODS	ASSESSMENT
1. Complete a feeding assessment of an infant 6-23 months	Individual reading Interactive presentation Viewing a demonstration video Role play in small groups Practice in clinic with mothers and children	Test of knowledge: <i>List the steps of a feeding assessment.</i> <i>Observation of counseling skills (summative): OSCE.</i>
2. List common feeding problems	Individual reading/lecture Brainstorming session on local feeding problems Review of clinical records Case study	Written assignments to assess knowledge : OSCE-simulated mother Identify feeding problem
3. Demonstrate nonjudgmental attitudes when counseling the mother of a child with feeding problem	Group discussion Counseling role plays	Observation of interaction with a mother or simulated patient

ROLE OF GOVERNMENT IN PROTECTING THE CODE

Dr. Satish Tiwari, Dr R. K. Agarwal, Dr Pushpa Chaturvedi

In today's high tech era, almost any information is available at the very doorsteps on the simple click of the mouse on internet or websites. But, unfortunately most of the times this information may be nonspecific, biased and unscientific, which may not be edited/screened by a qualified, experienced or a competent person. Thus it becomes a misinformation creating misconceptions or controversies ultimately resulting in damage/loss. Food and nutrition are one of the basic needs/ rights of any individual. Unethical, uncontrolled marketing practices by commercial food manufacturing multinational companies have added further to the age-old confusions and misconceptions associated with lingering heritage of artificial feeding practices. The commercial products are subtly portrayed to the consumers as latest, fashionable, essential and convenient to the so-called "modern parents" who wish to give their child the very best. World-wide discussions soon started to control this menace of unscientific marketing of foods so as to have a control over the increasing incidence of commerciogenic malnutrition. It was agreed upon that it was time to restrict many unethical and unscientific promotional practices.(1)

THE INTERNATIONAL CODE

The WHO and UNICEF organized an International meet on Infant and Young Child Feeding (IYCF) in Oct. 1979. After several discussions and consultations, a final Code was drafted in 1981 and approved by World Health Assembly (WHA) in May 1981 by 118 votes to 1 (United State not voting in favour).

According to the provisions of the article 11, the Government should implement, monitor and report progress to the WHO. The Code is mainly a recommendation to a government as a "minimum requirement" to be implemented "in its entirety". The Government should adopt a National legislation, a definite guideline or any other suitable measures to implement the provisions of the Code. The food industry has disputed the validity of Resolutions subsequent to the *International Code*.

CHIEF RESOLUTIONS OF WORLD HEALTH ASSEMBLY (WHA)

The **WHA resolution 49.15** (25 May 1996) calls for measures “to ensure that complementary feeds are not marketed for or used in ways that undermines exclusive and sustained breastfeeding. Measures should be taken to ensure that “the financial support to the professionals working in infant and young child’s health doesn’t create conflict of interests.

The **WHA resolution 54.2** (18th May 2001), recognizes the right of everyone to have access to safe and nutritious food, consistent with the right to adequate food and the fundamental right of everyone to be free from hunger, and that every effort should be made with a view to achieving progressively the full realization of this right.

The **WHA resolution 63.14** (21 May 2010), urges member states, to take necessary measures to implement the recommendations on the marketing of foods and non-alcoholic beverages to children, while taking in to account existing legislations and policies as appropriate. The resolution also urges to establish a system for monitoring and evaluating the implementation of the recommendations on the marketing of foods and non-alcoholic beverages to children.

Based on the model recommendations and provisions of *International code* and WHA resolutions many regional, zonal or National legislations, laws or Acts were enacted by respective groups or Governments.

THE CONVENTION ON THE RIGHTS OF THE CHILD (CRC)

The United Nations General Assembly, on 20th Nov. 1989 adopted the Convention on the Rights of the Child (CRC). This accepts that it is the right of the child to enjoy highest attainable standard of the health. This is one of the most universally embraced human right instruments in history, ratified by 191 countries throughout the world. The CRC is binding on Governments, which have a legal, and not just a moral, obligations to fulfil their commitments. The article 24 of the CRC asks the Governments to diminish Infant and Young Child mortality and combat disease and malnutrition by taking measures to ensure that all sectors of society, particularly parents “have access to education and are supported in the use of basic knowledge of child health and nutrition, the advantage of breastfeeding, hygiene and environmental sanitation and the prevention of accidents”.

THE INNOCENTI DECLARATION

In 1990, a high level, Government decision makers from 30 countries adopted this declaration in Florence, Italy. According to this declaration; all Governments by 1995 should have taken action to give effect to the aims and provisions of the articles of *International code* and subsequent WHA resolutions in their entirety.

The Codex Alimentarius Commission

This is an intergovernmental body established in 1963 with 140 member countries. It is a food standardizing process by FAO and WHO for international food products. The principle includes protecting human health and facilitating fair trade practices for the food products. It promotes consumer protection and international trade in food by prescribing acceptable food standards and acceptable levels of contaminants and additives in foods.(2)

The International Labour Organization (ILO) Convention 2000

It is important to support a woman in the workplace, so that she can successfully breastfed her baby. *WHA resolution 45.34* (14th May 1992) expressed its concern about the need to protect and support women in the workplace, for their own sake but also in the light of their multiple roles as mothers and care-providers, *inter alia (among other things)*; by applying existing legislation fully for maternity protection, expanding it to cover any women at present excluded or, where appropriate, adopting new measures to protect breastfeeding. It urges member states for enacting legislation and adopting means for its enforcement to protect the breastfeeding right of working women. The International Labour Conference adopted a new Convention on Maternity protection which extends maternity leave and includes paid breastfeeding breaks for mothers who are employed. Maternity benefits, including cash benefits, medical benefits, leave in cases of illnesses along with employment protection and non-discrimination etc. are also recommended.

THE INFANT MILK SUBSTITUTES (IMS) ACT

Based on the recommendations of WHA Indian government enacted *The IMS Act: The Infant Milk Substitutes, Feeding Bottles & Infant Foods (Regulation Of Promotion Supply & Distribution) Act, 1992*

The IMS act 1992 came in force since August 1, 1993. The Act had many loopholes which the multinational companies continued to exploit for promoting their products.(3) The Act was subsequently amended in 2003.(4)

The IMS Act controls marketing practices of baby foods, infant milk substitutes and related products, which constitute health hazard. The intents of the IMS Act are to save the lives of millions of children by improving their nutritional status. It is a special Act, which encompasses social and health concern of the community, particularly the poorer sections.

THE CABLE TELEVISION NETWORKS (REGULATION) AMENDMENT ACT 2000

In September 2000, The Cable, Television Networks (regulation) Act 1995 was amended. According to Sec. 6 & 7 of this act “no advertisement shall be permitted which is not in conformity with prescribed advertising code and which promotes directly or indirectly production, sale or consumption of infant milk substitutes, feeding bottles or infant foods”, through a cable service. After this amendment we do not see advertisements of baby foods on National Doordarshan channels. Similar amendments are needed to restrict the biased & unscientific advertisements on other channels, websites, magazines & even the news-papers.

Any violations to the provisions of this Act shall be reported to an authorized officer, which includes, i) a District Magistrate ii) a Sub-divisional Magistrate or iii) a Commissioner of Police.

ARE LEGISLATIONS EFFECTIVE?

The law is enacted by a political Government’s resolution. The policies of the government may not be need based and change according their own priorities. Some of the political decisions may have adverse effect as far as the health of the community is concerned. Many of legislations may be modified as per the industrial or commercial pressures. The proposal to repeal IMS Act and to enact “The Food Safety & Standards Bill, 2005”, is one such glaring example.(5) It is important that there should be a proper law enforcing and monitoring machinery. The people should be vigilant enough to see that the legislations do not become merely a piece of paper. It is not only the duty of the government to frame the laws but also of the people, parents and community to see that misconceptions are removed and the infant feeding practices are improved. It is our responsibility to awaken the consumers from the unethical, biased and unscientific propaganda by the media and the commercial food manufacturing companies.

ROLE OF THE GOVERNMENT

The role of the government & policy makers does not end with the enactment of the law. They should take some bold steps to implement the policies & provisions of the act. The Health Ministry, Women & Child Development Department, Human Resource Development Department should start promoting & supporting breastfeeding through TV & radio channels. We see clippings & advertisements on Pulse Polio, ORS, Smoking hazards, HIV etc., but we do not see any regular promotion of breastfeeding through these government media. Governments should realize that spending on infant and young child nutrition, especially on improving infant and young child feeding should be treated as investment pillar for improved health and development outcomes. Governments will be unsuccessful in the efforts to accelerate economic development in any significant long-term sense until optimal child growth and development, especially through appropriate feeding practices are ensured. The Government must look forwards and try to implement following recommendations:

Global legislation, binding to all states and private organizations including labour benefits, 6 (Six) months maternity and appropriate paternity leave is strongly recommended.

Scientific and unbiased IYCF practices must be promoted through regular advertisements in state, public or private owned audiovisual and print media. Public should be made aware that artificial, junk or packaged food can be injurious to the health of the children.

Necessary and adequate arrangements should be made for propaganda and implementation of the provisions of Infant Milk Substitute (IMS) Act which prevents advertising or promoting infant milk substitutes. In addition, further strengthening of the existing Act must be tried.

Adopt a National policy to avoid conflict of interests in the areas of child health and nutrition. Popularization of “unscientific health claims” by commercial advertisements through media needs to be restricted.

Government should explore the possibility of appointing or making Lactation counselor available at least at Block level.

Government along with International agencies should formulate National policy on Fortification of food with micronutrients.

The experts, academicians and government shall formulate / develop guidelines for management of Severe Acute Malnutrition (including effective home based care and treatment) in children.(6)

IS THERE NEED FOR MORE LEGISLATION?

Even after so many international and national legislations, some manufacturers are behaving as if these recommendations don't affect them. Either they have ignored or just given lip service to the provisions of these legislations. The manufacturers of artificial foods have promoted their products through a series of overt and subtle strategies. The present concerns are “**false health claims**” and Internet advertising adopted by the companies. The baby food industry now claims to support the International Code. Despite such assurances, companies continue to violate it in systematic manner and attempt to undermine its implementation. In recent years the industry has exploited fears about the transmission of HIV through breastfeeding. Research has shown that the companies will flout the Code where they can, but will curb their excesses when government acts. Does this mean that there is need for more stringent legislations?

In fact now it is felt that this is the proper time for further amendment so as to **extend the IMS Act into a “(Infant and Young Child Nutrition (IYCN) Act”** which will regulate not only the infant milk substitute but also various other foods, drinks (foods high in saturated fat, *trans*-fatty acids, free sugars, or salts and non-alcoholic beverages) that have detrimental effects on child health. The following issues also need further discussions:

Should the production of commercial food be stopped? The issue of need of production of commercial foods has been raised time & again. There are no definite advantages of “Ready to Use food” (commercial foods) over locally available, culturally acceptable natural food. The disadvantages of tinned food are also very obvious. The time has now come to think of banning of production of such foods rather than regulating their use, sale or promotion by the media & multinationals. The Business stakeholders will be the biggest hurdle in banning them.

The Maternity and Paternity Leave: As an increasing number of women are now working outside the home due to better education and economic needs, countries need to legislate for adequate maternity leave. These issues are discussed in separate chapter in this book.

Special benefits to working women: It has been suggested that the working women (especially those working in unorganized sector) should be given special benefits like; i) Nursing-Breastfeeding breaks in between the working hours, ii) Facilities/place (like crèche, mobile child-care units) to feed & take care the babies at work places, iii) Facilities to store/carry the expressed breast-milk and to feed the same iv) Facilities to carry the baby at work places etc. There should be adequate maternity protection for all women through appropriate

legislation to ensure optimal feeding practices. Maternity protection is in fact a precondition to equality and is non discriminatory.

CONCLUSION

Health workers and the child's relatives attitudes have a great influence on making & implementing decisions regarding IF practices. Poor IF practices and their consequences are one of the world's major problems and a serious obstacle to the social and economic developments. Experiences over the past few years have shown that, in reality, it is the health worker who ultimately bears the responsibility on the success or the failure of the various legislations. It is the responsibility of the Government, health workers and NGOs to ensure that correct, consistent and objective information is available on IYCF. There should not be any confusion, misconception or controversies. There is need to make the legal text more readable, relevant and interesting.

In last few decades or so, more and more babies are being fed with different type of artificial milk and baby foods. Many of us allowed the multinational companies to touch the lives of our babies, not because we didn't care, but because we didn't realize the consequences of granting such privilege.(7) Can the Codes, Laws, BFHI and all of us (health workers) reverse this trend of artificial feeding? Or will we have to wait till a natural calamity restores the nature's gift for the babies.

KEY MESSAGES

Health workers should apprise the community against the wasted, harmful purchases and "False Health Claims" by companies.

Health workers who request or accept free samples are equally at fault as multinational companies that offer them

Legislations, Codes, Laws, and Resolutions etc. are simply pieces of papers unless they are used as a tool for action in the ongoing battle for promoting infant health.

Campaigns are needed to encourage laws which protect infant health.

There is need to strengthen and implement the existing laws.

IMS Act can be amended as IYCN Act.

Follow the legislations in spirit and not in letters or words.

Anybody witnessing the violation of the legislated acts must take it a moral responsibility to report it, this will encourage others to join in this fight for the child's right.

REFERENCES

- 1) Tiwari S. Legislations & Infant feeding. In; Gupte S Editor; Text Book of Nutrition New Delhi, Peepee brothers 2006; 126-134
- 2) Kumta NB, Gupta S. Ecological aspects of Infant feeding In; Anand RK, Kumta NB, Kushvaha KP, Gupta Arun. Editors, The Science of Infant Feeding. 1st edition, New Delhi Jaypee Brothers; 2002, p 48-58
- 3) Tiwari S, Chaturvedi P: The IMS Act 1992; Need for more amendments & Publicity. Indian Pediatr 2003, 40: 743-746
- 4) Jain SC: IMS Amended Act 2003; What has changed? Indian Pediatr 2003, 40 : 747-756
- 5) Choudhury P, Gupta A. Protecting IMS Act: Balancing trade interest and child health. Indian Pediatr 2005, 42: 211-213
- 6) National Consultative committee for formulation of guidelines on IYCF practices, Indian Academy of Pediatrics, Tiwari SK, Dubey AP, Rajeshwari K. Infant and Young Child Feeding guidelines: 2010. Indian Pediatr 2010 (In press)
- 7) Andy Chetley. Protecting Infant health. 9th edition, Penang, Malaysia; IBFAN 1999: p. 1-33.

NATIONAL NUTRITIONAL SUPPLEMENTATION PROGRAMS IN PERSPECTIVE OF IYCF

Dr. Digant D. Shastri

Infant and young child nutrition has been engaging the attention of scientists and planners since long for the very simple reason that growth rate in the life of human beings is maximum during the first few years of life. Recent scientific evidence reveals that malnutrition has been responsible, directly or indirectly, for 60% of all deaths among children under five years annually.

Thirty percent of the world's population is affected by vitamin A, iron or iodine deficiency. About 700 million persons suffer from clinical forms of these deficiencies and another two billion from sub-clinical forms. Apart from these three major public health problems, deficiencies of other micronutrients such as zinc, calcium, folic acid and other vitamins are widely prevalent in the developing world. Three quarters of the populations suffering from these deficiencies live in Asia. Over the last decade, the proportion of Asian households consuming iodized salt has increased significantly, resulting in lower goiter rates. Yet, nearly one billion people in the region remain uncovered by Universal Salt Iodization (USI). The prevalence of xerophthalmia and blindness has reduced to a great extent but one third of the preschoolers still have sub-clinical Vitamin A Deficiency (VAD), which increases the risk of disease and death. Iron Deficiency Anemia (IDA) affects 60 percent of women of reproductive age and is an important cause of maternal mortality. It reduces physical work capacity and productivity in adults and impairs learning ability and scholastic achievement in children. Both iron and iodine deficiencies have a negative impact on psychomotor development of children, which may be permanent if not corrected early in life. Thus micronutrient malnutrition poses a serious threat to national health and development.

MICRONUTRIENT STATUS IN INDIAN CHILDREN

Vitamin A deficiency in 6-59 months old children	57%
Iodine deficiency in children	33%
Prevalence of anaemia in 6-59 months old children	75%
Prevalence of anaemia in women	51%

The consequences of these deficiencies are clear for India:

330,000 child deaths are precipitated every year due to VAD.

22,000 people, mainly pregnant women, die every year from severe anaemia.

6.6 million children are born mentally impaired every year due to iodine deficiency.

Intellectual capacity is reduced by 15 per cent due to iodine deficiency.

200,000 babies are born every year with neural tube defects due to folic acid deficiency; this is 16 times the global average.

INDIA MICRONUTRIENT NATIONAL INVESTMENT PLAN (IMNIP)

The India Micronutrient National Investment Plan for 2007-2011 has been prepared in response to the Government of India's increased priority towards combating malnutrition, specifically micronutrient malnutrition. At the Copenhagen Consensus, a set of international priorities developed in 2004 by an expert panel of leading international economists using cost-benefit criteria, identified addressing micronutrient malnutrition as its second highest priority. Reducing micronutrient malnutrition has been cited as an important dimension of strategies designed to address no fewer than six of the Millennium Development Goals, and is being currently addressed seriously by the Government Of India for those pertaining to poverty alleviation, universal primary education, gender equality, reduced child mortality, improved maternal health and combating HIV/AIDS, malaria and other diseases.

The IMNIP explicitly seeks to address those targets of the Planning Commission's 10th Five-Year Plan (2001-2006) that have not yet been achieved, i.e.

Eliminate Vitamin-A deficiency as a public health problem.

Reduce the prevalence of anaemia by 25% and moderate and severe anaemia by 50% in children, pregnant and lactating women, and adolescents.

Achieve universal access to iodized salt.

Generate district-wide data on the consumption of iodized salt.

Reduce the prevalence of Iodine Deficiency Disorders (IDD) in the country to less than 10% by 2010.

In seeking to address these targets, the IMNIP proceeds to address each of the major micronutrient deficiencies (Vitamin-A, iron and folic acid, iodine and zinc) plus multiple deficiencies through a combination of micronutrient supplementation, fortification and dietary diversification.

The supplementation and fortification activities for which additional costs are provided are the following:

Twice-yearly Vitamin-A syrup for children aged 9-59 months.

Home-based fortification premix (Anuka/ Sprinkles™) for children aged 6-24 months.

Nutri-candies for children aged 24-72 months.

Vita-shakti to fortify the food for children aged 24-72 months in the Integrated Child Development Services (ICDS) and Mid-Day Meals programmes.

Iodized/Double-Fortified Salt (DFS) and iron and folic acid fortified wheat flour distributed through the Public Distribution System (PDS).

Iron-Folic Acid tablets for adolescent girls, pregnant and lactating women.

Fortified wheat flour with iron and folic acid for the general population.

Zinc as adjunct therapy for diarrhoea.

Adding zinc to fortified foods.

Fortification Strategy to reduce Micro Nutrient Deficiencies (MND)

Effective nutrition interventions are available to prevent MND and their consequences. Short-term strategies such as nutrient supplementation (giving a large dose of the micronutrient as a medicinal supplement) have been effective in providing immediate relief in several countries, but there is concern that this approach is not sustainable in the long term. Food fortification is a more cost-effective and sustainable solution. It plays a major role in improving the diet and meeting the micronutrient needs of the population.

Food fortification has several advantages over other interventions as it does not necessitate a change in dietary patterns of the population, can deliver a significant proportion of the recommended dietary allowances for a number of micronutrients on a continuous basis, and does not call for individual compliance. It could often be incorporated harmoniously into the existing food production and distribution system, and therefore, can be sustained over a long period of time. Salt iodization is a good example of successful large-scale fortification in the developing world, the main reason for success being the simple and low-cost technology.

Policy on micronutrients

Vitamin-A

A Vitamin-A supplementation program has been in operation in India since 1970. National prophylaxis program for Prevention of Blindness comprises of both long term and short term strategy. The short term interventions focuses on administration of mega doses of vitamin-A on

periodic basis, while dietary improvement is the ultimate long term solution to solve the vitamin-A deficiency.

In recent years, there has been considerable debate on the continuation of the vitamin-A supplementation program. Since keratomalacia and resulting blindness is no longer a significant problem, opponents argue that there is no need for supplementation and that milder forms of deficiency can be addressed through alternate strategies aimed at dietary improvement. Vitamin-A intakes of children are less than half the RDA even today, with a significant proportion of them having clinical evidence of deficiency. Under these circumstances, it is not wise or ethical to withdraw the benefits of supplementation.

Prevention of Vitamin-A deficiency

1. Promotion of consumption of Vitamin-A rich food

- a. Regular dietary intake of vitamin-A rich food by pregnant & lactating mothers and children < 5 years
- b. To make aware the importance of prevention of vitamin A deficiency to mothers attending antenatal clinics
- c. Encourage breastfeeding including colostrums feeding
- d. Feeding of locally available beta-carotene rich food
- e. Increasing growing of vitamin A rich food in home garden.

2. Administration of Vitamin-A supplemental doses

- a. Administration of Vitamin-A dose to every child at 6 months interval, a dose of 100,000 IU to infants 6-11 months and dose of 200,000 IU to children 1- 5 years age.
- b. Contact infant at the time of measles vaccine between 9-12 months age

3. Treatment of Vitamin-A deficient children

Iron Folic Acid (IFA) supplementation - National Nutritional Anaemia Prophylaxis Program

Iron And Folic Acid deficiency anaemia affects an estimated 51% of reproductive age women and 75% of children in India. The government's 10th Plan explicitly focuses on both the means of addressing severe anaemia in the worst-affected groups (children, pregnant and lactating women and adolescents), and anaemia in the population at large.

At present, in parts of rural India, daily intake of folic acid is only a quarter of that needed to prevent birth defects. To prevent these irreversible defects, adequate folic acid is essential very

early in conception. This indicates a need for food fortification, since supplementation during pregnancy usually only begins after the first trimester. Providing a folic acid supplement during the later trimesters of pregnancy, however, will guard against anaemia and associated maternal mortality.

Accordingly, the key elements of the IMNIP to address iron deficiency anaemia are:

- An intensified effort to reach all pregnant women and adolescent girls in the country with iron-folate tablets accompanied by appropriate counselling

- Fortification of wheat flour with iron and folic acid

- Sale of fortified wheat flour through Public Distribution Systems (PDS), to reach those below the poverty line

- Double Fortified Salt (DFS) with iodine and iron, for sale through the PDS. This will target those households whose members are likely to be micronutrient deficient.

- Different activities to address iron-deficiency anemia, as well as other micronutrient deficiencies, in young children, including micronutrient-fortified candies, 'khichdi' (Vita-shakti) and RTE (Ready to Eat) food provided through Anganwadi centres; micronutrient enrichment of ICDS food supplements; and the provision through ICDS of micronutrient home-based fortification (e.g. Anuka/Sprinkles™) to mothers of very young children for addition to complementary food.

Iodine

An estimated 6.6 million children are born mentally impaired each year in India due to iodine deficiency in mothers; overall the country's intellectual productive capacity has been reduced by around 15% due to IDD. Since there is no assured way to obtain iodine from the diet due to low iodine in the soil, salt iodization is the worldwide intervention of choice to combat this deficiency. Relatively small proportion of Indian households, an estimated 50%, consume adequately iodized salt.

Another option for addressing IDD is the free provision of iodized salt to ICDS households. In Chhattisgarh, any household registered in ICDS with a woman of child-bearing age receives 1 kg of iodized salt every month. Although this may be a cost-effective solution to IDD alleviation, it is not included in the IMNIP, which encourages the provision of DFS to PDS households, many of which are also registered with ICDS. If DFS is distributed, both iodine and iron deficiencies will be reduced in this target population.

Zinc

Zinc deficiency is now understood to be a major contributing factor to nutritional stunting, which currently affects 42% of all children in the country. This deficiency also reduces the body's immune response, thereby increasing the risk of diarrhoeal disease and pneumonia.

The International Zinc Nutrition Consultative Group (IZincG) estimates that 25.9% of the population in India receives inadequate zinc. The Investment Plan proposes to expand existing interventions to reduce zinc deficiency by:

- Administering zinc tablets to children following diarrhoea episodes.

- Adding zinc to home-based fortificant (e.g., Anuka/ Sprinkles™).

Multiple Micronutrients

In many cases, it is possible to address micronutrient deficiencies with one intervention.

In the case of very young children (6-24 months), the most promising intervention addressing iron, folic acid, Vitamin-A, and zinc deficiencies, is a home-based fortification premix (e.g. Anuka/ Sprinkles™), a vitamin and mineral mix designed to be added to complementary food. Anuka/ Sprinkles™ circumvent the difficulty of tablets which are difficult for a young child to swallow, and of syrups which present problems of taste and teeth discolouration.

For somewhat older children (aged between 24-72 months), the IMNIP provides for a combination of nutri-candies, fortified khichdi (Vita-shakti) and fortified RTE food. For all pre-school age children, such supplements will be provided through the ICDS. For school-going children, on-site fortification will be provided as part of the Mid-Day Meals program.

ROLE OF UN AGENCIES IN FEEDING

Dr. Rajiv Kumar Bansal, Dr. Charu Kalra

INTRODUCTION

Role of UN agencies in supporting feeding in infants and young has been of utmost vitality and importance since its very beginning and today it has reached a stage where any program related to feeding is inconceivable without a UN agency's intervention.

Inappropriate breastfeeding - complementary feeding and uncontrolled distribution of infant formula, all heighten the risk of malnutrition, illness and mortality, especially in the face of disrupted and/or poor water and sanitation conditions that typify acute emergency situations.

Knowing these facts an urgent need to centralize the supporting systems for infant and young feeding was felt and so UN agencies came forward and initiated various programmes since 1990. But the biggest turnover came with the initiation of global strategies for infant and young feeding. Global strategies for infant and young feeding which was approved in the year 2002 sets the standards for global action in support of optimal breastfeeding, complementary feeding, and related maternal nutrition and health.

WHICH UN AGENCIES?

United Nations High Commission on Refugees (UNHCR)

World Food Programme (WFP)

World Health Organization (WHO)

United Nations Children's Fund (UNICEF)

Emergency Nutrition Network (ENN)

International Baby Food Action Network - Geneva Infant Feeding Association (IBFAN-GIFA)

United Nations University (UNU)

HOW UN AGENCIES WORK FOR INFANT FEEDING?

UN agencies work at 2 levels. Upstream levels and at grass root or downstream level.



VARIOUS PROGRAMMES UNDER UN AGENCIES

BFHI (Baby Friendly Hospital Initiative) based on the Ten Steps to Successful Breastfeeding, a programme that was initiated in 1990 summarizes the practices that maternity wards need to adopt to support breastfeeding.

The Code of Marketing of Breast milk Substitutes that called on governments to take measures to establish

- A national breastfeeding coordinator of appropriate authority, and multisectoral national breastfeeding committee
- Maternity services fully practicing the Ten Steps to Successful Breastfeeding (BFHI) 3. Implementation of the International Code and subsequent relevant WHA resolutions
- Legislation for the breastfeeding rights of working women and its enforcement

The Millennium Development Goals, pledged by 189 United Nations members, states regarding reduction in under-five mortality by two-third.

The World Fit for Children goals, which called for protecting, promoting and supporting exclusive breastfeeding of infants for six months and continued breastfeeding with safe, appropriate and adequate complementary feeding up to two years of age or beyond and provide infant-feeding counselling for mother living with HIV/AIDS to that they can make free and informed choices.

The Emergency Nutrition Network (ENN) (1996) set by an inter-agency group of humanitarian organisations to improve practice and strengthen the institutional memory of humanitarian agencies involved in the food and nutrition sector of emergencies.

Global Strategy on Infant and Young Child Feeding (GSIYCF) was developed in 2002 sets out targets for improving child survival through enhancing optimal infant and young child feeding, including in difficult circumstances like HIV and emergency situations. The feeding of infants in emergency situations policy and guidelines were compiled by UNICEF (1993) which were reviewed in 2000 by Save the Children, UK, UNICEF and the Institute of Child Health

World Alliance for Breastfeeding Action (WABA) an alliance of networks and organizations such as the International Baby Food Action Network (IBFAN), La Leche League International (LLI), and the International Lactation Consultant Association (ILCA), and individuals to protect, promote and support breastfeeding has made significant contributions regarding breastfeeding in the context of HIV.

WHAT ELSE NEEDS TO BE DONE?

High decline in morbidity and mortality in under-5 children and infants is a mirror to what UN agencies have done in past 2 decades in the field of infant and young feeding but there are few suggestions which can be considered in upcoming programs and policies.

Comprehensive guidelines on complementary feeding.

More educational programmes regarding optimal feeding, not only for mothers but also for all family members.

Efforts in health facilities need to be linked with outreach efforts so that interventions effectively reach women.

Targeted approach in developing countries.

More and more of political and financial sector involvement.

REFERENCES

1. A Gupta. *Infant and Young Child Feeding An 'Optimal' Approach*: Economic and Political Weekly, 2006. Available at: www.ibfanasia.org
2. Seal, A., Taylor, A., Gostelow, L. and McGrath, M. (2001). Review of Policies and Guidelines on Infant Feeding in Emergencies: Common Ground and Gaps. *Disasters*, 25: 136–148
3. *The Global Strategy for Infant and Young Child Feeding*, WHO/UNICEF, 2003

4. Schultink W, Arabi M. Effective nutrition programming for children and the role of UNICEF: consensus points from an expert consultation. Food Nutr Bull. 2009 Jun; 30(2):189-96
5. Nevin S. Scrimshaw. *A personal overview of the role and co-ordination of United Nations agencies in food and nutrition*: The United Nations University Press. *Food and Nutrition Bulletin* 1981 April (3)
6. Lewis, S. “Keynote Address” WABA-UNICEF Colloquium on HIV and Infant Feeding, Arusha, Tanzania
7. *UNICEF and the Global Strategy on Infant and Young Child Feeding (GSIYCF) Understanding the Past – Planning the Future*: UNICEF 2003

ROLE OF HEALTH WORKERS

Dr. C. R. Banapurmath

Who is a Health Worker?

All medical, nursing and paramedical staff in contact with pregnant women, lactating mothers and young infants (0-24 months) can be called as health workers. Hence, all Paediatricians, Obstetricians, Medical officers, Community medicine faculty members, Post graduates, Interns, duty doctors, medical students are all health workers. Similarly, all nursing faculty, staff nurses, nursing students are also health workers apart from field staff of health department, women and child development department and ASHA workers.

Anganawadi workers, ANM's, ASHA and Dai's apart from counsellors are referred to as front line workers (FLW). Similarly all the support care staff employed in Pediatrician's offices is also health workers.

Infant and young child feeding revolves around ability of health workers capacity in listening, learning and building confidence of the mothers. Hence, health workers need training in IYCF counselling.

What is the role antenatally?

During pregnancy, the frontline workers come in closer contact with the pregnant women and her family members. In hospitals where large number of pregnant women comes for antenatal guidance and examination, such beneficiaries spent lot of time while waiting for the consultant. This scenario provides an excellent opportunity for meaningful interaction. Building the capacity of the front line workers would go a long way in helping the pregnant mothers. Pregnant women have multiple doubts and when they are encouraged, they come out with such doubts and queries.

What is the role of health workers during labour?

It should suffice to mention that every mother in labour needs the help of health workers. Giving moral support and building confidence of such women is important. It has been shown that using non pharmacological methods like rubbing of back, touch and acupressure can alleviate the labour

pains. Traditional Doulas (women who provide non-medical support during labour and birth, and also the postpartum) have mastered this art.

Mother-Friendly Childbirth: Highlights of the Evidence

The Evidence Basis for the Ten Steps of Mother Friendly Care (*Journal of Perinatal Education*, Vol. 16, Supplement 1, Winter 2007), published in Lamaze International's peer reviewed professional journal, is the result of an extensive review of the research behind today's maternity care practices by the *Coalition for Improving Maternity Services (CIMS) Expert Work Group*. Citizens for Midwifery and Birth Network National have developed this summary of the research findings regarding the Ten Steps of Mother Friendly Care as defined in the CIMS' **Mother-Friendly Childbirth Initiative (MFCI)**, as well as an Appendix examining out of hospital birth.

Step 1: Offers all birthing mothers' unrestricted access to birth companions, labor support, and professional midwifery care.

UNRESTRICTED ACCESS TO BIRTH COMPANIONS

Perception of support during labor was a key ingredient in a woman's ultimate satisfaction with her birth experience and was more important in determining satisfaction than experience of pain or satisfaction with pain relief. More satisfaction was reported with birth support when provided by a partner or 'doula', compared to a doctor or nurse.

ACCESS TO LABOR SUPPORT

Using labor support reduced likelihood of requesting pain relief in labor, reduced likelihood of severe postpartum pain, increased likelihood of spontaneous birth (vaginal birth without the use of forceps or vacuum extraction), increased satisfaction with the birth experience, and resulted in fewer cesareans and less oxytocin during labor.

ACCESS TO MIDWIFERY CARE – Use of midwives was associated with:

- Increased length of prenatal visits, more education and counseling during prenatal care, and fewer hospital admissions.
- Less need for analgesia and/or epidural anesthesia and increased use of alternative pain relief methods, as well as more freedom of movement in labor and intake of food and drink.
- Decreased use of amniotomy (membrane rupture), IVs, electronic fetal monitoring; fewer inductions and augmentations of labor; and fewer injuries of the perineum as shown by fewer episiotomies, fewer rectal tears, and more intact perineum.
- Fewer cesareans overall, including fewer emergency cesareans for fetal distress or for inadequate progress in labor, and more vaginal births even after cesareans. Fewer infants born preterm, low birth weight or with complications such as birth injury or requiring resuscitation after birth, and more infants exclusively breastfeeding at 2 to 4 months after birth.

STEP 2: Provides accurate, descriptive, statistical information about birth care practices.

The only study on this topic found that providing evidence based information does not cause harm. The concept of “informed consent” is widely recognized as a fundamental human right, including the federal HIPAA law (The Health Insurance Portability and Accountability Act. It was first enforced in 1996. This act was created to provide protection for personal health information. It provides needed information to health care providers for patient care, but also provides patients certain rights to that personal information). Integral to these rights are discussions of benefits/risks of treatment or non treatment, informed consent and informed refusal, as well as the basic human right to personal autonomy.

STEP 3: Provides culturally competent care.

Culturally competent care was associated with improved communication, avoidance of medical errors, and increased patient/client satisfaction and confidence in health provider.

STEP 4: Provides the birthing woman with freedom of movement to walk, move, and assume positions of her choice.

No evidence of harm found when restriction is not required to correct a complication. Walking, movement, and changes of position may shorten first and second stage labor, were effective forms of pain relief, led to fewer non reassuring fetal heart rate patterns, fewer perineal injuries, and less blood loss. Walking during first stage of labor decreased the likelihood of delivery by surgery, forceps or vacuum extraction.

STEP 5: Has clearly defined policies, procedures for collaboration, consultation, and links to community resources.

Benefits for both mothers and babies were associated with continuity of care and collaborative care approaches, including more spontaneous vaginal births, less frequent use of epidural anesthesia, babies less likely to need resuscitation, and improved breastfeeding. Women who did not receive continuity of care were less likely to feel supported during labor, feel prepared for parenthood, or discuss pregnancy and postpartum concerns and problems with their caregiver(s).

STEP 6: Does not routinely employ practices, procedures unsupported by scientific evidence.

Examples of frequently used interventions that are not supported by evidence:

- Routine *amniotomy* failed to reduce the cesarean rate, may increase the risk of non reassuring fetal heart rate, may increase the maternal and neonatal infection rate, and can lead to umbilical cord prolapse.
- Routine *continuous electronic fetal monitoring*, compared with intermittent auscultation, increased the likelihood of instrumental vaginal delivery and cesarean section and failed to reduce rates of low APGAR scores, stillbirth and newborn death rates, admissions to special care nursery, or the incidence of cerebral palsy. Neonatal seizures associated with high dose oxytocin were reduced with EFM.
- Elective (without medical indication) *labor induction* was associated with an increase in the use of analgesia and epidural anesthesia, and in the incidence of non reassuring fetal heart rate patterns, shoulder dystocia, instrumental vaginal delivery, and cesarean surgery.
- Episiotomy* did not improve neonatal outcomes and resulted in more pain, more rectal tears, poor healing, weaker pelvic floor muscles, and worse sexual functioning.
- Cesarean surgery* increased the likelihood of infection, anesthesia complications, surgical injury, hysterectomy, need for blood transfusion, chronic pain, breastfeeding failure, poor physical or mental health, infertility and life threatening placental attachment problems in future pregnancies, in addition to increased likelihood of increasingly risky repeat cesarean surgery for future pregnancies.

STEP 7: Educates staff in non drug methods of pain relief and does not promote use of analgesic, anesthetic drugs.

- Massage and encouraging touch* was associated with reduced maternal pain, stress and anxiety, and helped women cope with labor.
- Hypnotherapy* was associated with reduced need for analgesia and for oxytocin augmentation of labor, increased maternal satisfaction with pain relief, and shortened labor duration.
- Hydrotherapy* was associated with reduced maternal blood pressure, decreased pain during the dilation phase of labor, reduced need for analgesia or anesthesia, reduced need for augmentation for slow labors, decreased fetal mal-presentations, and increased maternal satisfaction with pushing efforts.
- Epidural anesthesia complications* included severe itching (narcotic epidural), longer labor, increased use of oxytocin, more mal-positioned babies, increased use of instrumental vaginal delivery, more rectal tears, and possibly more cesarean surgeries, especially when anesthesia is initiated in early labor.
- When opioids (morphine derivatives) were used, newborns were more likely to experience respiratory distress and delayed breastfeeding.

STEP 8: Encourages all mothers, families to touch, hold, breastfeed, care for their babies.

Touching, holding and caring for infants was associated with enhanced attachment between mothers and babies, whether the baby was healthy, sick, premature or had a congenital birth defect. Eliminating or minimizing separation of mothers and babies for procedures whenever possible reduced distress in healthy and sick infants. Unimpeded early skin to skin contact increased breastfeeding initiation and duration in mothers with healthy infants.

STEP 9: Discourages nonreligious circumcision of the newborn.

Circumcision performed in the newborn period did not prevent problems that occur in adolescence or adulthood. Assuming a 2% complication rate, circumcising 1,000 male infants would prevent 9 cases of infant urinary tract infection, but would cause complications in 20 babies. No risk or lower risk alternatives may achieve the same benefits ascribed to routine infant circumcision.

STEP 10: Strives to achieve the WHO/UNICEF *Ten Steps of the Baby-Friendly Hospital Initiative* to promote successful breastfeeding.

Hospital based breastfeeding promotions can extend duration of exclusive breastfeeding. Infants born in facilities that adhere to the Baby Friendly Hospital Initiative's (BFHI) *Ten Steps to Successful Breastfeeding* were significantly more likely to be breastfeeding at 12 months than those who were not, were more likely to be exclusively breastfed at 3 and 6 months, and had significantly fewer gastrointestinal tract infections.

APPENDIX: Birth can safely take place at home and in birthing centers.

Summarizes evidence regarding both *home birth* (low risk women planning to give birth at home with a qualified provider) and birth in *freestanding birth centers* (independent facilities that provide care to low risk women and their newborns). Reviewers found:

- Lower rates of labor induction and augmentation, less use of amniotomy, IV fluids, continuous electronic fetal monitoring.
- Less need for analgesia or epidural or spinal anesthesia, more freedom of movement in labor (*home birth*).
- More effective pain management in labor; more freedom of movement and intake of food and liquid in labor (*freestanding birth centers*).
- Fewer cesarean surgeries, vacuum extractions, forceps deliveries and episiotomies.
- Similar outcomes compared with babies of low risk women planning hospital birth.

"Because of its inherently non-interventive and more intimate nature, out of hospital birth facilitates mother friendly care."

<http://www.motherfriendly.org/pdf/MFCevidencehighlights13B.pdf>

It is now very well known that onset and establishment of lactogenesis is dependent on various factors like:

Priming the mind of the mother. This should start in the antenatal period and continue till successful breastfeeding is established

Providing “skin-to-skin” contact between baby and mother from the time of child birth, after the baby has cried well and settle down, until the baby goes to deep sleep. Initiating breastfeeding by breast crawl is accepted as most scientific method.

Practicing all the 10 steps of BFHI during the first few days is crucial.

Step 6, 7 and 8 are interlinked with each other. Demand feeding, frequent feeding, co-sleeping, night feeding are important. Implementing these steps in every maternity facility and community (50% mothers deliver at home) is only possible when capacity of all health workers is optimized.

Avoiding nipples, teats, soothers, pacifiers or dummies, and bottle feeding needs constant vigil and high levels of training and understanding.

Lactating mothers depend on help and guidance from health workers and family members. This technical help is most crucial in the first postnatal week.

What is the role of health workers in early and exclusive breastfeeding for 6 months?

Every baby is brought to the health facility for immunization. There are at least 5 such visits in the first 6 months. Growth and nutritional adequacy monitoring during such visits when clubbed with informal chatting with the mother brings out useful information. Hence, when health workers are trained, they can play a great role.

Mothers meetings which are held at village level on every 3rd week of the month, where in all pregnant and lactating mothers assemble, as has been visualized by the Anganawadi Workers is an excellent platform for exchanging thoughts and actions by mothers themselves.

The date of birth approach: When a birth date approach is put into the mind of the mother, exclusive breastfeeding can be expected to be practiced more efficiently.

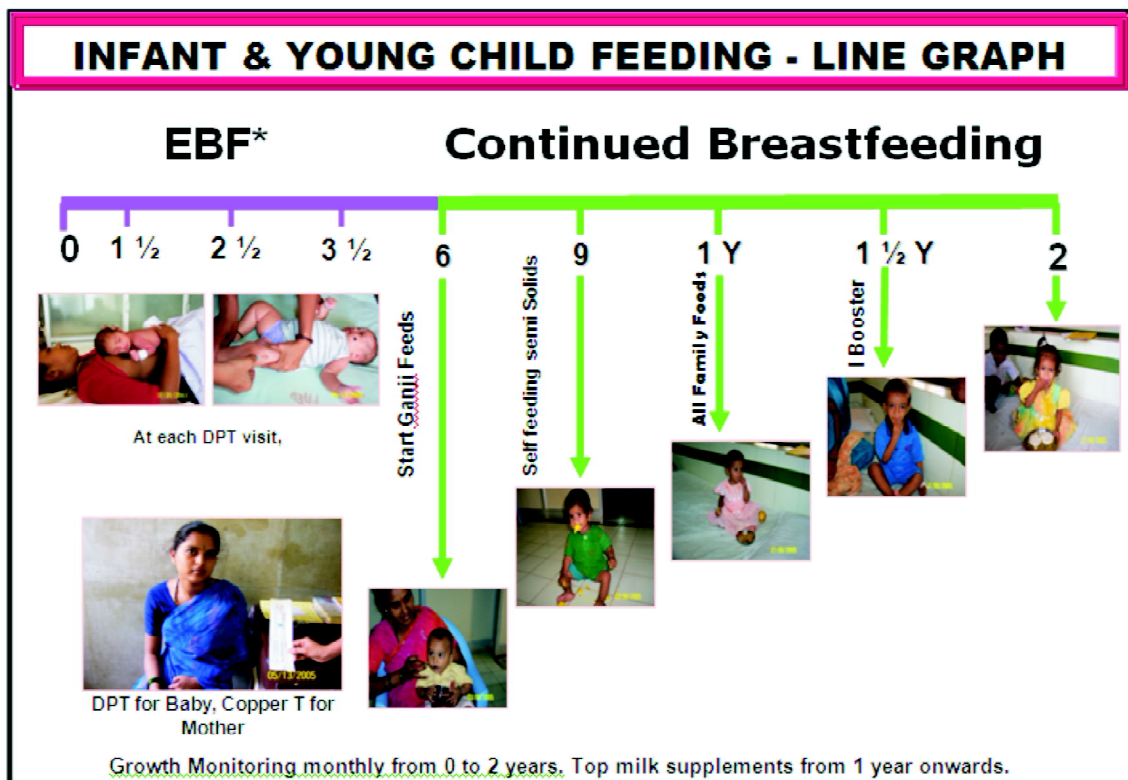
What is the role of health workers from 6 months to 24 months?

The seeds of under-nutrition are sown in this period. Mothers need constant and ongoing support. Children frequently fall ill. Feeding of young infants during and following illnesses is challenging. Encouraging self feeding among children from 9th month onwards and responsive feeding are vitally important. This period is dynamic and constantly changing. Infant care givers need proper guidance.

Getting the child for monthly growth monitoring through out the first 2 years would be an excellent strategy to not only prevent under nutrition but also to promote appropriate health and nutritional status of young infants of India. During every such visit, the weight of the baby must be informed to the mother and preferably every health worker should have two growth charts, one for their record and the other for the mother. Growth monitoring is the mirror of child health.

Implementing all the 10 guiding principles of complementary feeding cannot be over emphasized. Encouraging the mother to continue to breast feed for 2 years is equally important. This cannot happen unless the health worker has also counselled the mother on spacing. Hence, “*DPT for the baby and Copper-T for the mother*” would be an important approach.

The IYCF Line graph summarises all these points discussed so far.



ROLE OF NON-GOVERNMENT ORGANIZATIONS

Dr. Anurag Singh

CURRENT SCENARIO

The 2008 India Report reveals glaring gaps in both policy and programs that support breastfeeding and infant and young child feeding.¹ It is quite evident that not much has significantly changed over the past few years in the policy environment, except that maternity benefits have been provided to a miniscule number of women working for the Central government. Such benefits are not available to women working in the private and the informal sectors. There has also been little progress in the acknowledgement of crèches as a support to breastfeeding and the number of crèches to support women working in the informal sector continues to be woefully inadequate. Program focus on breastfeeding and complementary feeding is just a lip service; serious inputs are needed to increase early and exclusive breastfeeding.¹⁻³

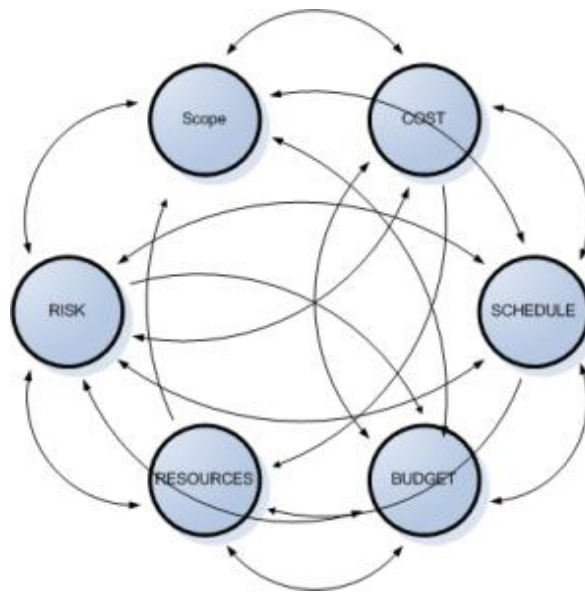
NEED FOR COORDINATION

There are major differences in the way in which various stakeholders perceive Infant and Young Child Feeding. There is not only ambivalence in the objectives but also a variation in the strategies. Accordingly, the stakeholders are confined to and work within their own microenvironment. Medical Colleges are responsible for Undergraduate and Post Graduate teaching. They are more concerned with the definitions, latest guidelines, lectures and presentations. They are also involved in the bed side teaching and generate clinical data but are less involved in policy formation and defining the curriculum. Even allocation of theory and practical time on IYCF is not flexible at most institutions. The lessons learned from field experience are not integrated with the teaching in a horizontal plane with time. The Indian Academy of Pediatrics can play a vital role in formulation of guidelines and influencing government policies. Likewise the Government ministries i.e. Health, Social Welfare, HRD, Women and Child development, Education, Technical and Higher Education as well as other central and state bodies have an important role to play in delivering the much desired improvement in IYCF policy and practice in the country but they need continuous, coordinated and concerted effort.

WHY NON-GOVERNMENT ORGANIZATIONS (NGOS)?

The diagram 1 shows the sextuple management constraints. Issues of scope, cost, risk, resources, budget and schedule crop up during implementation of any policy or program. They are intertwined in a complex manner. Not all stakeholders are equipped to deal with these complexities. Each one is working within their own framework and more often than not they find it very difficult to solve these entangled and interdependent issues. NGOs have experience in dealing with these situations and are proficient in dealing with these sextuple management constraints⁴.

Diagram 1: Sextuple management constraints



WHAT ARE NGOS

In India non-profit / public charitable organizations can be registered as **trusts**, **societies**, or a **private limited nonprofit company**, under section-25 Companies' Act.

Non-profit organizations in India⁵

Exist independent of the state

Are self-governed by a board of trustees or 'managing committee' / governing council, comprising individuals who generally serve in a fiduciary capacity

Produce benefits for others, generally outside the membership of the organization and

Are 'non-profit-making', in as much as they are prohibited from distributing a monetary residual to their own members.

Special Licensing for NGOs

In addition to registration, a non-profit organization engaged in certain activities might also require special license / permission. Some of these include (but are not limited to)

A place of work in a restricted area (like a tribal area or a border area requires a special permit – the Inner Line Permit – usually issued either by the Ministry of Home Affairs or by the relevant local authority i.e., district magistrate).

To employ foreign staff, an Indian non-profit organization needs to be registered as a trust/society/company, have FCRA registration and also obtain a No Objection Certificate. The intended employee also needs a work visa.

A foreign non-profit organization setting up an office in India and wanting staff from abroad needs to be registered as a trust/society/company needs permission from the Reserve Bank of India and also a No Objection Certificate from the Ministry of External Affairs.

BINGOs and PINGOs

Everyone should be careful in selecting the NGO it works with because there are two types of NGOs

BINGOs - Business Interest NGOs that are floated by business groups and which obviously sub serve their business interests

PINGOs - Public Interest NGOs that work only in public interest and are not linked directly or indirectly with any business group.

PREREQUISITE FOR NGO

Registered, independent, non-profit, national/regional organization that works towards protecting, promoting and supporting breastfeeding and appropriate complementary feeding of infants & young children

Believes that breastfeeding is the right of all mothers and children.

Works through advocacy, social mobilization, information sharing, education, research, training and monitoring

Understands and Complies with the IMS Act.⁶

Does not accept funds or sponsorship of any kind from the companies producing infant milk substitutes, feeding bottles, related equipments, or infant foods (cereal foods).

ROLE OF NGO

NGOs have an important role to play at the International, National, State and local level.

The members of the NGO/MSG should be properly trained and keep themselves updated on IYCF policies and practices.

Mother support group and Father Support groups can be formed and they can play a very important role at the local level. They are usually more effective than a health worker. Once trained properly and educated on issues of IYCF one of the members of the group can act as a leader and coordinate its activity.⁷⁻⁹

Role of NGO – National Level

At national level-NGO has an important role to play in; and should be able to work in areas of

National Policy, Program and Coordination

BFHI

International Code

Maternity Protection

Health and nutrition care

Information support

Community outreach

Infant feeding and HIV

Infant feeding in emergency situations

IYCF and Environmental concerns

Monitoring and evaluation

IMS act

NGOs should be able to initiate programs/community projects to provide home care and counseling on IYCF. They should understand and advocate the important recommendations at all levels. Experience from the past testifies the important role played by NGOs in the field of IYCF.¹⁰ From organizing regional colloquiums to making representations in the planning commission, from catalyzing curriculum revision to making task force for certification of baby friendly hospitals, NGOs can impact the development of good IYCF practices at all levels.

Role of NGO – State and Local Level

At State level the certification for **baby friendly hospital**, influencing the State Government policy, budget allocation for IYCF, coordinating training, influencing public awareness and monitoring at local level can all be carried out by NGOs. They can work as a link between different ministries like women and child development, health and nutrition, technical and higher education, Panchayati Raj, NRHM etc. and help the state achieve low Neonatal Mortality, IMR and under 5 mortality. At local level they can act by supporting the government programs on IYCF, training and dissemination of correct information, monitoring and evaluation. Fostering the formation of Mother support groups and Father Groups, reaching out the marginalized, underprivileged and at fringe children. Forming and sustaining IYCF activities through crèches and Lactation Management Clinics, Mother Support Groups and Father Support Groups can give permanent benefit to the local people. NGO can actually work like a thread which holds together the different pearls in the necklace of IYCF.

REFERENCES

- 1 Dr. Arun Gupta, Dr. Vandana Prasad, Dr. J.P. Dadhich, Mrs. Radha Holla Bhar, Dr. Ajay Gaur and Dr. Anurag Singh ; The World Breastfeeding Trends Initiative (WBTi)-India Report :2008
- 2 World Breastfeeding Trends Initiative (WBTi) -Web Based Toolkit -Windows Internet Explorer
- 3 A Gupta, V Arora. Tracking implementation of the global strategy for Infant and Young Child Feeding; The State of the World's Breastfeeding South Asia Report: Feb 2007
- 4 Jim Owens: May the fourth be with you. PMBOK cganges 4 change part 1/2 #.355. The sextuple constraint. Available from <http://pmhub.net/wp/2009/06/pmbok-4th-ed-changes1/>
- 5 NGO Directory/NGOs Resources/NGOs funding agencies. Web portal ofNGOs in India. Available from: <http://www..ngosindia.com/>
- 6 Arun Gupta et al. The law to protect, promote and support breastfeeding; BPNI. IInd Ed:2004
- 7 RK Anand. Felicity savage king. Helping mothers to breastfeed. Indian adaptation.ACASH.160-162

- 8 Wayne parker. Helping fathers Raise Great Kids. About.com Guide to Fatherhood. Available from: http://fatherhood.about.com/od/agesandstages/u/raising_great_kids.htm
- 9 Wayne parker. Should I join a Father's Support group. About.com Guide to Fatherhood. Cached 8 Sep 2010 05:45:37 GMT. Available from: http://fatherhood.about.com/od/mensissues/a/support_groups.htm
- 10 Radha Holla. Ed. Arun Gupta et al.; Revitalising Breastfeeding The report on Asia Pacific Conference on Breastfeeding & National Convention of BPNI 2003. BPNI/IBFAN Asia Pacific.3,4

ROLE OF MEDIA IN IYCF

Dr. Shyam S. Sidana

If one gets a prize/an award it's not worth unless it is known to the community/others. Similarly if one gets insulted by someone he doesn't feel guilty till it is known to others, likewise any legal act like IMS act or any information on IYCF which is meant for the community is almost null and void, if it does not get a proper publicity/attention of society or the target group. Then the question is, who will do this job? Of course, it is the media mainly⁽¹⁾, be it print (newspaper, poster, book, magazine etc) or electronic (TV, radio, recording, internet, cinema, video mobile etc)⁽²⁾.

So, media is our important partner regarding Information Education and Communication (IEC) activity of IYCF⁽²⁾. It is the most effective way of disseminating information of vital health programs which has/had been implemented successfully. Media can focus on IMS act and sensitise health professionals as well as convey the public about the advantage of breastfeeding and proper IYCF practices, maternity leave benefits, myths about IYCF, disadvantages of top & bottle feeding resulting in high infant morbidity, mortality & financial burden. A doctor in his busy practice cannot do justice regarding proper IYCF advice to the parents of infants because of time constraints, neither the contact ratio of health professionals to parents (target) is adequate enough in our country, moreover every child is not sick or even every sick one cannot afford to see the paediatrician or health professionals, whereas the media in some way or other is accessible to most of the mass like Radio, TV, newspaper, mobile, internet, posters, hoardings etc. TV and radio are available everywhere in the country, even in the remotest areas. Use of local language, creative and entertaining methods like street plays and expert talk like that in Kalyani program of Doordarshan goes a long way in dissemination of proper IYCF information. In urban areas access to cable/dish TV, internet (social network media) is very much helpful eg. Parvarish program of IAP being aired on a TV channel. Many of our colleagues are giving their valuable time through media in phone-in programs, interviews and expert talks.

Media with its role in IYCF is proving its worth in Bangladesh economy through improved infant survival and decreased morbidity. Bill and Melinda Gates foundation in their project '*Alive & Thrive*' (a five year initiative) documented it, taking help of media in IYCF and got good results. Advertisements of milk substitute were banned after IEC activity by media⁽³⁾. In Vietnam, the same project is having the similar results, as well⁽⁴⁾. There has been report of training of media personnel in Bangladesh for the effective reporting on IYCF, by the experts in a program titled '*effective*

reporting of infants and young child nutrition' held at Sarvar reported by 'Daily Star' the newspaper ⁽⁵⁾.

Documentary like "*Formula for Disaster*" by UNICEF highlights the risk of artificial feeding and negative effect of unethical marketing practices on breastfeeding. "*Breastfeeding in first hour*" and "*Breast Crawl*"⁽⁶⁾ videos by UNICEF are also quite useful and informative as part of IEC activities regarding IYCF.

Media can play its role in providing the knowledge regarding proper IYCF practices to the mass by

Regular articles in the newspapers on IYCF by Pediatricians / Nutritionists.

Advertisements with the help (sponsorship) from Government MOH & FW, CARE, UNICEF, or on its own behalf as corporate social responsibility for the cause of infants (future) of the nation.

Interviews of health professionals like Pediatricians / Nutritionists.

Avoiding advertisements from IMS industries and strictly adhering to the laws regarding the same ⁽⁷⁾.

Proper publicity of World Breastfeeding Week (WBW) activities of IAP, Government and various societies.

By phone-in programs of TV channels, radio and newspaper regarding queries of caretakers of infants on IYCF practices.

Scrolls in TV channels /news channels for promoting breastfeeding & complementary feeding.

Telecasting documentaries on IYCF and IMS code.

Use of social media by individuals by sharing opinions, views, videos, posts/tweets, quizzes on IYCF etc.

Sensitisation of doctors and health professionals through e-mails/SMS by IAP and its IYCF chapter regarding IMS act.

Posters, SMS, Pamphlets, by NGOs, Government and IAP.

CONCLUSION

Media can behave as an efficient partner of health professionals / Government regarding IEC activity of proper IYCF practices. Though the health professionals are more educative / interactive to the mass as experts, the media has a vital role in providing information regarding IYCF practices.

REFERENCES/SOURCES OF INFORMATION

1. Agarwal R.K. Importance of optimal infant and young child feeding (IYCF) in achieving Millennium Development Goals. *Indian Pediatrics* 2008; 45:719-721
2. State of the world's breastfeeding. Available from www.bpni.org/IYCF-is.html Accessed on October 3, 2010
3. Alive & thrive (A&T) in Bangladesh. A&T newsletter, issue 1 (January2010);and Bangladesh page on A&T website, January20,2010. Available from www.comminit.com/en/node309210/303 Accessed on October 4,2010
4. Alive & Thrive (A&T) in Vietnam, A&T newsletter, issue 1(January2010);and Vietnam page on A&T website, January20,2010. Available from www.comminit.com/en/node309212/303 Accessed on October 4,2010
5. The Daily Star, September 2. Role of media to curb child malnutrition stressed. Available from www.thedailystar.net/newDesign/news-detail.php?nid=153300 Accessed on October 2, 2010
6. Initiation of breastfeeding by crawl. Video by UNICEF. Available from <http://breastcrawl.org> Accessed on October 4, 2010
7. Dadich JP, Gupta Arun. Report of Assessment of status of IYCF practice, policy and program, Achievement and gaps. Available from www.worldbreastfeedingtrends.org/report/india.pdf Accessed on October 1, 2010

ROLE OF YOUTH IN BREASTFEEDING AND COUNSELING

Dr. Shama Jagadish Kulkarni

INTRODUCTION

Who is youth?

19 to 30 years' age group of population can be called as youth. On one side, there is adolescence – immature and struggling for identity & on the other hand there is experienced mature adulthood. Young people are mature enough who can understand the thoughts of mature adults.

Young age is always ready to accept scientific knowledge. There is quest of knowledge amongst them. They are enthusiastic, sincere and devoted with an ability to bring dramatic changes in the society. They are the pillars bridging the generation gap between adolescence and adulthood.

Why youth?

Young population has dreams and aims. They have crystal clear ideas about their goals. They have sincerity and dedication towards it. A young person would get curious and would want to have deeper understanding, and is hence probably ready to adopt concepts.

The young generation is always ready for experimentation & ready to welcome change. They are research oriented, want to know the reasoning. Once they are convinced, they can convince others and act on their own belief.

CREATING AWARENESS IN YOUNG GENERATION:

Various interesting programs can be carried out to train young generation. Once trained, volunteers can carry out various programs to carry the baton further under the guidance of experienced.

Young people should be actively involved in various activities like celebration for the World Breastfeeding Week. This will help to break the barriers about openly discussing the topic. Young people will start discussing about advantages & importance of breastfeeding. They will start asking question & start feeling proud of it. The youth are usually fascinated by media. The articles in newspapers, talk shows on television would encourage young minds to get involve. If article is

written by a trained young person, youth icons will attract teenagers, youth & adults as well. Young people will happily shoulder the responsibility of reducing the malnutrition & infant mortality. Young people have tremendous creative ideas. Various events can be organized in order to attract not just youth but everyone of the society. This impact will be long lasting and definitely satisfy the cause. Following mentioned ways are proven methodologies and should be acquired:

Street plays - Plays for social awareness has been there in the society since ancient time. It is proven that social drama is the best method to spread the word.

Promotional Rallies - Rallies can be conducted in tie-ups with local organizations which would create awareness in public, involving local organizations would help to improve network in that particular region and keep work alive in the region.

House to house information dissemination by volunteers – mouth to mouth publicity is the best and easiest way of marketing and would definitely be an effective way to communicate to masses

Bottle eradication: “Bottle Holi” – Holi of unethical things is a way of Satyagraha. This will also make an impact on the people promoting top milk or people suggesting not to give breastfeeding.

Strong action for violation of IMS act – IMS act should be used efficiently and effectively together by everyone. This will create awareness, impact and responsibility in minds of people opposing breastfeeding for their own profits.

Various interactive and interesting competitions can be conducted by the youth for the youth and judged by the youth.

Essay competition, Slogan competition, Twin / Triplet Breastfeeding competition, Debate competition, The Best Breast Fed Student Contest, The Best Breast Fed Crawling Baby contest

Apart from these methods following things can also be activities can be carried out which will especially for youth:

Self Help Groups – The name explains itself. These group are formed which can help there selves as well as others and would also promote the cause.

Mother Support Groups – These are specially formed groups to help mothers of infant as well as babies in helping breastfeeding, relactation. In today’s hectic, busy and most importantly nuclear families biggest problem is there is no one to guide and help in these issues. Mother support group would help in simplifying this issue.

Trainers for Adolescents – trainers for adolescents would create awareness about scientific importance and its long term effects. This will also help them to open up their selves up with family.

Role in the family – Major role of youth should be promoted in families in order to make them work for the things they believe in and they do. They are decision makers for their lives and are responsible for their actions. They have a huge role to play as future parents. Youth can bridge the gap between elder generation and mothers. Young fathers can discuss the benefits of breastfeeding with their own parents (grandparents). Usually baby might cry due to many things e.g. diaper rash, 8+: evening colic, wet diaper, cold or hot weather or the baby might just need cuddling. Just with the cry of the baby, grand parents might suspect ‘not enough milk’ and force daughter or daughter in law to give top feed and its vicious cycle. This vicious can be broken by knowledgeable trained parents.

Enthusiastic Researchers – Young people should be motivated for research. Thought process in this age is much fast and wide. Good direction with experienced guidance will be essential and experienced people should come ahead with self motivation.

Appreciation of Ideas – Ideas of young people to promote the cause should be appreciated. Also they should be encouraged to come up with new ideas and participate actively in activities for promotion of breastfeeding.

METHODOLOGY

Young people can be involved in various following ways:

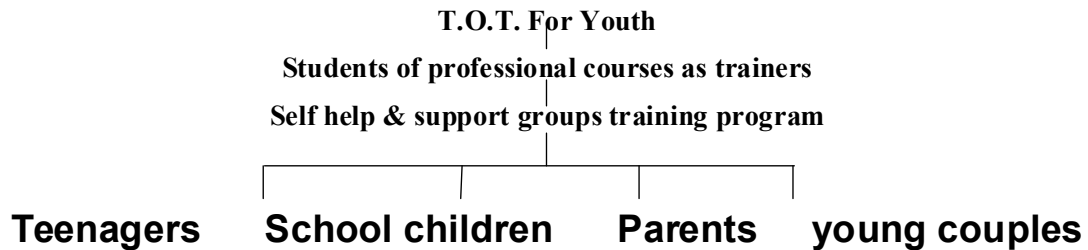
Training of youth for breastfeeding – New parents should be trained for breastfeeding, which will help them to solve their own problem. This training can be done in various ways like: Electronic Media, News papers/ Magazines, Awareness lecture, Interactive training sessions, Working with nursing mothers, Adding breastfeeding to curriculum of professional courses, Internship in lactation management clinic, Creating awareness through internet and social networking websites.

Youth as Trainers – Every generation can understand its own need and issues. Involving youth in process of promotion of breastfeeding and mentoring them as trainers would help in passing on knowledge in simpler way.

Training of Trainers (T.O.T.) Program

Today's Youth as parents: Young mothers are usually underestimated, whereas they are strong & dedicated towards their babies. Young parents get angry when not explained various options. They can contribute a lot in improving neonatal & infant survival. They are the ones who first experiences & then tell others.

Tree Diagram for training of Trainers program



This T.O.T. Youth as a trainer would be helpful as young minds possess some qualities like:

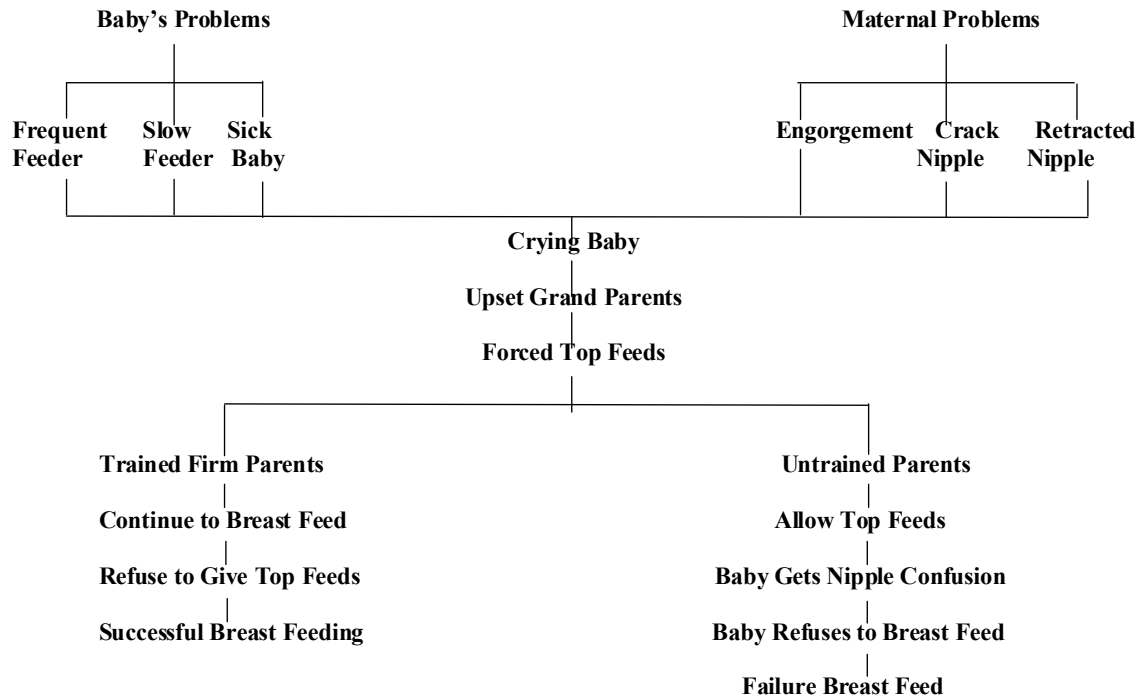
- They are catalysts for change
- They are very important in advocacy & activism in breastfeeding
- They are astute critics
- They are pivotal in disseminating & communicating this powerful knowledge.
- They can contextualise breastfeeding as powerful issue
- They can be dynamic resource persons

This will also help in solving practical problems like –

- This will motivate young mothers to breastfeed their child
- Teenager girl can also help sisters / sister in laws
- Child motivates mother to feed youngster
- Grandparents motivate daughter & daughter in law
- Most importantly training in school will make school children aware & proud. The small kids will also ask the mother to breast feed the younger one instead of feeling jealous about them.
- T.O.T. will also help in preventing from forced top feed by family, grandparents of baby.

T.O.T. would help youth to communicate with teenagers as they have recently crossed that bridge. Youth also can train adults & teenagers about proper age of marriage & teenage pregnancy.

Following tree diagram will help in understanding importance of T.O.T.



YOUTH AS RESEARCHER

To involve people from various backgrounds inter-disciplinary research should be promoted. It will also allow different perspectives. It could alleviate inappropriate feeding methods.

Training methodology used by Kiersten Israel Ballard to spread awareness about importance of young researchers in breastfeeding and HIV

Talking with mother / community health worker / others

He gathered options and suggestions. A inter-disciplinary team formed to handle multifaceted issues of infant feeding as well heat treatment of breast milk. Team included experts in pediatrics, nutrition, child health epidemiology, virology, immunology, microbiology, food sciences, thermal kinetics, medical anthropologists, and sociology.

They worked as close groups used conference calls. They worked together to design appropriate methods to take this study forward.

REFERENCES

Various issues of **WABA Youth For Breastfeeding** News Letter

WABA World alliance for breastfeeding website

NATIONAL CAPACITY BUILDING PROGRAM FOR IMPROVING IYCF PRACTICES

Dr. M.M.A. Faridi

Breast milk has unique composition that nourishes baby well; promotes optimal growth and development; protects from large number of infective and non-communicable diseases; supports quality survival from neonatal period to childhood, and prevents many metabolic adult-onset diseases. It has been established that out of all interventions to prevent U5 mortality, breastfeeding for one year independently prevents 13% U5 deaths, and together with timely complementary feeding it can prevent almost 1/5th of all deaths up to five years of age.¹ Initiation of breastfeeding within one hour of birth has been reported to decrease neonatal mortality by 22.3%; the benefit continues even if breastfeeding is delayed for 24 hours when it can still prevent 16.6% neonatal deaths.² The child survival is intrinsically related to safe motherhood. Emphasis on infant feeding and child survival should not overlook maternal health and wellbeing. Interestingly breastfeeding accrues several advantages to the mother unlike any other mode of infant feeding. These advantages alone are enough to warrant inclusion of breastfeeding program in the overall health delivery package.

World moves on economy and all efforts are directed towards generation of funds and boosting of economy at national and international level. It will be interesting to peep into economy of breastfeeding. Whereas formula feeding or fresh animal milk feeding is expensive, breastfeeding is free and saves money directly on procuring milk, utensils, fuel, detergents and potable water, and indirectly on treatment and physician's fee, as artificially fed babies get sick more often. It is estimated that a baby will need forty tins of 500 gm formula milk or 92 litres of fresh animal milk in first six months of life.³ In USA alone 3.9 billion US\$ were spent on infant formula in 2007.⁴ Europe may witness infant formula sale reach US\$ 2.1 billion in 2010⁵. United Kingdom is not far behind; the annual turnover of one British company, which manufactures feeding bottles and nipples and has world wide market, is 90 million pounds.⁴ The current estimate is that global baby foods and infant formula market will be worth US\$23.8 billion by 2015.⁶ In other words families will be spending this money on buying formula for feeding their babies whereas they could have been fed by their mothers without expenditure of this magnitude. One should not forget that expenses will also incur on transport for purchasing milk and fuel, and loss of wages on account of absence from work when baby falls sick and needs parents around. Animal milk is deficient in taurine, DHA, iron and vitamin C to cite a few nutrients. These nutrients are added in the formula milk to make up for the deficiency but babies feeding fresh animal milk have to be supplemented with these nutrients

which mean money. It is another issue that such nutrients are not available in the market in proper amounts and composition.

Time is money too. It takes about 11 minutes to make one feed on LPG which includes boiling and cooling of water, measuring of water and scooping of formula, and stirring of mixture of water and milk powder. Twenty-four minutes are needed to prepare a similar feed using wood/cow-dung cakes. It does not include time spent on hand washing and cleaning of utensils. Fresh feed has to be prepared by the mother every three hourly requiring almost 2 hours a day just on preparation of artificial feed. Naturally a mother will spend this time away from the baby in the kitchen daily and deprive her/him from her warmth, coziness of skin-to-skin touch and comfort of breastfeeding on one hand, and will suffer from extra physical work and stress on the other hand.

Come to hard statistics. It has been estimated in a study that if breastfeeding rates can be increased from 64% to 75% (in hospital) and 29% to 50% (at 6 months), it will save US\$ 3.6 billion to US exchequer annually.⁷ Honey & ware⁸ reported that medical cost at 12 months was US\$ 200 less on breastfed compared to formula fed infants presumably because former tend to suffer less from otitis media and diarrhoea.

Poverty is important but it is not responsible for poor infant and young child feeding practices in the community. 1st hour initiation and exclusive breastfeeding rates in the country are far from satisfactory [NFHS-III]. Similarly timely appropriate complementary feeding rates are far below the recommendations. It is the near absence of infant feeding policy, funding and strategy in the health delivery system for support, protection and promotion of breastfeeding and complementary feeding, which is responsible for suboptimal infant and young child feeding practices in the community.

There is general awareness in the community and among health professionals that breastfeeding is useful for infants. But at the same time there are several myths and beliefs (discussed in separate chapter in this book) There is also a strong conviction among medical fraternity that substitutes to breast milk and breastfeeding are available and that one can feed a baby successfully by formula milk with few precautions like 'proper' boiling of the bottle and so on. But truly speaking health workers have no pre-service training in infant and young child feeding counselling. They find themselves ill equipped in managing breastfeeding difficulties and breast conditions. Complementary feeding is the weakest link in the infant feeding scenario. Almost all medical, nursing and community health workers advise only 'what to feed' but never inform mother 'how to feed'. Frequently health worker fails to listen and learn family situation with respect to infant feeding and does not provide relevant information in positive manner. Empathizing with the mother and praising her efforts are seldom practiced by the health worker. The health worker ultimately ends up as an advisor giving 'commands' rather than offering suggestions empowering her to take most suitable decision for her situation. The health worker fails as counsellor.

Hence there is immediate need to recognize that health delivery system is neither sensitized to nor able to help mothers for breastfeeding and complementary feeding. At the same time family and community fail to proactively support breastfeeding and complementary feeding making the situation very complex. It follows that a country must be empowered to implementing Global Strategy of Optimal Infant and Young Child Feeding Practices in the community.

EMPOWERING A COUNTRY

National level

- Having IYCF policy
- Having legislation on sale of infant milk substitutes and infant foods
- Having breastfeeding policy in special situations
- Integrating IYCF with health delivery system
- Making IYCF indicators component of health reporting, biostatistics, and achievements
- Incorporating IYCF component in the disaster management
- Including IYCF counselling in the medical and nursing curriculum
- Allocating separate budget for IYCF activities

Health facility level

- Sensitizing health managers in IYCF practices
- Training staff in counselling for first-hour initiation of BF and helping mothers for Exclusive Breastfeeding for first 6 months (EBF6)
- Training staff for counselling mothers for complementary feeding
- Training staff for counselling in infant and young child feeding difficulties
- Training staff for supporting breastfeeding for 2 years or beyond
- Training health administrators & staff for monitoring International Marketing Code and Country Codes on breast milk and infant food substitutes

Community level: Trained staff in IYCF counselling available for:

- Initiation of first-hour BF; helping mother for EBF6 and for her own health
- Supporting mothers for Infant Feeding in special situations

Helping mothers for timely appropriate CF from family pot

Supporting mothers for 2 years BF

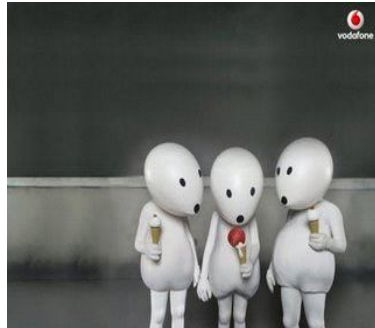
Managing IYCF difficulties

Helping mothers for emergency IYCF

CAPACITY BUILDING PROGRAM IN IYCF COUNSELLING

In order to help mothers to adopt optimal infant and young child feeding practices, it is imperative that all health workers caring for children and women are trained in IYCF Counselling. WHO/UNICEF offers three separate counselling courses on breastfeeding, complementary feeding and infant feeding and HIV. The total duration of these three courses is 11 days. Twenty two days will be required to make a Master Trainer of IYCF Counselling in all three areas. WHO/UNICEF has also developed a basic course of 5 days duration in 2005 after combining above three courses.

How to Empower a Country?



- **Develop Capacity Building Program in IYCF Counseling**
- Strong National & International liaisoning
- Dedicated budgeting
- **Inclusion of IYCF indicators in health reporting system of a country**

Meanwhile IBFAN Asia-Pacific and Breastfeeding Promotion Network of India (BPNI) developed a 3-in-1 course in IYCF Counselling; an integrated course of breastfeeding, complementary feeding and infant feeding and HIV counselling, with the support of UNICEF India Office, during same time in 2004-05. This course has since been ratified by the Ministries of Health & FW and Women and Child Development, and Indian Academy of Paediatrics. The course offers a program to train health workers in IYCF Counselling at all levels.

Master trainer

A training-of-trainers (T-O-T) for certifying a person *master trainer* of IYCF counselling, comprising of two phases, is organized for 13 days. There are 43 sessions in the course including 10 hours bed side clinical training in a hospital for real life experience. Phase-I, known as ‘preparatory phase’, lasts for 6 days. During this phase 6 master trainees are prepared to acquire knowledge, psychomotor skills and communication abilities related to IYCF by the course director. In the second phase, which lasts for 7 days, 24 IYCF counselling specialist trainees, in a ratio of 4 for each master trainee, are invited. During second phase the master trainees take different sessions and train IYCF counselling trainees under the supervision of the course director to acquire capability of transferring IYCF counselling skills to other persons. At the end of 13 days rigorous training a certificate of *master trainer* is awarded by the BPNI on the recommendation of the course director.

Work Profile of Master Trainers

Train master trainers, middle level trainers, IYCF counselling specialists, infant feeding and HIV counsellors and community health workers.

Counsel mother/family.

Monitor International Marketing Code of Breast Milk Substitutes and Infant Milk Substitutes Act 2003.

Implement BFHI in the health facility.

Supervise and certify health facility for ‘Breastfeeding Promotion at Birth Place’.

Establish IYCF Counselling Centre.

Provide referral level support for IYCF.

Advocacy on IYCF.

Monitor IYCF implementation program.

Work Profile of IYCF Counselling Specialists:

Twenty three IYCF Counselling Specialists attended 7 days extensive skill based, hands-on, practical oriented, live situation training course. Master Trainers individually helped them. The Course Director also guided the IYCF counselling specialists and satisfied by their performance and hope that they will be able to:

Counsel mother/family.

Establish IYCF counselling Centre.

Provide referral level support for IYCF.

Advocacy on IYCF.

Monitor IYCF implementation program.

Monitor International Marketing Code of the Breast Milk Substitutes and any country law on the subject.

REFERENCES

1. Jones G, Steketee RW, Black RE, Bhutta ZA, Morris SS. How many child deaths can we prevent this year? *Lancet*. 2003;5;362:65-71
2. Edmond KM, Charles Z, Quigley MA, Amenga-Etego S, Seth Owusu-Agyei, Kirkwood BR. Delayed Breastfeeding Initiation Increases Risk of Neonatal Mortality. *Pediatrics* 2006; 117:380-386
3. Infant & Young Child Feeding Counselling Course. A3-in-1 Course (Integrated course on breastfeeding, complementary feeding and infant feeding and HIV counselling). IBFAN, UNICEF, BPNI-2008
4. Palmer G. Why breastfeeding is political In: *The politics of breastfeeding-when breast are bad for business*. Pinter & Martin Ltd. London 2nd Edn. 2009: 1-10
5. Global Industry Analysts, Inc. 'Worldwide Baby Foods and Infant Formula Sales to Reach US\$ 23.8 billion by 2010' 3 march, 2008. www.strategy.com/Baby_Foods_and_Infant_formula_Market_Report.asp
6. Global Baby Foods and Infant Formula Market to Reach US\$23.8 Billion by 2015, According to New Report by Global Industry Analysts, Inc.' November 5, 2010. www.strategy.com/Baby_Foods_and_Infant_formula_Market_Report.asp
7. *The Economic Benefits of Breastfeeding: A Review and Analysis*. By Jon Weimer. Food and Rural Economics Division, Economic Research Service, U.S. Department of Agriculture. Food Assistance and Nutrition Research Report No. 13
8. Hoey C, Ware J. Economic Advantages of Breast-Feeding in an HMO Setting: A Pilot Study. *Am J Managed Care* 1997; 3: 861-865.

Section V

FACILITATION AND PROMOTION

MOTHER SUPPORT GROUP

Dr. Swati M. Vinchurkar

INTRODUCTION

There is enough evidence to support advantages of exclusive breastfeeding for 6 months, yet statistics speaks otherwise. Women have a need for one-to-one information and support from the health care system about breastfeeding and often they do not get it. Social support has been shown to be of great importance for breastfeeding success. In economically advantaged countries, young mothers, those in low-income groups or those who ceased full-time education at an early age are least likely to breastfeed. In poorer countries, more affluent groups may breastfeed less.

There is, however, uncertainty as to the most effective way of providing support to women who choose to breastfeed their children. There is clear evidence for the effectiveness of professional support on the duration of any breastfeeding although the strength of its effect on the rate of exclusive breastfeeding is uncertain. Lay support is effective in promoting exclusive breastfeeding while the strength of its effect on the duration of any breastfeeding is also uncertain.

There are extensive randomized trials and reviews supporting the advantage of mother support groups in initiation and continuation of exclusive breastfeeding. In spite of this knowledge professionals like obstetricians and paediatricians, trained nursing staff and NICU personnel fail to ensure exclusive breastfeeding. All forms of extra support together had a larger effect on duration of exclusive breastfeeding than on any breastfeeding (Relative Risk (RR) 0.81, 95% CI 0.74 to 0.89). Lay and professional support together extended duration of any breastfeeding significantly (RR before 4-6 weeks 0.65, 95% 0.51 to 0.82; RR before 2 months 0.74, 95% CI 0.66 to 0.83). Exclusive breastfeeding was significantly prolonged with use of WHO/UNICEF training (RR 0.69, 95% CI 0.52 to 0.91). (7)

Common situations or beliefs that can affect breastfeeding

- Sick baby or mother
- Low birth weight baby
- Kangaroo mother care
- Malnourished mother

Twins
 Inverted nipples
 Baby who refuses to breastfeed
 New pregnancy
 Mother away from baby
 Stress
 Beliefs/myths of breastfeeding
 Working mothers and breastfeeding

All these can be addressed and corrected with the help of mother support groups which can deliver correct information and emotional support to these mothers.

TARGET GROUPS

Ideally all mothers need support in some or the other form: physical, emotional, financial, or social. Breastfeeding / breast milk feeding is promoted by close, continuing skin-to-skin contact between mother and infant, effective breast milk expression, peer support in hospital and community, and staff training.

There are some high risk group targets that require specific support like:

- 1) Support to mothers of malnourished children
 - in in-patient therapeutic feeding centres
 - who are being treated in community-settings
- 2) Support to first time mothers or previously unsuccessful mothers
- 3) Support for mothers of newborns or infants admitted to the ICU.
- 4) Breastfeeding and the introduction of complementary foods after 6 months
- 5) Working mothers: some possible solutions to help make breastfeeding feasible without loss of income or seniority.

Here a special note to mention that all the laws about maternity leave and benefits are mainly on paper. In practice most working women face difficulties in working and breastfeeding at the same time leading to early introduction of top feeds or total discontinuation of breastfeeding. There should be a cultural shift in the industrial organizational policies which alone can make continuation of exclusive breastfeeding in working mothers possible.

AIM OF PEER SUPPORT GROUPS

Take the program to more pregnant women and mothers of children less than 2 years of age

To catalyze behaviour change

Provide peer counselling within a group setting. A non-formal and experiential learning approach allows women to examine their values and attitudes, discover assumptions and patterns of behaviour, ask questions, and learn new ways of thinking.

To empower women to make better decisions and build their self-confidence through activities that encourage them to identify and solve their own problems

Learn alternate feeding practices

Seek the best means to protect the health of their infants

How can the mother support groups be structured to provide outreach support to pregnant and lactating mothers?

1. A typical example of a mother to mother Support Group in a community setting is seen across rural Cambodia. The Mother support groups are credited in significant measure with saving the lives of infants. Participants in a typical group include the village chief, a traditional birth attendant and two model mothers. Additionally, local health volunteers are on hand to serve as intermediaries between the villagers and health centre staff.

Besides holding frequent, informal discussions with pregnant women and nursing mothers in their own villages, members of Mother Support Groups from several villages also gather for quarterly meetings at a local health centre to compare notes on their experiences.

2. Antenatal mother-Obstetrician-midwife/lactation counsellor group.

The process of breastfeeding support is best started when the mother is not stressed with the babies' cries/ hassles of maintaining feeding and nappy change schedules. The first hour initiation of breastfeeding in the delivery room can be best implemented by the Obstetrician and the nurse who have established a rapport with the mother during the antenatal period.

3. Postnatal mother-Pediatrician-Obstetrician-family members-other lactating mothers.

This group would be most useful in ensuring continuation of exclusive breastfeeding. Regular activities can be planned with specific topics addressed to help the mother feel empowered towards breastfeeding her child.

POSSIBLE THEMES FOR SUPPORT GROUPS

Advantages of breastfeeding for mother, baby, family (1 – 3 different topics)

Techniques of breastfeeding: attachment and positioning

Prevention, symptoms, and solutions of common breastfeeding conditions/difficulties: engorgement, cracked/sore nipples, blocked ducts that can lead to mastitis, and low milk supply

Breast milk expression and storage techniques.

Common situations or beliefs that can affect breastfeeding. Beliefs/myths of breastfeeding: maternal concern about breastfeeding and the introduction of complementary foods after 6 months

Working mothers: some possible solutions to help make breastfeeding feasible.

PRACTICAL TIPS FOR PRIVATE PRACTITIONERS

Train oneself and at least one staff in an outpatient clinic who can guide the mother to breastfeed successfully without any stress. Better employ and train a dietician for IYCF practices.

Train all staff in the in-patient setup, including the ayah, sweeper and junior nursing staff and empower them with scientific knowledge to promote the baby-friendly initiative.

Hold regular meetings with the other family members and prime them antenatally regarding the exclusive breastfeeding philosophy.

Help establish peer support groups among antenatal and postnatal mothers and help plan schedule for meetings.

Try to liaise with the employers of any working mother to help establish crèches at workplace and to support breastfeeding during the rejoining phase.

Do not give in to the temptation of seemingly easier options like the bottle/top-milk/formula.

FUTURE DIRECTIONS

There is clear evidence for the effectiveness of professional support on the duration of any breastfeeding. Hence, consideration should be given to providing supplementary breastfeeding support as part of routine health service provision. Lay support is also effective in promoting exclusive breastfeeding..

Further trials are required to assess the effectiveness (including cost-effectiveness) of both lay and professional support in different settings - in particular in those communities with low rates of breastfeeding initiation. Research is also required into the most appropriate training for those, whether lay or professional, who support breastfeeding mothers.

After implementation of a process-oriented breastfeeding training program for antenatal midwives and postnatal nurses that included an intervention guaranteeing continuity of care, the mothers were more satisfied with emotional and informative support during the first 9 months postpartum. The results lend support to family classes incorporating continuity of care.

CONCLUSION

Thus Mother support groups would help many a mother who wish to give exclusive breastfeeds but are unable to do so due to variable reasons. The mothers can solve many problems on their own and also help other mothers, which in itself is a great morale booster for all those involved in the support process. Needless to say, not just the baby but the whole family and society at large gets benefited. Then only truly it can be said “Where there is a will there is way”.

REFERENCES

1. Britton C, McCormick FM, Renfrew MJ, Wade A, King SE. Support for breastfeeding mothers. Update of: *Cochrane Database Syst Rev.* 2002;(1):CD001141.
2. Kyenkya-Isabirye M, Magalheas R The mothers’ support group role in the health care system. *Int J Gynaecol Obstet.* 1990;31 Suppl 1:85-90; discussion 111-3.
3. Training of Trainers for Mother-to-Mother Support Groups LINKAGES Project. January 2003: Handout 23:Possible Themes for Breastfeeding Mother-to-Mother Support Groups
4. Ekström A, Widström AM, Nissen E Does continuity of care by well-trained breastfeeding counselors improve a mother’s perception of support? *Birth.* 2006 Jun;33(2):123-30.
5. Sikorski J, Renfrew M *JCochrane Database Syst Rev.* Support for breastfeeding mothers. *General Practice and Primary Care* 2000;(2):CD001141. Update in: *Cochrane Database Syst Rev.* 2002;(1):CD001141.
6. Renfrew MJ, Craig D, Dyson L, McCormick F, Rice S, King SE, Misso K, Stenhouse E, Williams AF. Breastfeeding promotion for infants in neonatal units: a systematic review and economic analysis. *Health Technol Assess.*2009 Aug;13(40):1-146,ii-iv.7
7. Sikorski J, Renfrew MJ, Pindoria S, Wade A. Support for breastfeeding mothers. *General Practice and Primary Care, Guy’s, King’s and St Thomas’ School of Medicine.* Update in: *Cochrane Database Syst Rev.* 2007;(1):CD001141. Update of: *Cochrane Database Syst Rev.* 2000;(2):CD001141.
8. Renfrew MJ, Dyson L, McCormick F, Misso K, Stenhouse E, King SE, Williams AF Breastfeeding promotion for infants in neonatal units: a systematic review. *Epub* 2009 Nov 2, 2010 Mar;36(2):165-78.
9. Chung M, Ip S, Yu W, Raman G, Trikalinos T, DeVine D, Lau J.Rockville. Interventions in Primary Care to Promote Breastfeeding: A Systematic Review [Internet]: Agency for Healthcare Research and Quality (US); 2008 Oct. Report No.: 09-05126-EF-1.U.S. Preventive Services Task Force Evidence Syntheses, formerly Systematic Evidence Reviews.

FATHER SUPPORT GROUP

Dr. Anurag Singh

Do Fathers need support groups?

We have all heard of the mother support groups where mothers meet to share experiences: how they feel the pleasures of breastfeeding; the difficulties they have had and how they learnt to cope with them. They can see what they are all doing right, they can pass on skills to each other, and they can feel proud together. Do fathers also need support groups? Yes they very much do so. The need for father support groups has been realized in the western countries and such groups are also functional in the developed world.^{1,2}

Is there a need for father support group in India?

In India the concept is new but with the rapidly changing economic scenario, nuclear families, working mothers and migration for jobs the need for father support groups is becoming a need for the hour. Fathers are decision makers and their concepts and beliefs can influence the way a family practices infant feeding. During the antenatal period and right through labor and immediately in the post partum period the mother undergoes tremendous physical and hormonal changes that influence her mood, behavior and disposition. At times the would-be fathers are oblivious of these changes, which leads to acrimony and the mother does not get the desired support. This adversely affects her ability to successfully breastfeed her child. If on the other hand, the father is understanding and supportive, the chances of successful lactation increase tremendously.

Fathers also feel the need for correct information on IYCF policies and methods in order to support the mother and the baby. Being a member of father support group provides them with an opportunity to freely discuss with the other members everything, from emotional turmoil to availability of childcare items. They can fall back upon the other members to give them insight as to how to deal with a cranky child. Seemingly simple things like how to hold a baby can be problematic for some fathers. At times they feel inhibited from asking such questions to a doctor lest they be considered naïve. In the process they end up either avoiding the task of child rearing or putting the

child in jeopardy by harmful practices. The father support group gives them an opportunity to talk without inhibition and become more confident in dealing with the important issues related to child upbringing.

Why should we have father support groups?

Every father's goal is to raise responsible, healthy and well-adjusted children, teaching them values and attitudes that will serve them well throughout their lives. They need resources that will help them with this most important role.

Even fathers feel a need for a better connection with other *fathers so as to share experiences and learn from each other.*

They sometimes have special needs as a *father*. Father support group can help them realize these and better equip them to handle those first few months.

Fathers hold an important position in the Indian family but traditionally they are not much involved in child rearing.

They find themselves ill-equipped to handle a situation regarding infant feeding if it so arises.

They can be a big help to the feeding mother and their active participation can build her confidence. Conversely a non helping or ill informed father can be a real obstacle to good IYCF practices.

What should the support groups do?

The father support groups can organize meetings where they can discuss their problems and share experiences on how the more experienced ones amongst them solved these problems. They can be in touch with each other through SMS, phone or social networking although a close association with human interaction and physical proximity is more rewarding than a virtual support group and is the preferred way to interact.

In the villages a little interest by fathers can lead them to acquire correct knowledge and help in changing the unfriendly practices of using pre-lacteal feeds, infant milk substitutes and bottle feeding etc. They can organize group meetings at the Village Panchayat. The main activity at a meeting is to share experiences: how they feel the pleasures of having a newborn baby; the difficulties they have had and how they learnt to cope with them. They

can take home skills which they can proudly pass on to their partners and help the mother to breastfeed her baby.

They can invite an expert during these group meetings who can help them with one aspect of IYCF at a time such as "The advantages of breastfeeding" or "Overcoming difficulties". The leader need not give a lecture or do much talking. She / He may say a few words to introduce the topic and then encourage the others to talk about their own experiences and thoughts. The group leader should be able to correct misinformation and to suggest solutions to problems. This helps the group to be positive and not just to complain.³

To develop their skills, and to expand, groups need training. Suitably skilled health workers can help. But groups also need to be in contact with a more experienced support group.

If no group exists, they could write for help to the IAP IYCF Chapter or an NGO working in their area like BPNI, ACASH, WABA etc. They can be provided with IEC materials like leaflets, handouts, charts etc. Every support group can have IYCF helpline. The support groups can lobby with the government on demands like paternity leave and opening of crèches at the workplace where their womenfolk work. The support groups can also be effective eye keepers on companies that try to circumvent the IMS Act.⁴

REFERENCES

- 1 Wayne parker. Helping fathers Raise Great Kids. About.com Guide to Fatherhood. Available from: http://fatherhood.about.com/od/agesandstages/u/raising_great_kids.htm
- 2 Wayne parker. Should I join a Father's Support group. About.com Guide to Fatherhood. Cached 8 Sep 2010 05:45:37 GMT. Available from: http://fatherhood.about.com/od/mensissues/a/support_groups.htm
- 3 RK Anand. Felicity savage king. Helping mothers to breastfeed. Indian adaptation.ACASH.160-162
- 4 Arun Gupta et al. The law to protect, promote and support breastfeeding; BPNI. IIInd Ed:2004

MATERNITY AND PATERNITY LEAVE

Dr. Arun Phatak

Breastfeeding plays a significant role in promotion and protection of child health. The National Family Health Statistics (NFHS-3) of 2005-06¹ reported neonatal, infant and under-5 mortality rates of about 39, 57 and 74. It is observed that breastfeeding is the single most effective intervention that can reduce the under-five mortality by 13-14%². Based on scientific research around the world, the WHO and UNICEF recommended a global strategy for Infant and Young Child Feeding³.

Working women find it difficult to feed the baby exclusively for six months and to continue partial breastfeeding into the 2nd year. The parental (mostly maternal and slightly paternal) leave is in recognition of a woman's right to work as well as her right to motherhood.

Most countries have legislations that grant paid or unpaid time off from work to the mothers for a specified period before and after the delivery. The National legislations vary widely in the duration and type of leave mandated and the model of work policies and work environment is often influenced by the male forces. In most of the countries, a paid maternity leave of 10-20 weeks can be availed and if necessary, unpaid leave can be joined to it^{4,5}. The United States is the only country that does not mandate paid parental leave though unpaid maternity leave is mandated for the majority of workers.

In India, the Maternity Benefit Act, 1961 mandated that women working in specified establishments be given paid leave to a maximum of 12 weeks – six weeks before the expected date of delivery and six weeks after delivery (or miscarriage)⁶. It further stipulated that she be given a medical bonus of Rs.250/- if prenatal, confinement and postnatal care was not provided free of charge. The Act granted other benefits also, for example leave for illness arising out of pregnancy, delivery, premature birth or miscarriage, and nursing breaks in the work schedule till the child is 15 month old. The law also mandated against discharge, dismissal or reduction of wages during the period of maternity leave. The provisions of the Act were applicable to women working in factories, mines, establishments for exhibition of acrobatics and other performances (e.g. circus) and shops and establishments with 20 workers on any day of the past 12 months. Mothers were eligible for maternity leave if they have worked in the establishment for at least 80 days during 12 months prior to the expected date of delivery.

In 1972, the ceiling of maternity leave was raised to 135 days⁷.

A Bill amending the Maternity Benefit Act 1961 was passed by the parliament in 2008⁸ and received the assent of the President on 1st of April 2008. It is now called Maternity Benefit (Amendment) Act, 2008⁹.

- (a) The Act raised the ceiling of 135 days Maternity Leave provided in Rule 43(1) of Central Civil Services (Leave) Rules, 1972 to 180 days.
- (b) It granted that leave of the kind due and admissible (including commuted leave for a period not exceeding 60 days and leave not due) could be clubbed with Maternity Leave, and provided in Rule 43(4)(b) shall be increased to 2 years.
- (c) It allowed women employees having minor children Child Care Leave for a maximum period of two years (i.e. 730 days) during their entire service for taking care of up to two children whether for rearing or to look after any of their needs like examination, sickness etc. It was stipulated that during the period of such leave, the women employees shall be paid leave salary equal to the pay drawn immediately before proceeding on leave, and that it may be availed of in more than one spell and shall not be debited against the leave account.
- (d) It has raised the amount of medical bonus to Rs. 1,000/- and stipulates that this may be raised every three years to a maximum of Rs. 20,000/-.
- (e) The Act extends to the same places and establishments as specified by the Act of 1961. It, however, is made applicable to establishment with 10 (not 20 as in earlier Act) workers.

The Central 6th Pay Commission made the provisions be effective from 1st September 2008¹⁰.

Maternity benefits are not only maternity leave, protection of job and wages and nursing breaks. A mother who desires to continue to breastfeed her baby while continuing her job, needs not only the nursing breaks but also a child care facility at or near the work place or a clean private area where she can express her milk with facility (refrigerator) to preserve it. This means that the employer (government or private) should be prepared to go beyond the scope of the Act.

With the rise in nuclear families and when both the parents are working, child rearing is no longer the sole responsibility of the mother. A father is expected to be responsible for bringing up the child along with the mother and is entitled for taking off work to bond with the baby. This is now well accepted and many countries do grant paid paternal leave – usually for two weeks. Only recently (August 2010) Mr. David Cameron, the British Prime Minister, took paternity leave for two weeks from his duty as the Prime Minister, to be with his baby who had arrived three weeks early. In UK, six months of paternity leave is announced beginning April 2011. The father will have the right to be

at home for the last 3 months of the mother's maternity leave (which is 9 months). During this period, he will be paid £123/-per week. He can then take an additional unpaid leave for 3 months so that the couple can have a total of 12 months parental leave between them¹¹.

In India, the Central Government servants are granted 15 days of paid paternity leave. Similar policy is now adopted by some states like Haryana, Delhi, Rajasthan, Gujarat, Maharashtra. The facility is extended also to the schools in Delhi. Married soldiers on active duty get paternity leave for 10 days. Although there is no legal obligation to the private sector, some corporations like NIIT, Google, Microsoft have already implemented benefit of paternal leave to their employees.

It will be realized that the legal benefits are available only to the mothers working in organized sectors in specified areas. Moreover, legal mandates for parental benefits do not always reflect actual practice. In some countries, some individual employers choose to provide benefits beyond those required by law but more commonly, the laws are ignored in practice. Although refusing promotion because of maternity leave is illegal, many industries expect women to forgo maternity benefits if they wish their career to flourish (especially in the case of candidates for jobs with high salary). There are some who express that maternity leave is unfair (not only to colleagues and bosses but also ethically) and that since to have the child was the choice made by the couple, the community has no obligation to the rearing of that child.

The Maternity Benefit Act should be looked upon not only as a safeguard for the women's right to work and right to motherhood but also as a safeguard for child protection. Pandit Jawaharlal Nehru had said that 'a nation marches on the tiny feet of its children'. The culture of tomorrow will begin and always re-begin in the child of today. The first 2-3 years are critical for child rearing and the Acts about parental leave are meant to provide some opportunity and facility to the parents to shape the child during this critical stage.

REFERENCES

1. Ministry of Health and Family Welfare, Government of India. National Family Health Survey (NFHS-3) 2005-06, Volume I, International Institute for Population Sciences, Deonar, Mumbai, 400 088
2. Jones G, Steketee RW, Black RE, Bhutta ZA, Morris SS, Bellagio Child Survival Study Group. How many child deaths can we prevent this year? *Lancet* 2003; 362: 65-71.
3. WHO/UNICEF. Global Strategy for Infant and Young Child Feeding. World Health Organization (WHO), 2002.
4. Parental Leave, [http://en.wikipedia.org/wiki/parental_leave\(paid_leave_in_countries\)](http://en.wikipedia.org/wiki/parental_leave(paid_leave_in_countries))
5. Labor Statistics>Parental leave>Paid paternity leave (most recent)by country. www.nationmaster.com/graph

6. Maternity Benefit Act 1961 (No. 53 of 1961). www.pblabour.gov.in/pdf/acts_rules/maternity_benefit_act_1961.pdf
7. Central Civil Services Rules, 1972. www.mumbaicustoms.in/CS_Regulations/CCS_Leave_Rules_1971/chapter_05.aspx
8. Amendment to Maternity Benefit Act 1961. www.lawyersclubindia.com/share_files/AMENDMENT-TO-MATERNITY-BENEFIT-BILL-1961
9. The Maternity Benefit (Amendment) Act 2008 (No. 15 of 2008). www.prsindia.org
10. Maternity Leave, Child Care Leave: Sixth Pay Commission. www.finance-trading-times.com/2008/09/maternity-leave-child-care-leave-sixth.html
11. Fathers to get six month' paternity leave. www.guardian.co.uk/money/2010/jan28/fathers-six-months-paternity-,leave

WORKING WOMEN AND BREASTFEEDING

Dr. C. R. Banapurmath

INTRODUCTION

A mother has to work for herself and for her child and family. Mothers who work for commercial gains outside the house are considered as “Working Mothers”. Such situations are becoming more frequent since more and more women seek employment. Managing her job, child, husband and her family lays enormous stress and challenges on the working mother. At the same time, with proper preparation of her mind, proper planning and guidance, most working mothers can successfully manage the multiple challenges when they receive good support from her family members, employer and colleagues.

BARRIERS TO BREASTFEEDING AT WORKPLACE

The barriers that a mother can encounter are many. Table-1 shows some of them. Most of these barriers are mainly mental barriers, some are of utmost concern. Maternity leave available to her is emerging as the most crucial. Fortunately our country had made progress in the organized sector. A mother gets 100- 180 days of maternity leave in various places in India depending on the employer sector. The States of Punjab and Haryana have excelled in providing 6 months leave. Central govt employees now get 180 days. It is important that each mother gets enough maternity leave at least until breastfeeding is well established. This may take a few weeks in some mothers. Mothers must be encouraged to discuss this aspect with their employer well in advance so that the mind can be prepared.

Mother often feels worked-up, fatigued and stressed. However breastfeeding her baby would be her best stress buster since breastfeeding is associated with release of endorphins in the mother.

Negative reaction of colleagues at the workplace can be a very difficult situation for the working mother. This has to be addressed by requesting support from them and by sharing the difficulties she is facing. Mothers having shift duties are better placed than those who have continuous hours of working. Doctors and Nurses should be exempted from night duties until the baby is beyond 6 to 7 months.

FACTORS THAT SUPPORT BREASTFEEDING AT WORKPLACE

Table-2 shows the factors that support the working mother with breastfeeding. Efficiency of the mother at breast milk expression is probably the most important factor. For mothers having shift duties this will be less beneficial whereas for mothers who have to stay away from their baby for long hours, this skill assumes much importance. The mother has to have a proper place and time to express her milk at the workplace. Hence, it becomes very clear for her supporting medical and paramedical staff to train the working mother in expressing her milk manually. Breast pumps are not needed, not only they are expensive but they are also difficult to clean and sterilize. A mother can easily express 600 to 800 ml of milk with great ease and can express much more if needed. However this needs time and proper place.

When motivated, most mothers will be able to find time and place to express milk. The Maternity Act, 1961 of India also has stated that every lactating mother should be given 30 minutes of two breaks until the baby is 15 months of age.

TABLE – 1	
Barriers to breastfeeding at work place	
1.	Short maternity leave.
2.	Fatigue.
3.	Incompatibility of employment with breastfeeding.
4.	Worry about maintaining adequate milk supply.
5.	Prolonged separation from the infant.
6.	Feelings of guilt about separation from the infant.
7.	Infant refusal to breastfeed.
8.	Worries about the demands of breastfeeding.
9.	Difficulties with finding suitable place / time for milk expression.
10.	Lack of time for self.
11.	Breast engorgement.
12.	Leaking breast milk at work.
13.	Concerns about illness.
14.	Finding quality day care.
15.	Maintaining job performance.
16.	Difficulty reconciling multiple roles.
17.	Negative reactions of colleagues.
Modified from PCNA 2001, Part-II: The Management of Breastfeeding 48: 461-471	

TABLE – 2	
Factors that support breastfeeding in the workplace	
1	Child care by a trusted individual.
2	On-site child care.
3	Facilities / Efficiency for milk expression at work.
4	Adequate break time to nurse or place for milk expression / storage.
5	Support in the workplace / Family support..
6	Support groups / colleagues / supportive management.
7	Flexible schedules.
8	Educational programs concerning breastfeeding.
9	Successful role models.
10	Good diet.
11	Increased breastfeeding at night and on weekends.
Modified from PCNA 2001, Part-II: The Management of Breastfeeding 48: 461-471	

TABLE – 3	
12 Tips for successfully combining work and breastfeeding	
1.	Take as much leave as possible after birth.
2.	Take extra food and drink to maintain your health.
3.	Make sure breastfeeding is well established before returning to work.
4.	If you are away from your baby for several hours, express breast milk several times a day, and have your infant care giver feed it to the baby with a cup.
5.	Make sure the person who cares for your baby understands & supports breastfeeding.
6.	Practice expressing breast milk before returning to work. Expressing breast milk by hand is easy with practice and convenient for most women.
7.	Expressed breast milk keeps well at room temperature for 10 or more hours even in tropical countries. Cooling makes longer storage possible.
8.	Have family members and friends provide extra help while you are breastfeeding.
9.	If you are separated from your baby for long hours during the day, breastfeed more at night. Co-sleeping improves breast milk supply.
10.	If you have flexible work hours, going an hour late, extending your lunch break or leaving an hour early can be helpful.
11.	Form a support group with other working women who breastfeed or create a mother support group in your community.
12.	Delay your next pregnancy until you are ready to breastfeed another child.

TABLE – 4
Guidance for the Breastfeeding Mothers

I)	Before Delivery:
1	Communicate plans with supervisor or employer before delivery.
2	Agree on length of maternity leave.
3	Discuss availability of breaks or lunchtime for breast milk expression.
4	Discuss options for return to work full-time, part-time, flex-time, or work at home.
5	Investigate lactation programs available at the workplace.
6	Discuss plans with other women who have breastfed after return to work in the company and at other workplaces.
7	Discuss plans with spouse and potential infant's care givers.
8	Read about breastfeeding and employment.
II)	During Maternity Leave:
1	Establish a good milk supply by exclusive breastfeeding for as long as possible.
2	Have relative, friend, or infant's caregiver introduce expressed milk from a cup to the infant at approximately 4 weeks.
3	Update employer on any changes in plans.
4	Identify clothing for work that will facilitate milk expression & infant feeding.
III)	Return to work:
1	Make sure milk storage containers and coolers are ready.
2	Remember to take infant's picture to work.
3	Breastfeed just before leaving infant & as soon as possible after returning.
4	Try to express approximately every 3 hours in the beginning to avoid engorgement.
5	Wear clothing with designs that may be unbuttoned easily or lifted up.
6	Breastfeed frequently at night and on the weekends.
7	Seek the counsel of supportive co-workers.
8	Consult health care professionals if problems develop.
Modified from PCNA 2001, Part-II: The Management of Breastfeeding 48: 461-471	

ADVICE FOR MOTHERS WHO WORK AWAY FROM HOME

Avail all possible leave at your credit. Consider non paid leave also. Remember that breastfeeding has to go on exclusively for 6 months and continued for 2 years with home made semisolids and foods.

If possible, take your baby with you to work. If crèche is near your work place, it will be an added advantage.

If your work place is near to your home, you may be able to go home during breastfeeding breaks to feed him, or you may ask someone to bring him to you at work to breastfeed.

If your work place is far from your home, you can give your baby the benefit of breastfeeding in the following ways:

Breastfeeding exclusively and frequently for the whole maternity leave.

Do not start other feeds before you really need to. Do not think “I shall have to go back to work in 12 weeks, so I might as well bottle feed straight away”. This is the most common mistake by most mothers.

It is not necessary to use a bottle at all. Even very small babies can feed from a cup.

Wait until about a week before you go back to work. *Conduct test runs*, i.e., on that day get up early, express your milk and consider you are away and see how it works out. This will give a lot of confidence to you and the caregiver/s.

Leave just enough time to get the baby used to cup feeds, and to teach the caregiver who will look after him.

Continue to breastfeed at night, in the early morning, and at any other time that you are at home.

- This helps to keep up breast milk supply.
- It gives baby the benefit of breast milk – even if you decide to give him one or two artificial feeds during the day.
- Many babies ‘learn’ to suckle more at night, and get most of the milk that they need then.
- *Babies sleep more and need less milk during the day.*

Learn to express your breast milk soon after your baby is born.

- Express your breast milk before you go to work, and leave it for the caregiver to give to your baby.
- Express as much breast milk as you can, into a very clean cup or jar. Some mothers find that they can express 2 cups (400-500 ml) or more even after the baby has breastfed. But even 1 cup (200 ml) can give the baby 3 feeds a day of 60-70 ml each. Even ½ cup or less is enough for one feed.
- Leave about ½ cupful (100 ml) for each feed that the baby will need while you are out. If you cannot express as much as this, express what you can. Whatever you can leave is helpful.
- Cover the cup of expressed breast milk with a clean cloth or plate.

- Leave the milk in the coolest place that you can find, in a refrigerator if you have one, or in a safe, dark corner of the house.
- *Do not boil or re-heat your breast milk for your own baby. Heat destroys many of the anti-infective factors.*
- Expressed breast milk (EBM) stays in good condition longer than cow's milk, because of the anti-infective factors in it. Germs do not start growing in EBM for at least 10 hours, even in a hot climate, and outside the refrigerator and 24 hrs in the refrigerator.
- *Breastfeed your baby after you have expressed.*
- *Suckling is more efficient than expressing, so he will get breast milk that you cannot express, including some hind-milk.*

If you decide to use cow's milk for some or all of the feeds:

- To make 1 cup (200 ml) of feed, boil $\frac{3}{4}$ cup (150 ml) of cow's milk and $\frac{1}{4}$ cup (50 ml) of water. Add 1 level spoonful of sugar (15 g).
- Leave $\frac{1}{2}$ to 1 cup (100-200 ml) of mixture for each feed.
- Leave the mixture in a clean covered container.

If you decide to use formula:

- Measure the powder for a feed into one clean cup or glass.
- Measure the water to make up the feed into another clean glass.
- Cover them both with a clean cloth, or put them in a covered pan.
- Teach the baby's care giver to mix the milk powder and water when she is going to feed the baby. She must mix and use the formula immediately, because it spoils quickly after it is mixed.

Teach the care giver properly and carefully:

- Cups are cleaner, and they do not satisfy the baby's need to suckle. So, when you come home, your baby will want to suckle at the breast, and this will stimulate your breast milk supply.
- Teach her to give all of one feed at one time. She must not keep it to give later; and she must not give a small amount every now and again.
- *Teach her not to give the baby a pacifier but to calm him by other methods.*

While you are at work express your breast milk 2-3 times (about 3-hourly):

- If you do not express, your breast milk supply is more likely to decrease.
- Expressing also keeps you comfortable, and reduces leaking.
- If you work where you can use a refrigerator, keep your expressed breast milk there. Carry a clean jar with a lid to store your breast milk, and to take it home for the baby. If you can keep it refrigerator cold at home, it will be safe to use the next day.
- *If you cannot keep your EBM, throw it away. Baby has not lost anything –breasts will make more milk.*

(Material taken from Trainer’s Guide of Infant and Young Child Feeding Counseling: A Training Course The 3 in 1 Course of BPNI)

A Certificate to Extend Maternity Leave and Breastfeeding

Following is a draft of a letter which has almost always worked. If there is no family history of allergy, the third paragraph may be omitted.

Dr....., M.B.B.S. etc.

Address:

Date.....

This is to certify that Baby, born on is under my care. He is an exclusively breast-fed child and is thriving extremely well.

It has now been scientifically proved that mothers who breastfeed their babies exclusively for at least the first 4 months of life have a definite advantage over mother’s who are not able to do so. Their babies later in infancy and in early childhood fall ill less often and hence frequent absentism on resumption of duties is found to be less in such working mothers.

Baby also has a strong family history of allergy from side of both parents. Such babies are prone to get allergic disorders like Asthma and Eczema. But this risk is markedly reduced if the baby is exclusively breastfed for at least first 4 months of life – preferably for 6 months.

In light of above and in interest of all concened – the baby, the mother and the employer, I strongly recommend that’s mother may please be given leave till the baby completes 4 months of age.

Dr.

(From Dr. R. K. Anand’s, Maternity Home Practices & Breastfeeding page 73)

TO SUMMARISE

More and more mothers are seeking employment. Combining both is challenging. Priming the mind of the working mother, and motivating her, yields rich dividends for her and her baby. Anticipatory guidance given the health workers and counselors helps the working mother to cope

with the challenges and hurdles she may come across, most of which are related to timing and planning. The art of milk expression is most important skill that the working mother has to master.

Who are the role players?

- Self motivation.
- Husband's support.
- Family support.
- Employer's support.
- Colleague's support.
- Health professional's support.
- Community support.
- Government's support.

And finally every working mother should remember that: "Where there is a will there is a way".

FURTHER READING

1. PCNA February 2001, The Evidence for Breastfeeding Part-1 & Part-2.
2. Maternity Home Practices & Breastfeeding, 1998,
R. K. Anand et. al. AKASH Lawyers Chambers,
R. S. Sapre Marg, Mumbai-400 002.
3. Trainers Guide: Infant and Young Child Feeding
Counseling: A Training Course The 3 in 1
Course of BPNI, March 2008.
4. www.worldbreastfeedingweek.org 1993 website.
5. www.waba.org.my website.



BABY-FRIENDLY HOSPITAL INITIATIVE

Dr. Shitanshu Shrivastava

Revised, Updated and Expanded for Integrated Care 2009

Original BFHI Guidelines developed 1992



BACKGROUND

The Baby-friendly Hospital Initiative (BFHI) was launched by UNICEF and WHO in 1991-1992; the Initiative has grown, with more than 20,000 hospitals having been designated “Baby-friendly” in 156 countries around the world over the last 15 years. The challenges posed by the HIV pandemic and the importance of addressing “mother-friendly care” within the Initiative, resulted in updating the BFHI package. UNICEF, with WHO, undertook the revision of the materials in 2004-2005. The final version was completed in late 2007.

Key dates in the history of breastfeeding and BFHI

- 1991– Launching of Baby-friendly Hospital Initiative
- 2000– WHO Expert Consultation on HIV and Infant Feeding
- 2005 – Innocenti Declaration 2005
- 2007 – Revision of BFHI documents

Goals of the Baby-friendly Hospital Initiative

1. To transform hospitals and maternity facilities through implementation of the “Ten steps”.
2. To end the practice of distribution of free and low cost supplies of breast-milk substitutes to maternity wards and hospitals.

TEN STEPS TO SUCCESSFUL BREASTFEEDING***Every facility providing maternity services & care for newborn should:***

- 1. Have a written breastfeeding policy that is routinely communicated to all health care staff.**
- 2. Train all health care staff in skills necessary to implement this policy.**
- 3. Inform all pregnant women about the benefits and management of breastfeeding.**
- 4. Help mothers initiate breastfeeding within a half-hour of birth.**
- 5. Show mothers how to breastfeed, and how to maintain lactation even if they should be separated from their infants.**
- 6. Give newborn infants no food or drink other than breast milk unless medically indicated.**
- 7. Practice rooming in - allow mothers and infants to remain together - 24 hours a day.**
- 8. Encourage breastfeeding on demand**
- 9. Give no artificial teats or pacifiers (also called dummies or soothers) to breastfeeding infants**
- 10. Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or clinic.**

THE GLOBAL CRITERIA FOR THE BFHI**STEP-1: Have a written breastfeeding policy that is routinely communicated to all health care staff.**

This requires that the health facility has a written breastfeeding or infant feeding policy that addresses all 10 Steps and protects breastfeeding by adhering to the International Code of Marketing of Breast milk Substitutes.

It also requires that HIV-positive mothers receive counselling on infant feeding and guidance on selecting options likely to be suitable for their situations.

The policy should include guidance for how each of the “Ten Steps” and other components should be implemented. The policy is available so that all staff members who take care of mothers and babies can refer to it.

Summaries of the policy covering, at minimum, the Ten Steps, the Code and subsequent WHA Resolutions, and support for HIV-positive mothers, are *visibly posted* in all areas of the health care facility which serve pregnant women, mothers, infants, and/or children.

These areas include the *labour and delivery area, antenatal care in-patient wards and clinic/consultation rooms, post partum wards and rooms, all infant care areas*, including well baby observation areas (if there are any), and any special care baby units. The summaries are displayed in the language(s) and written with wording most commonly understood by mothers and staff.

STEP-2: Train all health care staff in skills necessary to implement the policy

The type and percentage of staff receiving this training is adequate, given the facility’s needs.

Out of the randomly selected *clinical staff members**:

At least 80% confirm that they have received the described training or, if they have been working in the maternity services less than 6 months, have, at minimum, received orientation on the policy and their roles in implementing it.

At least 80% are able to answer 4 out of 5 questions on breastfeeding support and promotion correctly.

At least 80% can describe two issues that should be discussed with a pregnant woman if she indicates that she is considering giving her baby something other than breast milk.

Out of the randomly selected *non-clinical staff members***:

At least 70% confirm that they have received orientation and/or training concerning the promotion and support of breastfeeding since they started working at the facility.

At least 70% are able to describe at least one reason why breastfeeding is important.

At least 70% are able to mention one possible practice in maternity services that would support breastfeeding.

At least 70% are able to mention at least one thing they can do to support women so they can feed their babies well.

*These include staff members providing clinical care for pregnant women, mothers and their babies.

**These include staff members providing non-clinical care for pregnant women, mother and their babies

STEP-3: Inform all pregnant women about the benefits and management of breastfeeding

If the hospital has an affiliated antenatal clinic or an in-patient antenatal ward:

A written description of the minimum content of the breastfeeding information and any *printed materials provided to all pregnant women* is available.

The antenatal discussion covers: The importance of breastfeeding, The importance of immediate and sustained skin-to-skin contact, Early initiation of breastfeeding, Rooming-in on a 24 hour basis, Feeding on cue or baby-led feeding, Frequent feeding to help assure enough milk, Good positioning and attachment, Exclusive breastfeeding for the first 6 months, The risks of giving formula or other breast-milk substitutes, Breastfeeding continues to be important after 6 months when other foods are given.

Out of the randomly selected pregnant women in their third trimester who have come for at least two antenatal visits:

At least 70% confirm that a staff member has talked with them individually or offered a group talk that includes information on breastfeeding.

At least 70% are able to adequately describe what was discussed about two of the following topics: importance of skin-to-skin contact, rooming-in, and risks of supplements while breastfeeding in the first 6 months.

STEP-4: Help mothers initiate breastfeeding within a half-hour of birth.

Place babies in skin-to-skin contact with their mothers immediately following birth for at least an hour. Encourage mothers to recognize when their babies are ready to breastfeed and offer help if needed.

Out of the randomly selected mothers with vaginal births or caesarean sections without general anesthesia in the maternity wards:

At least 80% confirm that their babies were placed in skin-to-skin contact with them immediately or within five minutes after birth and that this contact continued without separation for an hour or more, unless there were medically justifiable reasons.

(Note: It is preferable that babies be left even longer than an hour, if feasible, as they may take longer than 60 minutes to breastfeed).

At least 80% also confirm that they were encouraged to look for signs for when their babies were ready to breastfeed during this first period of contact and offered help, if needed.

(Note: The baby should not be forced to breastfeed but, rather, supported to do so when ready. If desired, the staff can assist the mother with placing her baby so it can move to her breast and latch when ready).

If any of the randomly selected mothers have had *caesarean deliveries* with general anesthesia, at least 50% should report that their babies were placed in skin-to-skin contact with them as soon as the mothers were responsive and alert, with the same procedures followed.

At least 80% of the randomly selected mothers with babies *in special care* report that they have had a chance to hold their babies skin-to-skin or, if not, the staff could provide justifiable reasons why they could not.

STEP-5: Show mothers how to breastfeed and how to maintain lactation, even if they should be separated from their infants.

The head of maternity services reports that mothers who have *never breastfed* or who have previously encountered *problems* with breastfeeding receive special attention and support both in the antenatal and postpartum periods.

Observations of staff demonstrating how to safely prepare and feed breast-milk substitutes confirm that in 75% of the cases, the demonstrations were accurate and complete, and the mothers were asked to give “return demonstrations”.

Out of the randomly selected clinical staff members:

At least 80% report that they teach mothers *how to position and attach their babies* for breastfeeding and are able to describe or demonstrate correct techniques for both ,

They teach mothers how to *hand express*

Describe how non-breastfeeding mothers can be assisted to safely *prepare their feeds*, or, if not, can describe to whom they refer mothers on their shifts for this advice.

Out of the randomly selected mothers with babies in special care:

At least 80% of those who are breastfeeding report that someone on the staff offered further assistance with breastfeeding within six hours of birth, offered them, provide help with positioning and attaching their babies.

At least 80% of those who are breastfeeding are able to demonstrate or describe correct positioning of their babies for breastfeeding, able to describe what signs would indicate

that their babies are attached and suckling well, how to express their milk by hand or given written information and told where they could get help if needed.

At least 80% of those breastfeeding or intending to do so report that they have been told they need to breastfeed or express their milk 6 times or more every 24 hours to keep up their supply

STEP-6: Give newborn infants no food or drink other than breast milk, unless medically indicated.

Review of all clinical protocols or standards related to breastfeeding and infant feeding used by the maternity services indicates that they are in line with BFHI standards and current evidence based guidelines.

No materials that recommend feeding breast milk substitutes, scheduled feeds or other inappropriate practices are distributed to mothers.

The hospital has an adequate facility/space and the necessary equipment for giving demonstrations of how to prepare formula and other feeding options away from breastfeeding mothers.

Observations in the postpartum wards/rooms and any well baby observation areas show that at least 80% of the babies are being fed only breast milk or there are acceptable medical reasons for receiving something else

At least 80% of the randomly selected mothers:

Report that their babies had received only breast milk or expressed or banked human milk or, if they had received anything else, it was for acceptable medical reasons, described by the staff.

Who have decided not to breastfeed report that the staff discussed with them the various feeding options and helped them to decide what was suitable in their situations

With babies in special care who have decided not to breastfeed report that staff has talked with them about risks and benefits of various feeding options.

STEP-7: Practice rooming-in. Allow mothers and infants to remain together 24 hours a day.

Observations in the postpartum wards and any well-baby observation areas and discussions with mothers and staff confirm that at least 80% of the mothers and babies are together or, if not, have justifiable reasons for being separated.

STEP-8: Encourage breastfeeding on demand.

Out of the randomly selected breastfeeding mothers at least 80% report that:

They have been told how to recognize when their babies are hungry and can describe at least two feeding cues.

They have been advised to feed their babies as often and for as long as the babies want or something similar

STEP-9: Give no artificial teats or pacifiers (also called dummies or soothers) to breastfeeding infants.

Observations in the postpartum wards/rooms and any well baby observation areas indicate that at least 80% of the breastfeeding babies observed are not using bottles or teats or, if they are, their mothers have been informed of the risks.

At least 80% report that, as far as they know:

Their infants have not been fed using bottles with artificial teats (nipples)

Their infants have not sucked on pacifiers.

STEP-10: Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or clinic.

The head/director of maternity services reports that:

Mothers are given information on where they can get support if they need help with feeding their babies after returning home, and the head/director can also mention at least one source of information.

The facility fosters the establishment of and/or coordinates with *mother support groups* and other community services that provide breastfeeding/infant feeding support to mothers, and can describe at least one way this is done.

The staff encourages mothers and their babies to be seen soon after discharge (preferably *2-4 days after birth* and again the second week) at the facility or in the community by a skilled breastfeeding support person who can assess feeding and give any support needed and can describe an appropriate referral system and adequate timing for the visits

A review of documents indicates that printed information is distributed to mothers before discharge, if appropriate, on how and where mothers can find help on feeding their infants after returning home and includes information on at least one type of help available.

Out of the randomly selected mothers at least 80% report:

That they have been given information on how to get help from the facility or how to contact support groups, peer counselors or other community health services if they have questions about feeding their babies after return home and can describe at least one type of help that is available.

REVISED BFHI

Section 1 includes background and implementation, summarizes the background of the initiative and describes the process of implementation

Provides guidance on the revised processes and expansion options at the *country, health facility, and community level*, recognizing that the Initiative has expanded and includes:

- Country Level Implementation

- Hospital Level Implementation

- The Global Criteria for BFHI

- Compliance with the International Code of Marketing of Breast-milk Substitutes

- Baby-friendly Expansion and Integration Option

- Resources, references and websites

It presents a methodology for encouraging nations to reinvigorate, restore or launch the BFHI in today's realities, facilitating the changes needed in maternity facilities, practices, and health worker training in those facilities, in accordance with the *WHO and UNICEF "Ten Steps to Successful Breastfeeding."*

Section 2 includes all material for training/raising the awareness of policy and decision-makers in relation of BFHI and IYCF in general

Section 3 corresponds to a 20-hour course for training facility staff (clinical and non-clinical)

Section 4 includes self-appraisal and monitoring tools

Section 5 includes the assessment and re-assessment tools

APPLYING THE TEN STEPS IN FACILITIES SETTINGS WITH HIGH HIV PREVALENCE

The “Ten Steps”	Guidance on applying the “Ten Steps”
<p>Step 1: Have a written policy on breastfeeding that is routinely communicated to all health care</p>	<p>Expand the policy to focus on infant feeding, including guidance on the provision of support for HIV positive mothers and their infants.</p>
<p>Step 2: Train all health care staff in skills necessary to implement this policy.</p>	<p>Ensure that the training includes information on infant feeding options for HIV-positive women and how to support them</p>
<p>Step 3: Inform all pregnant women about the benefits and management of breastfeeding</p>	<p>Where voluntary testing and counseling for HIV and PTMCT is available, Counsel all pregnant women on the benefits of knowing their HIV status so that, if they are positive, they can make informed decisions about infant feeding, considering the risks and benefits of various options. Counsel HIV positive mothers on the various feeding options available to them and how to select options that are acceptable, feasible, affordable, sustainable and safe. Promote breastfeeding for women who are HIV negative or of unknown status</p>
<p>Step 4: Help mothers initiate breastfeeding within a half-hour of birth.</p>	<p>Place all babies in skin-to-skin contact with their mothers immediately following birth for at least an hour. Encourage mothers who have chosen to breastfeed to recognize when their babies are ready to breastfeed, offering help if needed. Offer mothers who are HIV positive and have chosen not to breastfeed help in keeping their infants from accessing their breasts</p>

<p>Step 5: Show mothers how to breastfeed, and how to maintain lactation even if they should be separated from their infants</p>	<p>Show mothers who have chosen to replacement feed how to prepare and give other feeds, as well as how to maintain optimal feeding practices and dry up their breast milk while maintaining breast health</p>
<p>Step 6: Give newborn infants no food or drink other than breast milk, unless medically indicated</p>	<p>Counsel HIV positive mothers on the importance of feeding their babies exclusively by the option they have chosen (breastfeeding or replacement feeding) and the risks of mixed feeding (that is, giving both the breast and replacement feeds)</p>
<p>Step 7: Practice rooming-in- allows mothers and infants to remain together -24 hours a day.</p>	<p>Protect the privacy and confidentiality of mother's HIV status by providing the same routine care to all mothers and babies, including rooming-in.</p>
<p>Step 8: Encourage breastfeeding on demand.</p>	<p>Address the individual needs of mothers and infants who are not breastfeeding, encouraging replacement feeding at least 8 times a day</p>
<p>Step 9: Give no artificial teats or pacifiers (also called dummies or soothers) to breastfeeding Infants.</p>	<p>Apply this step for both breastfeeding and no breastfeeding infants</p>
<p>Step 10: Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or clinic.</p>	<p>Provide on-going support from the hospital or clinic and foster community support for HIV positive mothers to help them maintain the feeding method of their choice and avoid mixed feeding. Offer infant feeding counseling and support, particularly at key points when feeding decisions may be reconsidered, such as the time of early infant diagnosis and at six months of age. If HIV positive mothers are breastfeeding, counsel them to exclusively breastfeed for the first 6 months of life unless replacement feeding is acceptable, feasible, affordable, sustainable and safe for them and their infants before that time.</p>

BIBLIOGRAPHY

1. WHO/UNICEF. *Global Strategy for Infant and Young Child Feeding*. Geneva, World Health Organization, 2003. Full text PDF in English, Arabic, Chinese, French, Russian and Spanish.
2. *WHO HIV and Infant Feeding Consensus Statement*. Technical Consultation Held on behalf of the Inter-agency Task Team (IATT) on Prevention of HIV Infections in Pregnant Women, Mothers and their Infants Geneva, October 25-27, 2006.
3. Edmond K, Bahl R. *Optimal feeding for the low birth weight infant: Technical review*. Geneva, World Health Organization, 2006.
4. WHO/UNICEF. *Implementing the Global Strategy for Infant and Young Child Feeding: Report of a technical meeting*. Geneva, World Health Organization, 2003.
5. WHO/UNICEF. *Breastfeeding and maternal medication: Recommendations for drugs in the eleventh WHO model list of essential drugs*. Geneva, World Health Organization, 2002.
6. *Complementary feeding: Report of the Global Consultation, and Summary of Guiding Principles for complementary feeding of the breastfed child*. Geneva, World Health Organization, 2001.
7. *Guiding principles for complementary feeding of the breastfed child* Washington DC, WHO/PAHO, 2003.
8. Butte N, Lopez-Alarcon M, Garza C. *Nutrient adequacy of exclusive breastfeeding for the term infant during the first six months of life*. Geneva, World Health Organization, 2002.
9. *The optimal duration of exclusive breastfeeding, Report of an expert consultation* WHO/FCH/CAH/01.24. Geneva, World Health Organization, 2001.
10. *The optimal duration of exclusive breastfeeding, A systematic review* WHO/FCH/CAH/01.23. Geneva, World Health Organization, 2001.
11. *Statement on the effect of breastfeeding on mortality of HIV-infected women*. Geneva, World Health Organization, 2001.
12. *Evidence for the Ten Steps to Successful Breastfeeding* WHO/CHD/98.9 Geneva, World Health Organization. 1998. Available in English, French and Spanish. *Complementary feeding of young children in developing countries: A review of current scientific knowledge* WHO/NUT/98.1. Geneva, World Health Organization, 1998.
13. *Health aspects of maternity leave and maternity protection*. Statement to ILO, Geneva, 2001. *Breastfeeding and Maternal Tuberculosis*. Geneva, World Health Organization, 1998 (Update No. 23)
14. *Breastfeeding and the use of water and teas* Geneva, World Health Organization, 1997 (Update No 9).
15. *Not enough milk* Geneva, World Health Organization, 1996 (Update No 21).
16. *Hepatitis B and breastfeeding*. Geneva, World Health Organization, 1996. (Update No. 22).
17. WHO/UNICEF. *Breastfeeding counseling: A training course* Geneva, World Health Organization, 1993.

18. UNAIDS/FAO/UNHCR/UNICEF/WHO/WFP/WB/UNFPA/IAEA. *HIV and Infant Feeding: Framework for Priority Action* Geneva, World Health Organization, 2003. Available in Chinese, English, French, Portuguese and Spanish.
19. WHO/UNAIDS/UNFPA/UNICEF. *HIV transmission through breastfeeding. A review of available evidence* (Update). Geneva, World Health Organization, 2007.
20. WHO/UNAIDS/UNFPA/UNICEF. *HIV and Infant Feeding. Guidelines for decision-makers* Geneva, World Health Organization, 2004. Available in English, French and Spanish.
21. WHO/UNAIDS/UNFPA/UNICEF. *HIV and Infant Feeding. A guide for health-care managers and supervisors* Geneva, World Health Organization, 2004. Available in English, French and Spanish.
22. *Mastitis. Causes and management*. WHO/FCH/CAH/00.13. Geneva, World Health Organization, 2000.
23. *HIV and infant feeding counseling: A training course* WHO/FCH/CAH/00.2-4. Geneva, World Health Organization, 2000. Available in English and Spanish.
24. *Relactation. A review of experience and recommendations for practice* WHO/CHS/CAH/98.14. Geneva, World Health Organization, 1998
25. *Persistent diarrhea and breastfeeding* WHO/CHD/97.8. *Hypoglycaemia of the newborn. Review of the literature* WHO/CHD/97.1. Geneva, World Health Organization, 1997.

WEBSITES

Sections are available on the UNICEF website at http://www.unicef.org/nutrition/index_24850.html; <http://www.unicef.org/> and, on the WHO website at <http://www.who.int/nutrition/publications/infantfeeding/9789241594950/en/index.html>; www.who.int/nutrition.

HUMAN MILK BANKING

Dr. Ketan Bharadva, Dr. Nirali Mehta

“A pair of substantial mammary glands has the advantage over the two hemispheres of the most learned professor’s brain, in the art of compounding a nutritious fluid for infants.” —¹ Oliver Wendell Holmes

Definition

A human milk bank is a service established for collecting, screening, processing, storing and distributing donated human milk to the recipients who are not the biological offspring of the donor mother.²

HISTORY

The roots of donor milk banking reach back to earlier times when children were either breastfed by their mothers or breast fed by friends, relatives or strangers - a practice referred to as “wet nursing”.³ Human Milk Bank (HMB) is thus an technological alternative to age old concept of wet nursing.

First HMB was established at Vienna in beginning of 20th century.

The first human milk bank in India was established in LTMG hospital in Sion- Mumbai almost ten years back. At present, in Mumbai there are four milk banks – LTMG-Sion, K.E.M Hospital Parel, J.J Hospital Byculla & Cama Hospital. There exist two more milk banks- one at Goa Medical College, Panjim & the other at Baroda Medical College – Gujarat. Latest has been established in Surat, at the SMIMER Hospital HMB in Dec 2009.

International Statement of Advocacy

WHO and UNICEF, made a joint statement in 1980: “Where it is not possible for the biological mother to breast feed, the first alternative, if available, should be the use of human milk from other sources. Human milk banks should be made available in appropriate situations.”²

BANKING HUMAN MILK HELPS

Ensures continuous supply of human milk to sick & preterm babies, who are at risk to infection

Reduces infection rate in hospitalised babies

Helps mother to maintain lactation – reduced long term morbidity & mortality in babies.

Also helpful for babies separated from their mothers due to post-partum emergencies like PPH or any other serious medical illness.

Can be utilized for mothers who deliver twins, triplets or quadruplets.

Fruitful for a non lactating mother who has adopted a neonate.

Some mothers may donate accumulated expressed milk after a baby dies. This sense of giving and donating can be healing for many families while they grieve an infant's loss.

VIRUSES AND BREAST MILK

A review of the literature has found that no banked milk has ever been linked with the transmission of disease. Nor, has any worker become infected due to the handling of the milk. However, continuing the process of screening and pasteurization is essential in order to maintain this record.

It is possible for the human immunodeficiency virus to be transmitted in breastmilk. However, pasteurization is known to inactivate HIV 1 and 2.

Hepatitis B is not thought to be transmitted via breast milk, although at risk babies are given hepatitis B immunoglobulin and vaccine to decrease any potential risk. It appears that there is also a low risk of transmission of Hepatitis C via breast milk.

Cytomegalovirus is transmitted via breast milk, although viral shedding varies: being less in Colostrum compared to the mature breastmilk. Viral shedding peaks during seroconversion, so breastfeeding is not recommended at this time, even though transmission usually does not cause symptomatic disease. Immuno-compromised or very premature infants should be fed on pasteurized milk, or milk donated from a seronegative mother.

Rubella is potentially transmittable in breast milk, but no disease is ever seen.

It seems unlikely that herpes is transmitted through breastfeeding, unless there are herpetic breast lesions present.²

HUMAN MILK BANKING: SYSTEM OF “TRIPLE PROTECTION”

One of the major issues milk banking faces is the possibility of transmission of an infectious disease via the milk. Parents may fear accepting donated milk for this reason, while doctors may feel that the benefits of donated milk are outweighed by the possible legal implications. Hence proper care is extremely important. A system of “*triple protection*” is applied for it:

- Review of donor’s health history
- Serum screening and
- Heat treatment of all donor breast milk

The Human Milk Banking Association of North America (HMBANA) has exhaustive “Guidelines for the Establishment and Operation of a Human Milk Bank”. There are similar guidelines for UK.⁴

Human Milk Banking is essentially a voluntary system. No donor receives payment for her milk. This also helps to keep the donation safety.

Perhaps the only exception to this situation might be in a hospice situation where the recipient of the milk is not expected to live. In this case, milk from a family member may alleviate suffering and discomfort caused by medications or the disease itself. Family members should not expect a quick fix, however, and should discuss the options thoroughly and be fully aware of the possibility of disease transmission.



COUNSELLING OF MOTHERS



SAMPLING

DONOR SELECTION

Mother’s full medical history should be taken before milk donation

Mothers should be encouraged to lead a healthy lifestyle and eat a healthy well balanced diet.

Donor mothers should be recruited as early as possible after the birth of the baby, once lactation is well established and any possible breastfeeding difficulties have been resolved. Donor milk from a newly lactating mother has a high content of immunological factors. Their milk is therefore most valuable as donor milk.

Donors should not be recruited when they are weaning their baby. Mothers who start to wean their baby should not be encouraged to continue lactating solely to donate milk to a milk bank. There is almost a 10 fold drop in zinc content of milk throughout 12 months lactation. 4

Mothers Not Eligible For Donating Breast Milk

Lifestyle behaviours

Mothers who smoke cigarettes. Nicotine and cotinine are found in the breast milk of smoking lactating mothers and consequently have physiological effects on recipient infants.

Mothers who use illegal drugs. Cocaine use has been associated with convulsions in a breast fed baby.

Mothers who regularly consume more than 2 units of alcohol daily. Alcohol in breast milk has been associated with pseudo-Cushing syndrome and may have an effect upon mental and motor development.

Medical Conditions

Mothers who suffer from any chronic illness or systemic disorder.

Mothers who receive long term prescribed medication, except for the oral progesterone-only contraceptive pill, diabetes, thyroid disorders & asthma inhaler. Taking medication very rarely prevents a mother to breastfeed her own healthy baby. But donor milk is likely to be pooled with other mothers' milk and it is undesirable to feed a cocktail of drugs and their metabolites to sick infants.4

Infections

Mothers who test Hepatitis B surface antigen positive or positive for Hepatitis C. Hepatitis B infection may be transmitted from mother to child through breastfeeding and it is at present unclear whether Hepatitis C is transmitted by breastfeeding.

Mothers who have had a recent hepatitis A infection (within the last month). Hepatitis A is often found in breastmilk but transmission is rare. The period of infectivity of Hepatitis A is a few days only.

HIV: These criteria are all selected to minimize the possibility that a donor mother is HIV 1 infected. The categories are equivalent to those used to defer donations of blood by the Blood Transfusion Service

- Mothers who test positive for HTLV-I or HTLV-II antibodies. HTLV infections are very uncommon. However they have been shown to be transmitted from mother to child through breastfeeding and therefore it is recommended that donor mothers are screened for these infections and any who test positive should not donate milk
- Mothers who have AIDS are known to be infected with HIV1 or 2 or test positive for HIV. HIV can be transmitted via breast milk
- Mothers who belong to a group considered to be at higher risk of HIV, that is if they are known to be any of the following:
 - Sexual partners of men known to be infected with HIV1 or 2.
 - Drug users, or sexual partners of drug users, who have injected themselves with drugs at any time

Mothers who are commercial sex workers.

Mothers who have received in the preceding 6 months a blood transfusion or other blood products whilst in a country where screening of donations is not routine.

Mothers who test positive for treponemal serology suggestive of active infection. Syphilis can be transmitted from mother to child through breastfeeding

Asymptomatic individuals potentially at risk from iatrogenic exposure e.g. recipient of human growth hormone, or duramater graft or individuals who have been contacted as potentially 'at risk' because of exposure to instruments or tissues 4

FUNCTIONING PROTOCOLS

Counselling of mother

Screening procedure

Collection of milk in sterile containers

Transport to milk bank in vaccine carrier

Pooling of milk

Heat treatment of pooled milk

Bacteriological test of processed milk

Storage in deep freezer. 3 – 6 months

Distribution by First in First out basis.

Dispatched milk is thawed at room temperature & such milk is used within 4 hours.



Screening

USA and UK recommend serological testing every 2 to 6 months of the donor for HIV 1 and 2, HTLV 1 and 2, hepatitis B and C and syphilis.

The screening process for becoming a donor is a **three-stage procedure**.

First part of screening is counselling and a consent form for the woman and her doctor to ensure that neither the donor mother nor her infant will suffer if the mother donates milk.²

Second, the donor answers a detailed health history questionnaire.

Third, donor undergoes recommended serological blood tests. New tests may be added to this screening panel as new viruses emerge which could create potential problems for recipients. Milk banks will cover the cost of the serological screening.

Repeat donors are treated as new donors with each pregnancy and must undergo screening again.

Collection

It varies from milk bank to milk bank. In some centres, hospital patients are the major source of donations, while others ship milk from interstate from a donor's home. Donors are educated regarding the most hygienic way to express milk. Hand expression is the best method for collection; however some centres allow certain types of hand pumps to be used.

Drip milk (milk that drips from the unused breast during feeding or expressing from the other breast) has a lower caloric content and is more susceptible to contamination, but is acceptable to some centres.



The type of container used for collection also varies according to what is most readily available. Polythene bags are associated with a decrease in the IgA content of milk, while glass is linked to a loss of leucocytes.

The current recommendation is that glass is best, but world wide many different types of materials are used. In India steel utensils / containers are used.²

To inactivate the relevant viruses and kill potentially harmful bacteria while maintaining a reasonable immunoglobulin, lactoferrin and lysozyme content, milk should be pasteurised. Most milk banks pasteurize their milk. The protocol is called “Holder Pasteurization” which means that milk is heated at 62.5 degrees Celsius for 30 minutes.

New guidelines now recommend 56 degrees Celsius because at this temperature most bacteria and viruses are adequately dealt with, while retaining many of the immunological and nutrition



PASTEURIZATION

properties of breast milk. The milk is again checked for bacterial counts after heat treatment, but no level of growth is accepted.

The current recommendation for pasteurisation is to be at the higher temperature of 62.5 degrees Celsius for 30 minutes to ensure that bacteria such as *Mycobacteria tuberculosis* and as many viruses are killed and inactivated as possible. In view of the increasing prevalence of tuberculous infection it is now considered that the lower temperature of 57 degrees Celsius is not acceptable.

Some centres analyze each batch of milk for its nutritional content and label it appropriately.²

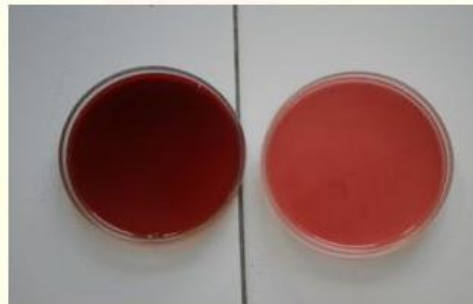
All milk should be thoroughly defrosted before processing to ensure adequate heat treatment. The time and temperature of the heat-treatment cycle should be recorded automatically by the machine. The operator should retain this record after each run. The maintenance schedule should be followed. There may be a risk of water ingress if bottles are submerged during cooling with the possibility of the milk becoming contaminated.

Bottles of milk will be cooled rapidly as part of the cooling cycle of the pasteurizer. In practice the reduction of temperature from 62.5 degree C to 25 degree C in 10 minutes is desirable, however

to date there is no evidence to support a specific method of cooling. Milk should be removed from the pasteurizer immediately on completion of the cycle.⁴

Microbiological testing

It is important that the milk is microbiologically tested, before and after heat treatment. A member of the microbiology team uses a dedicated area in the milk bank and take a loop of milk (10 ml) using a sterile loop (singly packed – plastic disposables are commercially and readily available). It is spread directly on to an agar plate. The plates are then transported back to the laboratory for incubation in a suitable specified container. The other option is that a small sample (e.g. 2 ml) from each bottle is taken aseptically and transferred to a sample bottle and sent to the laboratory for testing. This method could introduce contamination of the sample if incorrect aseptic technique is carried out.



MICROBIOLOGICAL TESTING

Plates are read after overnight incubation at 37°C whereby no potential pathogens should be present and there should not be confluent growth of organisms, indicating a total count exceeding 10^5 cfu per ml.⁴

Storage and Dispatch

Fresh-raw milk must be stored continually at 4 degrees Celsius for no longer than 72 hours following expression, whereas fresh-frozen milk can be held at 20 degrees Celsius for 12 months.²

Each bottle of milk *and* cap should be labelled with batch number with an indelible marker before putting them in the freezer. The frozen milk has to be thawed to room temperature before dispatching it.



STORING IN DEEP FREEZER

Milk should be used as soon as possible after pasteurisation. As a guideline it is considered undesirable to keep it frozen for longer than 3 months.

EFFECT OF STORAGE ON BREAST MILK CONTENTS

Amongst nutrients in the milk those most likely to deteriorate are vitamins and fats. Fats are prone to peroxidation, leading to rancidity. The free fatty acid concentration of human milk rises after heat-treatment and during storage. This is attributable to disruption of the milk fat globule membrane and to enzymatic lipolytic activity, though the lipase is probably inactivated by heat treatment. Free fatty acids in human milk are subject to peroxidation during storage at 4 degrees C for four days, probably as a consequence of release of reactive oxygen species (ROS) from macrophages.

Lipid peroxidation increases with time at -20 degree C and has been shown after 2 – 5 months storage. Vitamin C levels reduce at -20 degree C after 2 months.⁴

CONCLUSION

A review of the literature on human milk banking is very positive. WHO recommends, “Where a baby is unable to receive the biological mother’s milk, milk of another mother is next best”. In order to ensure a safe supply of breast milk for all infants, regulated milk banking is the safest means of doing this.²

REFERENCES

- 1 Quotations about Breastfeeding: Oliver Wendell Holmes. Available from : www.quote garden.com/breastfeeding.html Last modified 2010 Nov 18 Thu 06:56 PST
- 2 Human Milk Banking: A Review. Courtesy - Dr Carolyn Nash and Dr Lisa Amir for the Maternal and Child Health Sub-committee. Available from: http://www.breastfeedingindia.com/breastfeeding/human_milk_banks.html
- 3 The History of Milk Banking, F. Jones, October 2003. Available from: <http://www.hmbana.org/index/history>
4. Guidelines for the establishment and operation of human milk banks in the UK. 3rd Edition September 2003. United Kingdom Association for Milk Banking. The Milk Bank Queen Charlotte’s and Chelsea Hospital Du Cane Road. London W12 0HS . Available from : www.ukamb.org



FEEDING THE BABY IN NICU

Section VI

DISORDERS

MALNUTRITION

Dr. S. Mruthyunjaya

Although the term malnutrition refers to both under and over nutrition, in view of the size and urgency of the under nutrition problem in India it has taken priority over the problem of over nutrition.

About 50% of under-five's in our country have been considered to be under nourished, according to NFHS III. More than 75% of preschool children suffer from Iron deficiency and 57% have subclinical Vitamin-A deficiency, reflects the high prevalence of micronutrient deficiency in our children. Under-nutrition, both PEM and micro-nutrient deficiency directly affects many aspects of child development such as physical, cognitive growth and increased susceptibility to infections.(1) It also limits education attainment, productivity and ultimately perpetuates poverty. Children who are under nourished in the first 2 years of life & who put on weight rapidly later in childhood & in adolescence are at high risk of chronic diseases related to nutrition in adulthood such as hyperlipidaemia, diabetes mellitus, hypertension & other cardiovascular disorders, alteration in the lung functions and immune response, muscular skeletal disorders & mental illness.(2)

The ready to use energy dense supplements have successfully addressed the problem of acute and severe forms of malnutrition, such as marasmus and kwashiorkor, masking the huge number of under weight, stunted children. The dangerous part of under-nutrition is a chronic and subclinical condition, failing to draw the attention of the community and health care system resulting in irreversible growth failure if not detected early.(3)

ROOTS OF UNDER NUTRITION

Many factors play role in the causation of malnutrition but poverty/low income may not be the predominant cause.(4) The process of under-nutrition can begin as early as under six months of age due to suboptimal breastfeeding and weaning practices in the form of poor exclusive breastfeeding rates, both early and delayed introduction of complimentary feeds, and poor nutrient intake (low food diversity and poverty). Lack of maternal education plays an important role in the causation of under-nutrition. Prevention of maternal and child under-nutrition is a long time investment that will benefit the present & future generations. Under-nourished children are more likely to become short adults, to have lower educational catchments, and give birth to smaller infants.(5) In

sub-Saharan Africa and, increasingly in India, an additional concern is that many patients with severe malnutrition are also infected with HIV.(6)

Causes of malnutrition

Inadequate food intake:

- Improper infant feeding practices
- Lack of exclusive breastfeeding
- Delayed weaning
- Dilution of milk
- Poor caloric and nutritional content of food
- Inequitable interfamilial distribution (age & gender differences)

Illness (Recurrent diarrhoea & respiratory infections)

- Poor environmental/housing conditions
- Lack of hygiene and sanitation facilities
- Inadequate access & utilization of health care
- Poor food hygiene
- Poor immune status

Deleterious caring practices:

- Absence of responsible caregivers
- Traditional beliefs
- Parental illiteracy
- Poverty

Service issues:

- Lack of reach & coordination of public sectors services
- Inadequate training and supervision of services provider in nutritional counseling.
- Missed opportunities for services and programmes (ICDS, PDS & others)
- Inadequate targeting of urban poor.

Mothers who have been intensely influenced by the advertisements of milk formulas & tin foods, may exhibit more faith in them instead of regular home made complimentary food. Early habituation to junk food to pacify the child can divert appetite and eating habits of the child. Exacerbations and recurrence of the respiratory infections following exposure to allergens, triggering factors during infancy and early childhood can seriously affect the appetite, food intake and ultimately the growth. Very revealing is the statistics provided by the NFHS-3 that malnutrition among Indian children below the age of three born to illiterate mothers (55%) is more than twice the level (26%) reported among mothers who have completed more than ten years of schooling. As a mother's education per se cannot conceivably affect the health of a child, this number speaks a great deal. Both child malnutrition and education are strongly correlated with women's social status.

TREATMENT

Some basic elements / principles of treatment are mentioned in the following table. The details of management including that of Severe Acute Malnutrition (SAM) are beyond the aim and scope of this chapter and hence not included.

Elements in the management of severe protein–energy malnutrition (7)	
Problem	Management
Hypothermia	Warm patient up; maintain & monitor body temperature
Hypoglycemia	Monitor blood glucose; provide oral (or intravenous) glucose
Dehydration	Rehydrate carefully with oral solution containing less sodium and more potassium than standard mix
Micronutrients	Provide copper, zinc, iron, folate, multivitamins
Infections	Administer antibiotic and anti-malarial therapy, even in absence of typical symptoms
Electrolytes	Supply plenty of potassium and magnesium
Starter nutrition	Keep protein and volume load low
Tissue-building nutrition	Furnish a rich diet dense in energy, protein and all essential nutrients that is easy to swallow and digest
Stimulation	Prevent permanent psychosocial effects of starvation with psychomotor stimulation
Prevention of relapse	Start early to identify causes of protein–energy malnutrition in each case; involve the family and the community in prevention

PREVENTION

Interventions like appropriate breastfeeding practices alone can prevent 55 to 87% of neonatal deaths.(8) Complimentary feeding practices are appropriate when they are timely, adequate safe & properly fed. Maintenance of breastfeeding, frequent and on demand breastfeeding until 2 years of age or beyond can provide significant nutritional support. Encourage fluid intake & breastfeeding during illness along with soft, varied, appetizing, favourite foods. After illness give food more often than usual. High immunization coverage and early and correct management of cases of infectious disease play major roles in the prevention and treatment of protein–energy malnutrition. In poor communities, the treatment of helminthic infections 3 times per year improved child growth and development.(9) Bottle feeding and diluted milk can cause recurrent infections and poor calorie intake predisposes the child to under-nutrition.

Numerous studies have shown that income or assets controlled by women are more likely to be spent on items that benefit children and themselves than assets controlled by men.(10) Therefore empowering women through legislation may indirectly help combating nutritional problems in both women and children.

Because malnutrition has many causes, only multiple and synergistic interventions embedded in true multi sectoral programs can be effective. A variety of actions are needed, including agricultural and micronutrient interventions and the provision of safe drinking water and sanitation, education about and support for better diets, special attention to gender issues and vulnerable groups such as pregnant women and young children, and quality health services. Nutrition education about locally available protein- and micronutrient-rich plants is particularly effective and sustainable. Dietary diversification, better coverage under the national anaemia control program, massive dose vitamin-A administration, universal access to iodised and later iron and iodine fortified salt are some of the interventions that could help the country to achieve rapid reduction in micronutrients deficiencies.”(11)

Summarizing the preventive measures of under nutrition

Regular antenatal check up and nutritional supplementation during pregnancy.

Prenatal counselling on infant and young child feeding.

Early initiation and exclusive breastfeeding.

Strict avoidance of bottle feeding.

Immunization.

Timely introduction of complimentary feeding.

Regular growth monitoring and early detection, intervention.

Regulate the interference by the infant milk formulas through IMS act.

Educate the mother to develop good eating habit in her child

Family planning and birth spacing.

Nutrition supplementation (Ready to use therapeutic foods, Vitamin-A, Iodine, Iron etc.,) and involvement of family members, students and the community in the nutritional care of the child.

Transferring timely feeding responsibility from elder siblings to their mothers.(12)

Prevention of early marriages in adolescent girls who are malnourished and not attained physical, mental maturity leads to early pregnancy and birth of small infants.

Provision of sanitation facility, proper housing and transport to health care facilities.

Training of all Health care personnel, Social workers & Supervisors in the field of IYCF.

REFERENCES

1. Health Education to Villages, Programmes for Mother and Child Nutrition at www.hetv.org/programmes/nutrition.htm
2. Lancet, 2008, January 26; 371 (9609) 340-357.
3. Malnutrition causes heavy economic losses, contributes to half of all child deaths, but can be prevented – new World Bank report, March 2nd 2006, at <http://web.worldbank>
4. <http://www.indiatogether.org/2007/apr/chi-nutrition.htm>. Gujarat, by contrast with Manipur, tends towards a low general status of women and has a significant tribal population who are illiterate and marginalized.
5. www.ifpri.org/media/BeijingPlus10/briefIndia.pdf
6. Ambrus JL Sr, Ambrus JL Jr. Nutrition and infectious diseases in developing countries and problems of acquired immunodeficiency syndrome. *Exp Biol Med* (Maywood) 2004;229:464-72
7. Ashworth A, Chopra M, McCoy D, Sanders D, Jackson D, Karaolis N, et al. WHO guidelines for management of severe malnutrition in rural South African hospitals: effect on case fatality and the influence of operational factors. *Lancet* 2004;363:1110-5.
8. Jones G, Steketee R.W, Morris S.S, How many child deaths can we prevent this year? *The Lancet* .2003; 362: 65-71.
9. <http://www.indiatogether.org/2007/apr/chi-nutrition.htm>. Gujarat, by contrast with Manipur, tends towards a low general status of women and has a significant tribal population who are illiterate and marginalized.
10. www.ifpri.org/media/BeijingPlus1Au:0/briefIndia.pdf
11. <http://nutritionfoundationofindia.res.in/fao%202007/FAO2007/11%20Summary%20and%20Conclusion/11%20Conclusion%20.pdf>
12. <http://www.hindu.com/2007/06/22/stories/2007062250151000.htm>

CHILDHOOD OBESITY IN INDIA

Dr. Urmila S. Deshmukh

INTRODUCTION

Obesity has reached epidemic proportions globally, with more than 1 billion adults overweight, at least 300 million of them clinically obese. Overweight and obesity now rank as the fifth leading global risk for mortality.(1) In developing countries such as India, obesity now coexists with under-nutrition, affecting virtually all ages and socioeconomic groups. India, a country with highest number of undernourished under 5 children, is also known as the Diabetes capital of the world.

Evidence is accumulating showing the rising trend of childhood obesity in India. (2-6) Increased consumption of more energy-dense, nutrient poor foods with high levels of sugar and saturated fats, combined with reduced physical activity, have been implicated in the rising prevalence of obesity.(7)

Although rapid industrialisation and nutrition transition has contributed much to the escalating prevalence of non-communicable diseases (NCDs, e.g. obesity, type 2 diabetes, cardiovascular diseases etc.), the contribution of early life factors also needs to be understood. Research in the last three decades has shown the importance of early life factors in this dual burden of under- and over- nutrition. The life cycle approach to NCD prevention would be much more effective rather than focusing only on adulthood factors such as therapeutic life style changes.

ESTIMATES OF OVERWEIGHT-OBESITY

In 2007 it was estimated that globally 22 million children under 5 years were overweight, and in 2010, 43 million will be overweight. More than 75% of overweight and obese children live in low and middle income countries. Although current estimates suggest that the rate of obesity in developed countries is double than that in developing countries, in terms of absolute numbers, prevalence is much higher in developing countries. There are an estimated 35 million overweight/obese children in developing countries, compared with 8 million in developed countries.(8)

here is lack of nationally representative data of childhood overweight and obesity in India. Reports from various regions in India showing prevalence of childhood overweight and obesity have been

summarized in Figure-1. Study of secular trends in body size and metabolic parameters are showing significant increase in abdominal obesity, fasting blood glucose and blood pressure (9), and decrease in high-density lipoprotein cholesterol.(3) Thus the evidence points towards an urgent need to *prevent* these morbidities.

OVERWEIGHT, OBESITY AND METABOLIC SYNDROME

Development in the methods of body composition measurement introduced the concept of adiposity. Although often used interchangeably, 'adiposity' indicates the *percent fat mass* in the body, whereas 'obesity' entails the *total fat mass* in the body. Accumulation of adipose tissue in excess amounts leads to obesity.

The commonly used thresholds to define overweight or obese children are: 110% or 120% of ideal weight for height; weight-for-height Z scores of higher than 1 or higher than 2, and BMI at the 85th, 90th, 95th, and 97th percentiles (on the basis of international or country specific reference populations). The Childhood Obesity Working Group of the International Obesity Task Force (IOTF) reference uses sex- and age-specific BMI cutoffs that correspond to BMI 25 kg/m² for overweight and 30 kg/m² for obesity at age 18 years.(10) The WHO Child Growth Standards introduced in April 2006, accepted by our government and Indian Academy of Pediatrics, are expected to provide a valuable tool to identify, assess and monitor the double burden of malnutrition (stunting and overweight) (<http://www.who.int/childgrowth/en/>).

Recently revised guidelines for diagnosis of obesity, abdominal obesity, the metabolic syndrome (MS), physical activity, and drug therapy & bariatric surgery for obesity in Asian Indians have been published and the same for pediatric age group is expected soon.(11) The International Diabetes Federation (IDF) consensus definition of metabolic syndrome in children and adolescents is given in Table 1. (12) Consistent with the situation in adults, waist circumference in children is shown to independently predict IR, lipid levels and blood pressure, and therefore waist measurement is now included in the definition of MS in children.

OBESITY ASSOCIATED COMORBIDITIES

Concomitant with the greater prevalence of childhood obesity, the prevalence of type 2 diabetes has increased in children and adolescents. Recently, Kapil et al. studied the prevalence of MS in 1331 children in the age group 6-18 y, belonging to high income group in Delhi. The MS prevalence was 6.5% (6.9% in boys and 5.9% in girls).(13) These investigators also studied prevalence of impaired glucose tolerance (IGT) and type 2 diabetes in 154 obese children in age group 6 to 18 y, in Delhi. The prevalence was found to be 1.3 and 18.2% for IGT and diabetes respectively.(14) A cross-sectional, population-based study of 1022 students aged 14-19 years in New Delhi

investigated correlates of primary hypertension. Hypertension in these adolescents was associated with obesity (waist circumference), higher serum lipids and a family history of hypertension.(15)

Obesity (BMI \geq 95th percentile) is associated with hyperandrogenemia and hyperinsulinism in pre- to mid-pubertal girls, with high risk for polycystic ovary disease (PCOD). Acanthosis nigricans (AN), hypertension, proteinuria, elevated ALT, focal segmental glomerulosclerosis (FSGS), obstructive sleep apnea (OSA) and psychosocial problems constitute the other important comorbidities. Excess weight has been associated also with gallstones, slipped capital femoral epiphysis, genu valgum, tibia vara (Blount disease), flat kneecap pressure/pain, flat foot, spondylolisthesis, scoliosis, and osteoarthritis.(10)

DETERMINANTS OF ADIPOSITY- OBESITY

Research investigating the rising childhood obesity prevalence has looked into different correlates such as genetics, socioeconomic status, maternal BMI, nutrition and smoking, birth weight, infant feeding, energy expenditure, growth during infancy and childhood including period of adiposity rebound etc. Identification of the risk factors is mostly from observational, cross sectional studies and there are hardly any randomized trials from India.

Conventionally, methods to control or prevent obesity-diabetes have focused on 'diet' and 'physical activity' as the main modifiable risk factors. This is unlikely to curtail the rapidly rising chronic disease epidemic. The focus needs to be moved on to the early life factors.(16)

In 1991, Hales and Barker reported in the UK, that low birth weight and ponderal index at birth are risk factors for type 2 diabetes. They proposed that under-nutrition at critical periods of intrauterine development causes permanent changes in the structure and/or function of the developing systems of the fetus, determining the later health (Fetal Origins of Adult Diseases, FOAD).(17) The concept of Developmental Origins of Health and Disease (DOHaD; previously known as FOAD) has revolutionized the ideas in etiology of chronic diseases like obesity and diabetes. It describes that early life factors (including maternal nutrition and metabolism, and childhood growth) interact with later life exposures to determine the risks of morbidity and mortality.(16) The WHO Expert Committee has conceptualized this idea in a now famous 'life-course' evolution of the risk of NCDs which proposes that the NCD risk originates very early in life, sometimes inter-generationally. The risk progressively accumulates throughout the life course until a disease is diagnosed at an arbitrarily defined cut point usually in adulthood (Figure 2).(18)

Intrauterine exposures, and fetal and postnatal growth

During intrauterine life fetus is exposed to an environment which is determined by maternal factors. For e.g. maternal under-nutrition leads to fetal deprivation resulting into LBW baby, whereas

maternal over-nutrition in the form of overweight or hyperglycemia (due to gestational or pregestational diabetes) leads to a macrosomic baby. Longitudinal follow up studies of offspring through childhood to adult life have provided important information regarding critical periods of fetal and perinatal exposures and subsequent growth that determine the long term risk of chronic diseases.

The Pune Maternal Nutrition Study, showed for the first time that Indian babies are relatively adipose and hyperinsulinemic at birth compared to Caucasian newborns (19), highlighting the 'thin-fat' phenotype of Indians. Follow up of the 8 year old children in the Pune Children Study showed that levels of CVD and diabetes risk factors (plasma glucose, insulin, lipids, leptin and blood pressure) were highest in children who were born the lightest but were heaviest at 8 years of age.(20) The offspring from New Delhi Birth Cohort who are followed from birth were studied at 28 years of age. Those who were diabetic were born lighter, had grown slower during infancy but had grown progressively faster from 3 years of age, and had an earlier adiposity rebound compared to those who were normal glucose tolerant. (21) In the same cohort a rapid BMI gain during childhood and adolescence was a risk factor for development of metabolic syndrome and glucose intolerance in adult life.(22)

These longitudinal studies underpin the need to monitor exposures and growth trajectory of every child in a well baby clinic, so as to implement a preventive strategy.

Breastfeeding

Quantitative analyses of the published evidence has showed that breastfeeding in infancy is associated with protection against obesity (23), lower blood cholesterol (24), a reduced risk of type 2 diabetes in later life, and with lower blood glucose and serum insulin concentrations in infancy.(25)

Physical activity

Increase in indoor entertainment (television viewing, computer games), motorised transport and multiple domestic automatic devices (e.g. washing machine, vacuum cleaners) have contributed to physical inactivity. Population-based studies in developed countries have now related physical activity levels to adiposity, blood pressure, insulin resistance and C-reactive protein (all inverse associations) during childhood and puberty. Adolescents in Hyderabad who participated regularly in outdoor games had lower prevalence of overweight compared with those who did not, in whom the risk of overweight was 3 times higher.(9)

PREVENTIVE AND TREATMENT STRATEGY

Obesity in childhood is a complex interaction of genetics-epigenetics; intrauterine- postnatal exposures, and family non-genetic factors. Pediatric obesity leads to adult obesity. It is much more difficult to treat obesity than to prevent, and therefore an early preventive action should be a priority. The IAP National Task Force for Childhood Prevention of Adult Diseases, 2004, has given the guidelines for prevention and treatment of childhood obesity (26), which are due for an update.

Given the current scenario of rapid nutrition transition and a wide urban-rural divide, identifying and targeting the modifiable factors is a challenging task. Pediatricians should universally assess children for risk of overweight-obesity including assessment of age and gender specific BMI (calculate and plot at least annually), unhealthy eating and physical activity habits and medical risks.

Role of stakeholders

The 63rd World Health Assembly, in May 2010 (27), has rightly urged the member states (in addition to other recommendations),

1. To develop or review current policy frameworks addressing the double burden of malnutrition and to include in the framework childhood obesity and food security and allocate adequate human and financial resources to ensure their implementation;
2. To strengthen and expedite the sustainable implementation of the global strategy for infant and young child feeding, and the implementation of the Baby-friendly Hospital Initiative;
3. To scale up interventions to improve infant and young child nutrition in an integrated manner with the protection, promotion and support of breastfeeding and timely, safe and appropriate complementary feeding as core interventions; the implementation of interventions for the prevention and management of severe malnutrition; and the targeted control of vitamin and mineral deficiencies;
4. To implement the WHO Child Growth Standards by their full integration into child health programmes.

Role of school based programs

Adolescents are a major target group (especially girls who are tomorrow's mothers), and can be reached primarily through school-based programs. Adolescents should be educated about the importance of good metabolic control, and should be motivated to make the necessary lifestyle

changes. In the “MARG” programme more than 50,000 school children from Delhi, Jaipur and Agra are being educated for optimal dietary and lifestyle practices for prevention of lifestyle diseases.(28) Recently, the effectiveness of a multi-component intervention model of nutrition and lifestyle education on behaviour modification, anthropometry and metabolic risk profile in adolescents (15-17y) in Delhi have been investigated. After six months of follow up the model showed significant effect in improving the nutrition-related knowledge, eating habits and lifestyle practices, and resulted in beneficial changes in anthropometric and biochemical profiles when compared with the control children.(29) This study shows that similar interventions may be applied in our country for obesity-diabetes prevention.

Role of nutrition and health clinics

Excess and uncontrolled food advertising practices, relatively low cost, with increasing purchasing power is exposing children and adolescents to high saturated-fat snacks, refined carbohydrates, sweetened carbonated beverages, and diets low in polyunsaturated fatty acids (PUFAs) and fibers. Such rapidly changing dietary practices, accompanied by an increasingly sedentary life style are adding up to the already at risk ‘thin-fat’ phenotype. In comparison to the rural adolescents, urban adolescents’ total fat intake is high in India (7).

The aim of nutrition intervention should be to-

Achieve energy balance and a healthy weight,

Limit energy intake from total fats, prefer unsaturated fats to saturated fats, and try to eliminate transfatty acids,

Increase consumption of fruits, vegetables, legumes, whole grains and nuts,

Limit the intake of free sugars,

Limit salt (sodium) consumption from all sources and ensure that salt is iodized .(30)

Attention must also be paid to binge eating, if it exists. In obese children weight loss should be gradual and sustained, for optimal glycemic control and decrease of blood lipids and lipoproteins.

Emphasis on physical exercise is vital. It reduces blood pressure, improves the level of high density lipoprotein cholesterol, and improves control of blood glucose in overweight people, even without significant weight loss.(30)

CONCLUSION

Prevention of childhood obesity in our country may appear irrelevant considering the relatively higher importance of under-nutrition than obesity at this time. However, preventing the obesity

epidemic is timely, and adolescent girls should be the key. It is widely recognized that women's health interventions are highly cost-effective. According to the World Bank, improving health care for women aged 15-44 years offers the biggest return on health-care spending for any demographic group of adults (men or women). In addition, spreading awareness about the early life origins of chronic NCDs in policy makers, health workers, clinicians and society is of paramount importance. Research into infant feeding patterns, growth trajectory and body composition, with special focus on micronutrient nutrition is needed to guide the scientific basis of future IYCF policy.

Key messages

Obesity is gradually becoming a public health problem in India.

At the same time, our country also has over 8 million severely undernourished children.

Early life origins of chronic diseases need to be understood to tackle this dual burden.

Key for primordial prevention lies in optimising adolescent health.

Promotion of breast feeding and monitoring childhood growth is the primary steps for the clinicians.

REFERENCES

1. The global burden of disease: 2004 update. Geneva, World Health Organization, 2009.
2. Wang Y, Chen HJ, Shaikh S, Mathur P. Is obesity becoming a public health problem in India? Examine the shift from under- to overnutrition problems over time. *Obes Rev.* 2009;10:456-74.
3. Singhal N, Misra A, Shah P, Rastogi K, Vikram NK. Secular trends in obesity, regional adiposity and metabolic parameters among Asian Indian adolescents in north India: a comparative data analysis of two selective samples 5 years apart (2003, 2008). *Ann Nutr Metab.* 2010;56:176-81.
4. Raj M, Sundaram KR, Paul M, Sudhakar A, Kumar RK. Dynamics of growth and weight transitions in a pediatric cohort from India. *Nutr J.* 2009; 23:8:55.
5. Kaur S, Kapil U. Prevalence of overweight and obesity in school children in Delhi. *Indian Pediatr.* 2008;45:330-1.
6. Kaur S, Sachdev HP, Dwivedi SN, Lakshmy R, Kapil U. Prevalence of overweight and obesity amongst school children in Delhi, India. *Asia Pac J Clin Nutr.* 2008;17:592-6.
7. Gupta N, Shah P, Goel K, Misra A, Rastogi K, Vikram NK et al. Imbalanced dietary profile, anthropometry, and lipids in urban asian Indian adolescents and young adults. *J Am Coll Nutr.* 2010; 29: 81-91.
8. Population-based prevention strategies for childhood obesity: report of a WHO forum and technical meeting, Geneva, 15-17. December 2009.

9. Laxmaiah A, Nagalla B, Vijayaraghavan K, Nair M. Factors affecting prevalence of overweight among 12- to 17-year-old urban adolescents in Hyderabad, India. *Obesity (Silver Spring)* 2007;15:1384–1390.
10. Han JC, Lawlor DA, Kimm SY. Childhood obesity. *Lancet*. 2010;375:1737-48.
11. Misra A, Chowbey P, Makkar BM, Vikram NK, Wasir JS, Chadha D et al.; Consensus Group. Consensus statement for diagnosis of obesity, abdominal obesity and the metabolic syndrome for Asian Indians and recommendations for physical activity, medical and surgical management. *J Assoc Physicians India*. 2009;57:163-70.
12. Zimmet P, Alberti KG, Kaufman F, Tajima N, Silink M, Arslanian S et al. IDF Consensus Group. The metabolic syndrome in children and adolescents - an IDF consensus report. *Pediatr Diabetes*. 2007;8:299-306.
13. Kapil U, Kaur S. Prevalence of Pediatrics Metabolic Syndrome (PMS) Amongst Children in the Age Group of 6-18 Years Belonging to High Income Group Residing in National Capital Territory (NCT) of Delhi. *Indian J Pediatr*. 2010 [Epub ahead of print]
14. Kaur S, Kapil U. Impaired glucose tolerance and diabetes mellitus in obese children. *Indian Pediatr*. 2010;47:362-3.
15. Goel R, Misra A, Agarwal SK, Vikram N. Correlates of hypertension among urban Asian Indian adolescents. *Arch Dis Child*. 2010 Aug 12. [Epub ahead of print]
16. Yajnik CS, Deshmukh US. Maternal nutrition, intrauterine programming and consequential risks in the offspring. *Rev Endocr Metab Disord*. 2008; 9:203-11.
17. Barker DJP. Mothers, babies and health in later life. 2nd ed. Edinburgh: Churchill Livingstone, 1998
18. Aboderin I, Kalache A, Ben-Shlomo Y. Life course perspectives on coronary heart disease, stroke and diabetes: key issues and implications for policy and research. Geneva: WHO, 2001
19. Yajnik CS, Fall CHD, Coyaji KJ, Hirve SS, Rao S, Barker DJP et al. Neonatal anthropometry: the thin-fat Indian baby: The Pune Maternal Nutrition Study. *Int J Obes*. 2003;26:173–80.
20. Bavdekar A, Yajnik CS, Fall CH, Bapat S, Pandit AN, Deshpande V et al. Insulin resistance syndrome in 8-year-old Indian children: small at birth, big at 8 years, or both? *Diabetes* 1999;48:2422-9.
21. Bhargava SK, Sachdev HS, Fall CH, Osmond C, Lakshmy R, Barker DJ et al. Relation of serial changes in childhood body-mass index to impaired glucose tolerance in young adulthood. *N Engl J Med*. 2004;350:865-75.
22. Fall CH, Sachdev HS, Osmond C, Lakshmy R, Biswas SD, Prabhakaran D et al. New Delhi Birth Cohort. Adult metabolic syndrome and impaired glucose tolerance are associated with different patterns of BMI gain during infancy: Data from the New Delhi Birth Cohort. *Diabetes Care*. 2008;31:2349-56.

23. Owen CG, Martin RM, Whincup PH, Smith GD, Cook DG. Effect of infant feeding on the risk of obesity across the life course: a quantitative review of published evidence. *Pediatrics*. 2005;115:1367-77.
24. Owen CG, Whincup PH, Kaye SJ, Martin RM, Davey Smith G, Cook DG et al. Does initial breastfeeding lead to lower blood cholesterol in adult life? A quantitative review of the evidence. *Am J Clin Nutr*. 2008;88:305-14.
25. Owen CG, Martin RM, Whincup PH, Smith GD, Cook DG. Does breastfeeding influence risk of type 2 diabetes in later life? A quantitative analysis of published evidence. *Am J Clin Nutr*. 2006;84:1043-54.
26. Bhave S, Bavdekar A, Otiv M; IAP National Task Force for Childhood Prevention of Adult Diseases: Childhood Obesity. *Indian Pediatr*. 2004;41:559-75.
27. Sixty-third world health assembly; wha63.23. Agenda item 11.6 21, May 2010. Infant and young child nutrition.
28. Shah P, Misra A, Gupta N, Hazra DK, Gupta R, Seth P et al. Improvement in nutrition-related knowledge and behaviour of urban Asian Indian school children: findings from the 'Medical education for children/Adolescents for Realistic prevention of obesity and diabetes and for healthy ageing' (MARG) intervention study. *Br J Nutr*. 2010;104:427-36.
29. Singhal N, Misra A, Shah P, Gulati S. Effects of controlled school-based multi-component model of nutrition and lifestyle interventions on behavior modification, anthropometry and metabolic risk profile of urban Asian Indian adolescents in North India. *Eur J Clin Nutr*. 2010;64:364-73.
30. World Health Organization. Global strategy on diet, physical activity and health. 2004.

Figure 1: Diagrammatic representation of percent prevalence of childhood and adolescent overweight and obesity in India [2-6].

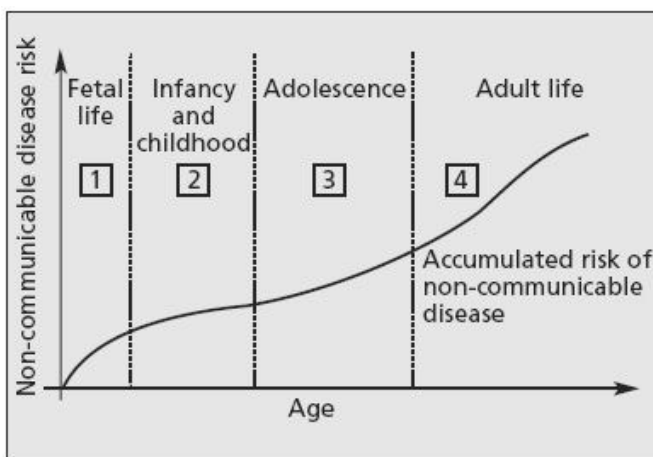
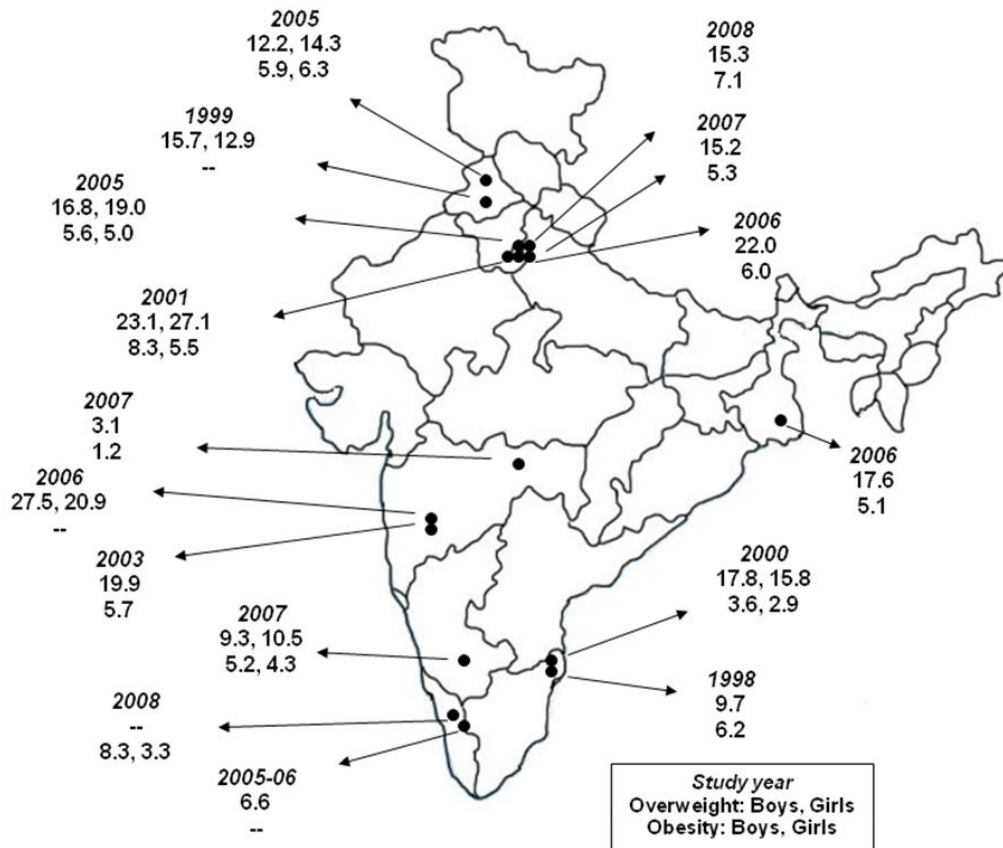


Figure 2: The World Health Organization's life-course model of non-communicable disease. The model suggests that non-communicable diseases have their origins in early life. The risk progressively

Table 1: The IDF consensus definition of metabolic syndrome in children and adolescents					
Age group (years)	Obesity* (WC)	Triglycerides	HDL-C	Blood pressure	Glucose (mmol/L) or known T2DM
6 – <10	=90th percentile	Metabolic syndrome cannot be diagnosed, but further measurements should be made if there is a family history of metabolic syndrome, T2DM, dyslipidemia, cardiovascular disease, hypertension and/or obesity.			
10 – <16 Metabolic syndrome	=90th percentile or adult cut-off if lower	=1.7 mmol/L (=150 mg/dL)	<1.03 mmol/L (<40 mg/dL)	Systolic =130/ diastolic =85 mm Hg	=5.6 mmol/L (100 mg/dL) (If =5.6 mmol/L [or known T2DM] recommend an OGTT)
16+ Metabolic syndrome	Use existing IDF criteria for adults, i.e.: Central obesity (defined as waist circumference = 94cm for European men and = 80cm for European women, with ethnicity specific values for other groups*) plus any two of the following four factors: <ul style="list-style-type: none"> • raised triglycerides: = 1.7mmol/L • reduced HDL-cholesterol: <1.03mmol/L (<40 mg/dL) in males and <1.29mmol/L (<50 mg/dL) in females, or specific treatment for these lipid abnormalities • raised blood pressure: systolic BP =130 or diastolic BP =85mm Hg, or treatment of previously diagnosed hypertension • impaired fasting glycemia (IFG): fasting plasma glucose (FPG) =5.6 mmol/L (=100 mg/dL), or previously diagnosed type 2 diabetes 				
WC: waist circumference; HDL-C: high-density lipoprotein cholesterol; T2DM: type 2 diabetes mellitus; OGTT: oral glucose tolerance test.					
*The IDF Consensus group recognises that there are ethnic, gender and age differences but research is still needed on outcomes to establish risk. [12].					

DEFICIENCY DISORDERS AND INFANT FEEDING

Dr. Nita Radhakrishnan, Dr. Satya P Yadav, Dr. Anupam Sachdeva

Breastfeeding is the biological norm. Major professional bodies across the globe recommend exclusive breastfeeding till completion of 6 months of life.^{1,2} After that complimentary foods need to be added in order to provide for the limiting nutrients.

The choice of the feed introduced should be based on the limiting nutrients in breast milk. For most micronutrients, human milk contains generous amounts and hence the requirement from complementary food is minimal.³ For Vitamin- D and iron, the choice of complementary food should ensure an adequate supply of these nutrients.¹

Nutritional deficiencies that occur in an otherwise asymptomatic child are often missed on routine clinical exam and follow-up. They are often overlooked and are detected only after it significantly affects the health of the child.⁴ In many developing countries, the prevalence of micronutrient malnutrition is very high among infants and young children. Even though complementary foods are introduced, the quantity of the cereal-based porridge consumed is often very low and does not meet energy and nutrient requirements.⁵

VITAMIN DEFICIENCIES

Vitamin-D

Exclusively breastfed infants receive Vitamin-D through fetal stores, on exposure to sun and through dietary intake.⁶ Vitamin-D stores acquired from fetal life are depleted by 2 months of age. Mature human milk contains <20 IU/L of Vitamin-D, where as the requirement daily is between 300-400 IU/day. Hence, for endogenous synthesis exposure to sunlight is important. Sunlight exposure of at least 1-2 hours per week has been found to be helpful in maintaining adequate concentration of Vitamin-D.⁶ Dark-skinned children are at increased risk due to less amount of Vitamin-D produced on exposure to sunlight. Even the concentration of Vitamin-D in the breast milk of dark-skinned mothers is less than that of light-skinned mothers.

The traditional practice of exposing the babies to sunlight after oil application is excellent for Vitamin-D synthesis.⁷ For those infants who are dark-skinned or are inadequately exposed to the sun, Vitamin-D supplementation at a dose of 400 IU per day has been advocated.⁶

Treatment of established deficiency is with Vitamin-D preparations. Calcium intake should be maintained at a dose of 30-75mg/kg/day throughout the treatment to avoid the risk of hypocalcemia.

Vitamin-K

Compared to other vitamins, Vitamin-K is not transported readily from the mother to the fetus. Breast milk is a poor source of Vitamin-K (15 µg/dl). In breastfed infants, the intestinal colonization with bacteria occurs late. Hence, breastfed infants require supplementation of Vitamin-K either oral or intramuscular during the newborn period⁶.

Vitamin-A

Human milk is an excellent source of Vitamin-A provided the mother doesn't suffer from Vitamin-A deficiency. Moreover, adequate amounts of Vitamin-A are transported transplacentally. Hence, there is no need to supplement Vitamin-A in breastfed infants.⁶

Epidemiological studies have identified increased morbidity from sub-clinical Vitamin-A deficiency. Hence, WHO recommends supplementation of Vitamin-A in all infants and children.⁴

Vitamin-E

Good quantity of Vitamin-E is found in human colostrum and mature milk. No known deficiencies have been reported in term infants who have been breastfed.⁶ Vitamin-E supplementation has been recommended in premature babies as well as those with malabsorptive syndromes.⁷ The features of deficiency are ataxia, neuropathy, myopathy and broncopulmonary dysplasia and hemolytic anemia in preterm infants.⁶

Water-soluble Vitamins

The breast milk content of Vitamins C, B1, B2, B6, niacin and folate is good in well-nourished mothers. Thus deficiency states have not been reported in breastfed infants and hence there is no need for supplementation.⁶

Thiamin (Vitamin B1) deficiency in young children is usually seen associated with malnutrition. Rich sources of thiamine include yeast, unpolished rice, legumes, etc. Florid deficiency state presents in infants with congestive cardiac failure, encephalopathy and polyneuropathy.⁴

Niacin is widely distributed in plants and animal foods like nuts, meat etc. Deficiency is usually associated with other nutrient deficiencies in malnourished patients. Deficiency produces photosensitive rash in sun-exposed areas.⁴

Pyridoxine (Vitamin B6) deficiency has been noted in poorly nourished pregnant women. Severe deficiency is noted only in inborn errors of metabolism. Isolated nutritional deficiency is unusual. Deficiency causes anemia, convulsions and peripheral neuropathy.⁴

Vitamin-B12 is found in adequate quantities in the milk of well-nourished mothers with adequate B12 intake. In women who are strict vegans, supplementation is however required.⁸ After starting complementary foods, animal products are the only dietary source of Vitamin-B12. Deficiency is noticed in breastfed infants of mothers who are B12 deficient.

Folic acid is present both in animal products and in green leafy vegetables. Folate along with B12 is necessary for DNA synthesis and deficiency of both lead to impaired DNA maturation and megaloblastic anemia. Deficiency of folate is due to poor dietary sources. Even though it is plentiful in vegetables and animal products, it gets easily destroyed on cooking. As the body stores are minimal, it needs to be supplemented often.⁴ Neurological abnormalities are not seen with folate deficiency. Management involves replacement of B12 and Folic acid. Conventionally, high doses (1 mg) of B12 is given parenterally daily for 1 week followed by 100 µg weekly for a month and thereafter monthly.⁹ Due to frequent occurrence of tremors and extra-pyramidal symptoms, lower doses of 250 µg is often given to infants and young children.¹⁰ Folic acid is replaced as 5 mg tablets. Total duration of treatment is 6-8 weeks.

Vitamin-C deficiency in normally growing children is extremely rare. Breast milk and complementary foods are good sources of Vitamin-C. Deficiency is usually noticed in malnourished children.⁴ Vitamin-C is lost during cooking and excessive washing of the cut vegetables.⁷

TRACE ELEMENTS

Iron

Iron deficiency is the commonest nutritional deficiency in children.⁷ In the NFHS III (2005-06) survey, 78.9% of young children (6-35 months age) were found to be anemic. The reserves present in the body at birth are a critical determinant of the risk of anemia during infancy. In normal term infants, the risk of anemia with exclusive breastfeeding is less till around 9 months of age.¹ The iron content in human milk decreases steadily during lactation from early transitional milk to mature milk and reaches approximately 0.3 mg/L by age 5 months.¹² Low birth weight babies have reduced iron stores and are at greater risk for deficiency. In exclusively breastfed infants, the prevalence of anemia was around 10% in infants of born weighing > 3 kg and almost 50% in the infants born weighing < 3 kg.¹³

Excess intake of cow's milk leads to iron deficiency. Milk per-se is a poor source of iron. Along with that, the phosphates in milk retard absorption of iron. Cow's milk can also lead to enteropathy and blood loss from the GIT. Insufficient intake of iron through complementary foods, early introduction of cow's milk, worm infestations are the other common causes for iron deficiency in young children.¹

Breastfeeding is adequate to prevent iron deficiency during the first 6 months of life. After 6 months of age, the introduction of iron-fortified cereals supports normal iron status.¹² Along with cereals,

juices and pureed fruits should be included in order to improve the bioavailability of dietary iron. If supplementary milk feeds are used during infancy, iron-fortified formula should be preferred rather than non-fortified formula. Cow's milk should best avoided for at least the first year of life.¹² If iron-fortified complementary foods are not available or not consumed regularly, then all infants should receive iron supplements after six months of age. □¹¹

Iron deficiency is managed with oral iron at a dose of 3 to 4 mg/kg/day of elemental iron in 3 divided doses. Dietary modifications like including citrus juice and curd at meal times, avoiding excess cow's milk (not more than 500 ml per day), avoiding tea, coffee during meals help in increasing dietary non-heme iron absorption. Cooking in iron pots also is beneficial. In case of non-responsiveness to oral iron, compliance to therapy should be ensured before evaluating for conditions simulating iron deficiency (thalassemia trait, chronic diseases) or complicating iron deficiency (concomitant B12/ folate def, blood loss etc.).⁴

Zinc

Zinc is an important micronutrient, essential for human growth, immune function and development. Moderate to severe deficiency results in growth retardation, alopecia and frequent infections.

Iodine

Iodine is utilized by the body for synthesis of thyroid hormones. Maternal deficiency leads to mental retardation in the offspring. Dietary requirement is usually met through water and iodized salt.

Selenium

Selenium is an antioxidant that acts as a cofactor for several enzymatic reactions in the body. Subtle deficiency results in recurrent infections. Overt deficiency leads to the well-described cardiomyopathy and arthritis. Dietary sources are grains, meat and garlic.

Copper

Nutritional copper deficiency is rare in otherwise well growing individuals. Dietary sources are cereals, nuts, vegetables and fruits.

NUTRITIONAL DEFICIENCIES IN PRETERM INFANT

Premature infants are prone to multiple nutrient deficiencies as most vital nutrients are transported transplacentally during the last trimester. After birth, these infants exhibit rapid catch up growth, which further increases the demand for nutrients.¹⁵ Further, those preterm babies who are hospitalized are managed with intravenous fluids and enteral feeding is delayed.¹⁶ Breastfeeding should be encouraged due to its nutritive as well as non-nutritive benefits.

Human milk although ideal, does not always provide all the adequate nutrients to support growth. Up to 50% of infants with birth weight <1800gms have been reported to have hypophosphatemia after 4 to 6 weeks of hospital discharge. Unfortified human milk even when consumed at a rate of 180 to 200 ml/kg/day provides only 1/3rd of the intrauterine calcium and phosphorus accrual.¹⁶ Hence fortification of human milk should be practiced for preterm infants especially those who exhibit poor growth or have biochemical markers of osteopenia at 4-6 weeks.¹⁵ Osteopenia presents with poor linear growth and hypotonia. Management is with adequate supplementation of calcium and phosphorus. This should be continued till normalization of alkaline phosphatase or at least 6 months postnatal age.¹⁶

Iron deficiency manifests frequently in premature infant due to limited iron stores, inadequate intake and rapid catch-up growth. Current recommendations are to start iron supplementation at a dose of at least 2 mg/kg per day starting at 2 months of age or at hospital discharge.¹⁷ It is also prudent to screen these children for iron-deficiency anemia at 6, 12, and 18 months of age.¹²

Long Chain PUFA supplementation has been found to be helpful in preterm babies to improve the neuro-developmental outcome.¹⁶

CONCLUSION

Many of the nutrient deficiencies seen in infants and young children are often subtle and easily missed. Timely introduction of appropriate complementary food is vital for the immediate and long-term health of the infant¹⁸. Many deficiencies can be prevented in infancy if the lactating mother takes regular mineral and iron supplements

TAKE HOME MESSAGES

1. Ensure exclusive breastfeeding till 6 months. Introduction of complementary feeding prior to 6 months does not offer any growth advantage.
2. Breastfeeding is adequate to prevent iron deficiency anemia during the first 6 months of life. After 6 months of age, iron supplementation is important.
3. Nutritional deficiencies especially of iron and Vitamin-D can exist even in children who are growing normally.

REFERENCES

1. Dewey KG. Nutrition, growth, and complementary feeding of the breastfed infant. *Pediatr Clin North Am.* 2001; 48(1): 87-104.
2. Policy statement. Breastfeeding and the use of human milk. American Academy of Pediatrics. Work Group on Breastfeeding. *Pediatrics.* 1997; 100(6): 1035-9
3. Picciano MF. Nutrient composition of human milk. *Pediatr Clin North Am.* 2001; 48(1): 53-67
4. Suskind DL. Nutritional deficiencies during normal growth. *Pediatr Clin North Am.* 2009; 56(5): 1035-53
5. Nestel P, Briend A, de Benoist B, Decker E, Ferguson E, Fontaine O, Micardi A, Nalubola R. Complementary food supplements to achieve micronutrient adequacy for infants and young children. *J Pediatr Gastroenterol Nutr.* 2003; 36(3): 316-28.
6. Greer FR. DO breastfed infants need supplemental vitamins? *Pediatr Clin North Am.* 2001; 48(2): 415-23
7. Elizabeth KE. *Nutrition and Child Development.* 3rd ed. Hyderabad: Paras Publishing; 2005. Chapter 5. Vitamins, Minerals and Micronutrients; p93-132
8. Mariani A, Chalies S, Jeziorski E, Ludwig C, Lalande M, Rodière M. Consequences of exclusive breast-feeding in vegan mother newborn—case report. *Arch Pediatr.* 2009; 16(11): 1461-3
9. Wakins D, Whitehead VM, Rosenblatt DS. Megaloblastic anemias. In: Orkin SH, Nathan DG, Ginsburg D, Look AT, Fisher DE, Lux SE. eds. *Hematology of Infancy and childhood.* 7th ed. Philadelphia. Saunders Elsevier; 2009
10. Chandra J. Megaloblastic anemia: back in focus. *Indian J Pediatr.* 2010; 77(7): 795-9.
11. Kapil U. Prevention and control of iron deficiency anemia amongst young children. *Indian Pediatr.* 2003; 40(4):293-5
12. Griffin IJ, Abrams SA. Iron and breastfeeding. *Pediatr Clin North Am.* 2001; 48(2): 401-13.
13. Dewey KG, Cohen RJ, Rivera LL, et al: Effects of age of introduction of complementary foods on iron status of breast-fed infants in Honduras. *Am J Clin Nutr.* 1998; 67:878-884
14. Lozoff B, Klein NK, Nelson EC, et al: Behavior of infants with iron-deficiency anemia. *Child Dev.* 1998; 69: 24-36
15. Hall RT. Nutritional follow-up of the breastfeeding premature infant after hospital discharge. *Pediatr Clin North Am.* 2001; 48(2): 453-60

16. Shah MD, Shah SR. Nutrient deficiencies in the premature infant. *Pediatr Clin North Am.* 2009; 56(5): 1069-83.
17. Ehrenkranz RA: Iron, folic acid and Vitamin- B₁₂. In Tsang RC, Lucas A, Uauy R, et al (eds): *Nutritional Needs of the Preterm Infant: Scientific Basis and Practical Guidelines*. Baltimore, Williams & Wilkins, 1993, 177-192
18. Van der Merwe J, Kluys M, Bowley N, Marais D. Optimizing the introduction of complementary foods in the infant's diet: a unique challenge in developing countries. *Matern Child Nutr.* 2007; 3(4): 259-70

Section VII

MISCELLANEOUS

ANTIOXIDANT MICRONUTRIENTS IN INFANT FEEDING

Dr. Nigam Prakash Narain, Dr. Neeraj Kumar, Dr. Smiti Narain

INTRODUCTION

Micronutrients (vitamins and minerals) are essential for human health, growth and development. Minerals are an integral part of the body structure and provide for specific vital functions. Total body content for various minerals varies widely, from kilogram (calcium is 1% to 2% of body weight) to milligram quantities. Trace minerals (elements) are those present in the human body in quantities of less than 50 mg/kg (0.005% body weight) and include copper, iron, manganese, and zinc.¹

Ultra trace minerals have estimated dietary requirements of less than 1 µg/day. 18 elements are considered as trace elements: aluminum, arsenic, boron, bromide, cadmium, chromium, fluorine, germanium, iodine, lead, lithium, molybdenum, nickel, rubidium, selenium, silicon, tin, and vanadium. These elements may be essential, because they prevent deficiency syndromes, but the evidence of essentiality varies considerably.¹

In severe malnutrition there is a major imbalance between the potential for damage induced by free radicals and protective antioxidant systems. Infection, oxidative burst and free iron all contribute to an increased potential for damage. Mortality is greatest in those with an obvious impairment of the antioxidant defenses. The many layers of antioxidant protection which are specific for each compartment of the cell provide a measure of safety. However, the system is potentially vulnerable to deficiencies or limitations in multiple micronutrients. A deficiency might not be readily identifiable, either clinically or biochemically and a high index of suspicion is required.^{1,2}

VITAMINS

Vitamins are organic compounds which cannot be synthesized in sufficient quantities by an organism and must be obtained from diet.

Nutrients with radical-quenching properties

Vitamins C and E are the principal nutrients which possess radical quenching properties.

Vitamin C

Many, if not all of the biological properties of vitamin C are linked to its redox properties. For example, the consequences of scurvy, such as the breakdown of connective tissue fibres and muscular weakness, are both linked to hydroxylation reactions in which ascorbate maintains loosely bound iron in the ferrous form to prevent its oxidation to the ferric form, which makes the hydroxylase enzymes inactive.

Ascorbate exhibits similar redox functions in catecholamine biosynthesis and in microsomal cytochrome P450 enzyme activity, although the latter may only be important in young animals.

Vitamin C is a regulator of redox and metabolic checkpoint controlling activation and survival of immune cells. Ascorbate regulates the phagocyte process by decreasing free radical production and this potentially reduces the severity of endotoxin response. Supplementation of antioxidant vitamin including vitamin C has been shown to improve immune response to group A streptococcal infection compared to penicillin alone.

Vitamin E

This falls into the class of conventional antioxidants which generally consist of phenols or aromatic amines.

There are eight possible isomers of vitamin E, but α -tocopherol (5,7,8-trimethyltolcol) is the most biologically important antioxidant in vivo. In plasma samples, more than 90% is present as α -tocopherol but there may be approximately 10% of γ -tocopherol. In foods such as margarine and soy products the γ form may be predominant whereas palm oil products are rich in the tocotrienols.

Vitamin E is found throughout the body in both cell and subcellular membranes. Within biological membranes, vitamin E is believed to intercalate with phospholipids and provide protection to PUFAs. PUFAs are particularly susceptible to free radical-mediated oxidation. The amount of PUFAs in the membrane far exceeds the amount of vitamin E, and the tocopherol–PUFA ratios are highest in tissues where oxygen exposure is greatest and not necessarily where the PUFA content is highest. Oxidation of PUFAs leads to disturbances in membrane structure and function and is damaging to cell function. Vitamin E is a strong antioxidant that can support monocyte-macrophage-mediated response.

Vitamin E influences T cell function by down regulating prostaglandin E_2 .^{1,2} Vitamin E deficiency may enhance virulence in viral infection.

Vitamin A

Vit A deficiency are common in our country. Less obvious changes lead to impaired integrity of mucosal surfaces in GI and respiratory tract lowering resistance to gastroenteritis and respiratory infection.

During infection vitamin A is lost from the body, severe deficiency may develop rapidly and the eye sign often deteriorates during early treatment.

If vitamin A deficiency is suspected, a large dose of vitamin A given very early in the treatment is an urgent necessity.³

Carotene and other carotenoids

Many hundreds of carotenoids are found in nature but relatively few are found in human tissues, the five main ones being β -carotene, lutein, lycopene, β -cryptoxanthin, and α -carotene. β -carotene is the main source of provitamin A in the diet. There are approximately 50 carotenoids with provitamin A activity, but β -carotene is the most important and is one of the most widely distributed carotenoids in plant species.^{4,5}

Calcium and Magnesium

Calcium is the mineral in greatest concentration in the human body, with more than 99% present in the bones and teeth. Calcium exists in bone as hydroxyapatite, a dynamic tissue undergoing bone remodeling, with osteoclastic bone resorption and osteoblastic bone formation. Calcium within the bone not only provides a structural strength that allows the bone to support the body's weight and anchor the muscles, but also serves as a reservoir that can be tapped to maintain extracellular calcium concentration, regardless of intake. The 1% of remaining calcium is in the blood and extracellular fluids and within cells of all tissues, where the regulation of important metabolic functions occurs. In addition, calcium ions play a critical role in smooth muscle contractility. Ionized calcium plays a role in initiation of blood clot formation by the stimulation of thromboplastin from blood platelets and by the conversion of prothrombin to thrombin, which helps in the polymerization of fibrinogen to fibrin and eventual blood clot formation.^{4,5}

Magnesium

Magnesium is essential for bioenergetics reactions controlling fuel oxidation, membrane transport, and signal transmission, contributing to the action of more than 300 enzymes.

Magnesium requirements in the first 6 months range between 40-50 mg/day; 60 mg/day for 6 to 12 months and approximately 200 mg/day for older children.^{4,5}

Iron

Iron is highly reactive chemically and fulfills many important functions related to generation of energy for normal cellular function. High reactivity if not adequately controlled, carries the potential for cell damage. Red cell mass reduces in malnutrition as the lean body mass decreases. The iron is not used for further Hb formation and cannot be excreted so has to be stored innocuously as any form which is unbound is liable to increase oxidative cell damage. In severe malnutrition there is

increased stored iron and free iron. The available iron is not used for Hb formation and giving iron supplement to treat anemia simply adds to the load, stresses the system further and increases mortality especially in the presence of infection such as malaria. Hence, initially it is more important to repair and restore the capacity to cope with free radical by improving vitamin and trace element status and treating infection. Later when the acute problem has been resolved, the iron will be removed from storage and used to form new tissue. When stored iron is used up supplemental iron will have to be provided to keep pace with the rate of tissue demand.^{4,5}

Chromium

Chromium acts in glucose homeostasis by potentiating insulin action, possibly by interacting with insulin and its receptor, facilitating bindings. Its deficiency usually seen in case of total parental nutrition.⁵

Iodine

The thyroid hormone, dependent on an adequate supply of iodine, is essential for normal brain development.

Recommended daily allowance of iodine is as follows:

90 µg for preschool children (0 to 59 months)

120 µg for school children (6 to 12 years)

150 µg for adults (above 12 years)

200-250 µg for pregnant and lactating women.⁶

Nutrients with an antioxidant role

Dietary antioxidant is a substance in foods which significantly decreases the adverse effects of reactive oxygen species, reactive nitrogen species, or both on normal physiological function in humans.^{7,8,9,10}

The need for biological antioxidants

It is now well established that free radicals, especially superoxide (O_2^-), nitric oxide (NO), and other reactive species such as hydrogen peroxide (H_2O_2), peroxynitrite are continuously produced in vivo.^{11,12,13,14} To cope with potentially damaging reactive oxidant species (ROS), aerobic tissues contain endogenously produced antioxidant enzymes such as superoxide dismutase (SOD), glutathione peroxidase (GPx), and catalase as well as several exogenously acquired radical-scavenging substances such as vitamins E and C and the carotenoids.¹⁷ Fruits and vegetables are good sources of many antioxidants, and it is reported that diets rich in these foods are associated with a lower risk of the chronic diseases of cancer and heart disease.^{15,16} The most prominent

representatives of dietary antioxidants are vitamin C, tocopherols, carotenoids, and flavonoids.¹⁷⁻¹⁹

Nutrients associated with endogenous antioxidant mechanisms

Both zinc and selenium are intimately involved in protecting the body against oxidant stress. Zinc combined with copper is found in the cytoplasmic form of SOD whereas zinc and magnesium occur in the mitochondrial enzyme.

Superoxide dismutase is present in all aerobic cells and is responsible for the dismutation of superoxide. It has been suggested that in combination with iodine deficiency, the inability to remove high concentrations of hydrogen peroxide may cause atrophy in the thyroid gland, resulting in myxedematous cretinism.²⁰

Zinc

Zinc is required for the function of a wide range of enzymes and a deficiency has a widespread effects. A shortage of zinc impairs the replication cell such as gut mucosa leading to further mucosal damage and increased diarrhea. Zinc deficiency leads to diarrhea and diarrhea leads to Zinc deficiency. Similar changes take place in damaged skin leading to ulcerated skin which is readily damaged with mild trauma. Zinc requirement for infants range from 3.5 and 5 mg per day.^{21,22,23}

Selenium

Selenium acts as antioxidant via Selenium dependant enzyme glutathione peroxidase, to protect cellular membranes and organelles from peroxidative damage. Selenium deficiency in severe malnutrition leads to congestive heart failure and it enhances viral virulence.^{21,22}

Copper

Copper deficiency leads to reduced antioxidant function measured by Cu-superoxide dismutase (SOD-1) activity. Copper deficiency causes significant neutropenia. The IL-2 response is reduced in copper deficiency and marginal copper deficiency leads to immune dysfunction. Serum copper or ceruloplasmin levels reflect the severity of malnutrition.^{21,22,23}

REFERENCES

1. Institute of Medicine (1998) Prevention of Micronutrient Deficiencies: Tools for Policy Makers and Public Health Workers. National Academy Press, Washington, DC.
2. Burton GW, Ingold KU. Autoxidation of biological molecules

3. WHO/UNICEF/IVACG (1997) Vitamin A Supplements: A Guide to Their Use in the Treatment and Prevention of Vitamin A Deficiency and Xerophthalmia, 2nd ed. World Health Organization, Geneva, Switzerland.
4. Thurnham DI. Carotenoids: functions and fallacies. *Proceedings of the Nutrition Society*, 1994, 53:77–87.
5. Rock CL, Jacob RA, Bowen PE. Update on the biological characteristics of the antioxidant micronutrients: vitamin C, vitamin E and the carotenoids. *Journal of the American Dietetic Association*, 1996, 96:693–702.
6. Essential pediatrics –sixth edition, O P Ghai, p.n. 94
7. Young VR et al. *Dietary reference intakes. Proposed definition and plan for review of dietary antioxidant and related compounds*. Washington, DC, National Academy Press, 1998.
8. Dormandy TL. An approach to free radicals. *Lancet*, 1983, 2:1010–1014.
9. Thurnham DI. Antioxidants and pro-oxidants in malnourished populations. *Proceedings of the Nutrition Society*, 1990, 48:247–259.
10. Shankar AH, Prasad AS. Zinc and immune function: the biological basis of altered resistance to infection. *American Journal of Clinical Nutrition*, 1998, 68(Suppl.):S447–S463.
11. Halliwell B, Gutteridge JMC. *Free radicals in biology and medicine*, 2nd ed. Oxford, Clarendon Press, 1989.
12. Ames BN. Dietary carcinogens and anticarcinogens, oxygen radicals and degenerative diseases. *Science*, 1983, 221:1256–1264.
13. Moncada S, Higgs EA. Mechanisms of disease: the L-arginine-nitric oxide pathway. *New England Journal of Medicine*, 1993, 329:2002–2012.
14. Koppenol WH et al. Peroxynitrite, a cloaked oxidant formed by nitric oxide and superoxide. *Chemical Research in Toxicology*, 1992, 5:834–842.
13. Diplock AT et al. Functional food science and defence against reactive oxidative species. *British Journal of Nutrition*, 1998, 80(Suppl. 1):S77–S112.
15. Hennekens CH. Micronutrients and cancer prevention. *New England Journal of Medicine*, 1986, 315:1288–1289.
16. Van Poppel G et al. Antioxidants and coronary heart disease. *Annals of Medicine*, 1994, 26:429–434.
17. Thurnham DI. Carotenoids: functions and fallacies. *Proceedings of the Nutrition Society*, 1994, 53:77–87.

18. Rock CL, Jacob RA, Bowen PE. Update on the biological characteristics of the antioxidant micronutrients: vitamin C, vitamin E and the carotenoids. *Journal of the American Dietetic Association*, 1996, 96:693–702.
19. Hertog MGL et al. Dietary antioxidant flavonoids and risk of coronary heart disease: the Zutphen Elderly Study. *Lancet*, 1993, 342:1007–1011.
20. Howie AF et al. Identification of a 57-kilodalton selenoprotein in human thyrocytes as thioredoxin reductase and evidence that its expression is regulated through the calcium phosphoinositol-signalling pathway. *Journal of Clinical Endocrinology and Metabolism*, 1998, 83:2052–2058.
21. Zinc Investigators Collaborative Group (1999) Prevention of diarrhoea and pneumonia by zinc supplementation in children in developing countries: pooled analysis of randomised controlled trials. *J. Pediatr.* 135: 689–697.
22. The Zinc Investigators Collaborative Group (2000) Therapeutic effects of oral zinc in acute and persistent diarrhoea in children in developing countries: pooled analysis of randomised controlled trials. *Am. J. Clin. Nutr.* 72: 1516–1522.
23. Sazawal, S., Black, R. E., Menon, V. P., Dingsra, P., Caulfield, L. E., Dhingra, U. & Bagati, A. (2001) Zinc supplementation in infants born small for gestational age reduces mortality: a prospective, randomised controlled trial. *Pediatrics* 108: 1280–1286.

WHO CHILD GROWTH STANDARDS

Dr. Nidhi Chaudhary, Dr. Kunal Bagchi

Growth monitoring is an essential tool to measure and monitor the health status of individual children and under five year's population. The WHO Child Growth Standards are to be used as a tool in public health, medicine and by government and health organizations for monitoring the well-being of children and for detecting children or populations not growing properly or under- or overweight and may require specific medical or public health responses. Normal growth is an essential expression of health and a way to measure efforts designed to reduce child mortality and disease. The new charts therefore provide a simple tool to assess the effectiveness of such efforts.

WHO Child Growth Standards demonstrate for the first time ever that children born in different regions of the world and given the optimum start in life, have the potential to grow and develop to within the same range of height and weight for age.

The standards are a crucial new tool for monitoring and evaluating efforts to implement the national guidelines for Infant and Young Child Feeding. They provide the necessary measurement and evaluation tool for parents, caregivers, health practitioners, policymakers and advocates with which to monitor healthy growth, ensure timely screening and treatment, recommend and follow positive nutritional practices.

Given below are the frequently asked questions on the new WHO Child Growth Standards:

Q. Why are new standards needed?

A. Since the late 1970s, the National Center for Health Statistics (NCHS)/WHO growth reference has been in use which describes how children grow in a particular region and time. This reference was based on data from several samples of children from a single country and suffers from a number of technical and biological drawbacks that make it inadequate to monitor the rapid and changing rate of early childhood growth.

Under the leadership of WHO, the United Nations in 1993 undertook a comprehensive review of the uses and interpretation of child growth references. The working group concluded that

the NCHS references and its variations being used in countries around the globe had numerous technical inadequacies as follows:

The data for development of these standards was collected from predominantly formula fed infants who resided in a restricted geographic area in USA and were of relatively high socio-economic background. This approach was widely inconsistent with health benefits associated with breastfeeding.

The measurements from the sample were taken only once in three months and the analytical methods available at the time were inadequate for the task and were likely to depict inappropriately, the pattern of growth and variability of normal growth. The measurements at three monthly intervals were inadequate to capture the dynamic pattern of growth in the first six months of life.

The review concluded that it was time to develop new standards that show how children should grow in all countries rather than merely describing how they grew at a particular time and place.

Q. How different are the new standards from the old growth charts?

A. The new standards differ from any existing growth charts in a number of innovative ways.

For the first time they describe “how children should grow,” which is a *prescriptive approach* and not just descriptive, by including in the study’s selection criteria, the specific health behaviors that are consistent with current health promotion recommendations (e.g., breastfeeding norms, standard pediatric care, non-smoking requirements).

Another key characteristic of the new standard is that it makes breastfeeding the biological “norm” and establishes the *breastfed infant as the normative growth model*. The previous reference was based on the growth of artificially-fed children.

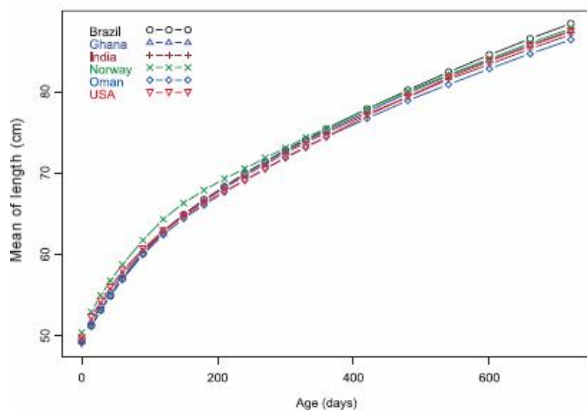


Figure: Length changes in infants in the six participating countries of the WHO Multicentre Growth Reference Study

The pooled sample from the 6 participating countries allows the development of a truly international standard (in contrast to the previous international reference based on children from a single country) and reiterate the fact that child populations grow similarly across the world’s major regions when their needs for health and care are met (Figure-1).

The development for the first time, of standardized Body Mass Index (BMI)

charts for infants to five years of age, is a major innovation in assessing healthy weights of children.

These standards also include new innovative growth indicators beyond height and weight that are particularly useful for monitoring the increasing epidemic of childhood obesity, such as the skin fold thicknesses.

The study's longitudinal nature also allowed the development of growth velocity standards. Health care providers will not have to wait until children cross an attained growth threshold to make the diagnosis of under-nutrition and overweight since velocity standards will enable the early identification of children in the process of becoming under- or over-nourished.

Lastly, the development of accompanying windows of achievement for six key motor development milestones, provide a unique link between physical growth and motor development.

There are separate charts available for boys and girls.

Q. How was the new WHO Child Growth Standards developed?

- A.** The WHO Multicentre Growth Reference Study (MGRS) was undertaken between 1997 and 2003 to generate new growth curves for assessing the growth and development of infants. In setting this ambitious goal, WHO and its principal partner, the United Nations University, in collaboration with a number of academic institutions worldwide, undertook the Multicentre Growth Reference Study (MGRS), a community-based, multi-country project to develop new growth standards for infants and young children.

The study involved the recruitment of children who met a number of health criteria in 6 countries representing different regions of the world: Brazil, Ghana, India, Norway, Oman, and the United States. Crucially and by design of the research project, the 8,440 children included in the study were raised in environments that promote healthy growth such as breastfeeding, good diets and prevention and control of infection. In addition, their mothers followed health practices such as breastfeeding their children and not smoking during and after pregnancy and ensuring adequate healthcare for the children.

Q. Will the standards be applicable to Indian children?

- A.** The standards describe normal child growth from birth to 5 years under optimal environmental conditions and can be applied to all children everywhere, regardless of ethnicity, socioeconomic status and type of feeding. The Ministry of Health and Family Welfare and Ministry Of Women and Child Development adopted the WHO Child Growth Standards in 2008. The WHO Child Growth Standards have been incorporated into the new unified Mother and Child

Protection Card used commonly in the National Rural Health Mission and the ICDS program (Annexure 3).

Q. What are the types of available standards and the indicators being used?

- A.** There are 30 WHO growth standards for boys and girls from 0-5 yrs of age based on the anthropometric measurements of weight, height, head circumference, arm circumference, skin fold thickness and motor development milestones. The standards for the following indicators are available:

- Length/height-for-age
- Weight-for-age
- Weight-for-length
- Weight-for-height
- Body mass index-for-age (BMI-for-age)
- Head circumference-for-age
- Arm circumference-for-age
- Subscapular skinfold-for-age
- Triceps skinfold-for-age
- Motor development milestones
- Weight velocity
- Length velocity
- Head circumference velocity

From the above indicators weight for age is being used in the Anganwadi centres under the ICDS program. Height measurements are to be done in health facilities and weight for height is to be monitored at the health facility level.

Q. Do these new standards change current estimates of overweight and under-nutrition in children?

- A.** Yes, estimates are going to change because of differences in the pattern of growth between the new standards and the old reference, especially during infancy. The magnitude of the change in the estimates however will vary by age, sex, growth indicator, and the underlying nutritional status in the population being evaluated

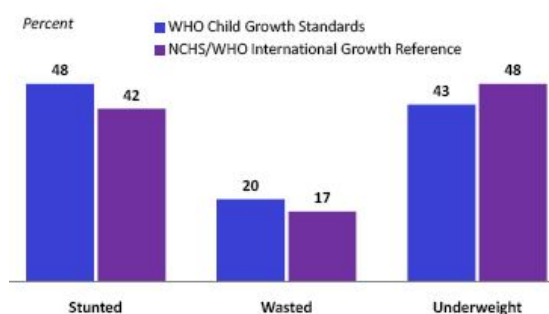


Figure 2: Malnutrition rates in under five children in India based on NFHS 3 data

The major differences in the prevalence of malnutrition when compared to NCHS would be as given below:

Underweight prevalence (weight for age): Prevalence will be higher during the first six months and will subsequently decrease in the next six

months of infancy.

Stunting rates (height for age): Stunting rates will be higher with these standards compared to NCHS for all ages under five.

Wasting and severe wasting (weight for height): These rates will be substantially higher with these standards during the first half of infancy. Thereafter the prevalence of severe wasting will continue to be 1.5 – 2.5 times that of NCHS reference.

Over weight: These rates will be higher.

Q. What needs to be done/addressed/changed/improved so that all children grow well according to these standards?

A. The WHO Child Growth Standards are based on important ‘norms’ for child care, nutrition and health. The following steps need to be implemented:

Sound nutritional practices are important throughout childhood.

Full implementation of the objectives of the National Guidelines for Infant and Young Child Feeding (2006) is crucial. Breastfed infants are lean babies, a characteristic that is documented by the new reference.

Vaccinations and good health care should be available and accessible to all infants and young children and families and their communities should do all they can to ensure a good pregnancy.

Pregnant women and mothers should refrain from using tobacco.

Q What is the diagnostic criteria for identification of severe acute malnutrition (SAM)?

A. Using weight-for-height, WHO and UNICEF recommend the use of a cut-off for weight-for-height of below -3 standard deviations (SD) of the WHO standards or a mid upper arm circumference of less than 115 mm with or without bilateral pedal edema to identify infants and children (6-59 months) as having SAM.

The reasons for the choice of this cut-off are as follows:

- 1) Children below this cut-off have a highly elevated risk of death compared to those who are above;
- 2) These children have a higher weight gain when receiving a therapeutic diet compared to other diets, which results in faster recovery;
- 3) In a well-nourished population there are virtually no children below -3 SD (<1%).
- 4) There are no known risks or negative effects associated with therapeutic feeding of these children applying recommended protocols and appropriate therapeutic foods.

The shift from NCHS to WHO child growth standards or the adoption of the new cut-off for MUAC will therefore sharply increase case loads. This has programmatic implications.

Q. What reference data should be used for children older than 5 years?

- A.** Data from the 1977 National Center for Health Statistics (NCHS)/WHO growth reference (1–24 years) were merged with data from the under-fives growth standards' cross-sectional sample (18–71 months) to smooth the transition between the two samples. State-of-the-art statistical methods used to construct the WHO Child Growth Standards (0–5 years), i.e. the Box-Cox power exponential (BCPE) method with appropriate diagnostic tools for the selection of best models, were applied to this combined sample.

The new reference curves for children above 5 yrs – 19 yrs (Annexure 2) are closely aligned with the WHO Child Growth Standards at 5 years, and the recommended adult cut-offs for overweight and obesity at 19 years. They fill the gap in growth curves and provide an appropriate reference for the 5 to 19 years age group.

Q. Are there any tools to facilitate the analysis of data collected on child growth monitoring?

- A.** The WHO Anthro is software for use on desktop personal computers or laptops using MS Windows. It was developed to facilitate application of the WHO Child Growth Standards in monitoring growth and motor development in individuals and populations of children up to 5 years of age.

It has been updated to allow users to correct for cluster sampling in the analysis of nutritional surveys. Additionally the survey module includes the option to collect address data similarly to the individual assessment. This information can be useful for mapping and stratified analysis. The software consists of three modules: Anthropometric calculator, Individual assessment & Nutritional survey

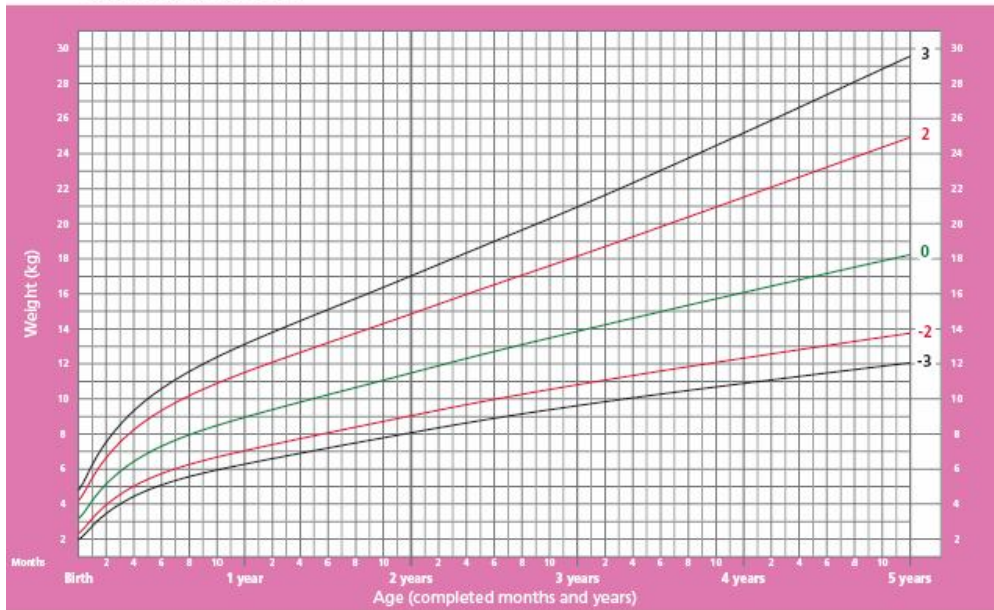
REFERENCES

1. WHO Child Growth Standards: Methods and development: Length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age. 2006.
2. WHO Multicentre Growth Reference Study Group. Assessment of linear growth differences among populations in the WHO Multicentre Growth Reference Study. *Acta Paediatr Suppl* 2006; 450:56-65.
3. Onyango AW, de Onis M, Caroli M, Shah U, Sguassero Y, Redondo N, Caroli B. Field-testing the WHO Child Growth Standards in four countries. *Journal of Nutrition* 2007; 137; 149-52.
4. Nutrition in India. National Family Health Survey 2005-06. IIPS, Mumbai. August 2009
5. S Prinja, J S Thakur & S Bhatia. Pilot testing of WHO Child Growth Standards in Chandigarh: implications for India's child health programmes. *Bull World Health Organ* 2009; 87:116-122
6. WHO child growth standards and the identification of severe acute malnutrition in infants and children. A Joint Statement by the World Health Organization and the United Nations Children's Fund. 2009
7. De Onis M, Onyango AW, Borghi E, Siyam A, Nishida C, Siekmann J. Development of a WHO growth reference for school-aged children and adolescents *Bull World Health Organ* 2007;85:660-7.
8. WHO Anthro (version 3.1, June 2010) and macros. Accessed www.who.int/childgrowth/software/en/ on 12/10/2010

Annexure 1: WHO Child Growth Standards

Weight-for-age GIRLS

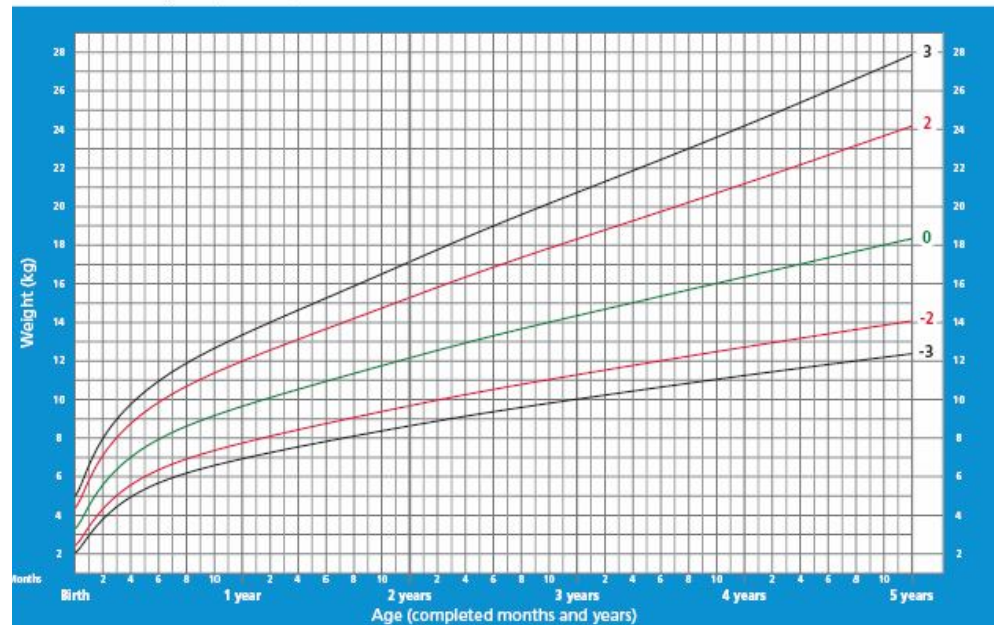
Birth to 5 years (z-scores)



WHO Child Growth Standards

Weight-for-age BOYS

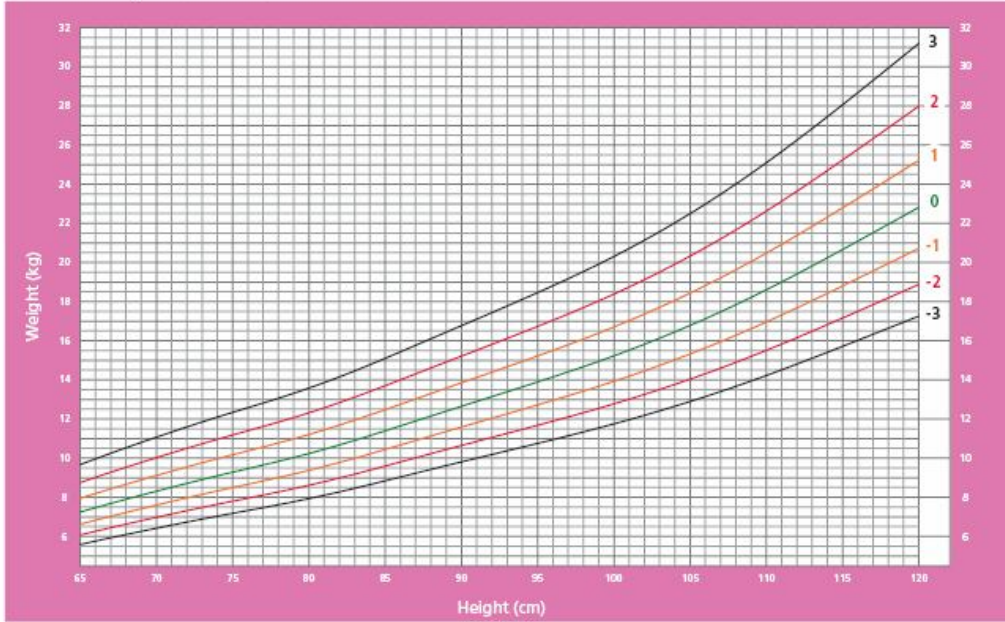
Birth to 5 years (z-scores)



WHO Child Growth Standards

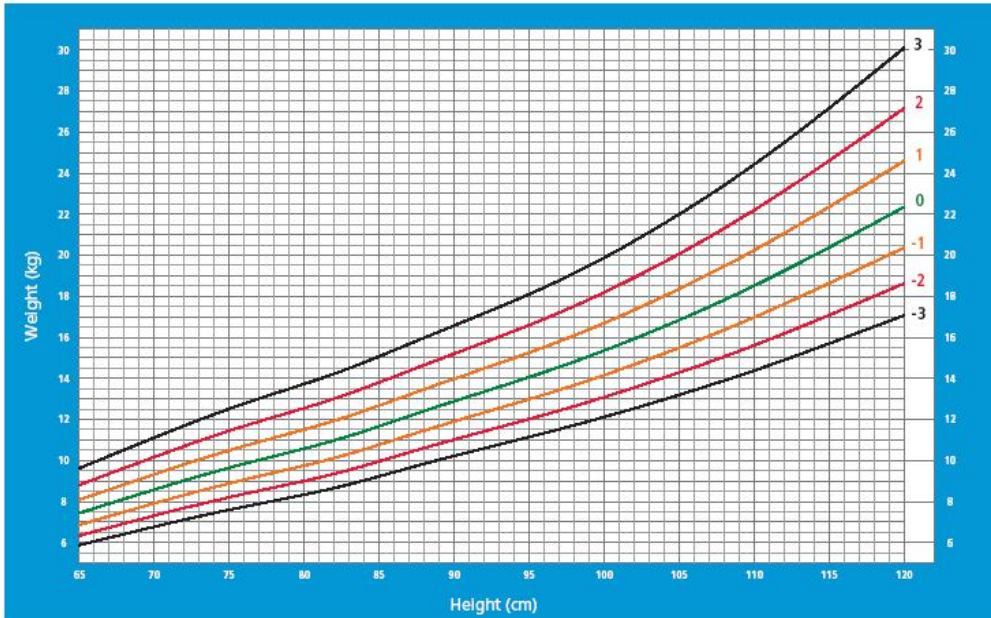
Weight-for-Height GIRLS

2 to 5 years (z-scores)



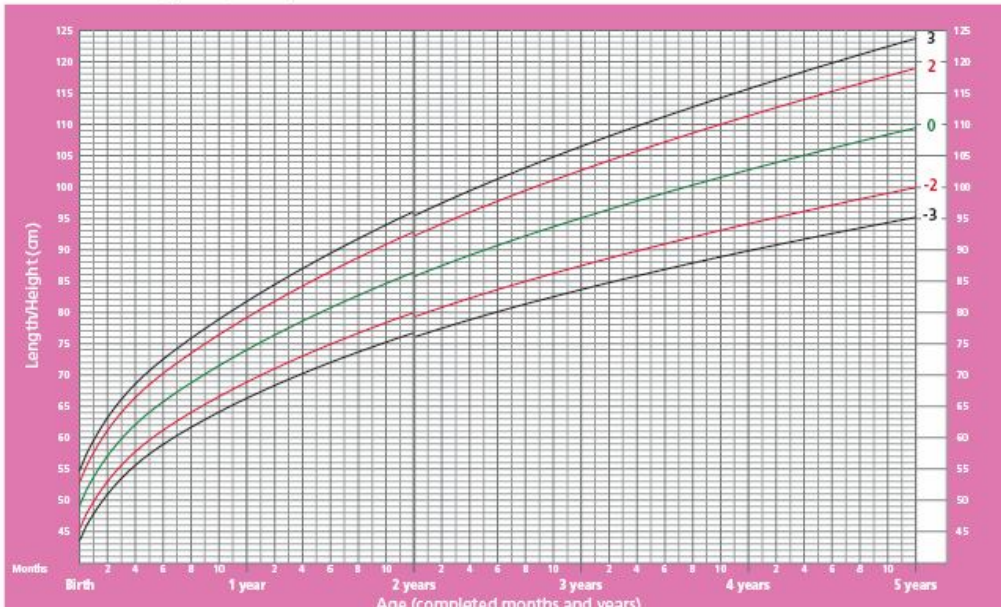
Weight-for-height BOYS

2 to 5 years (z-scores)



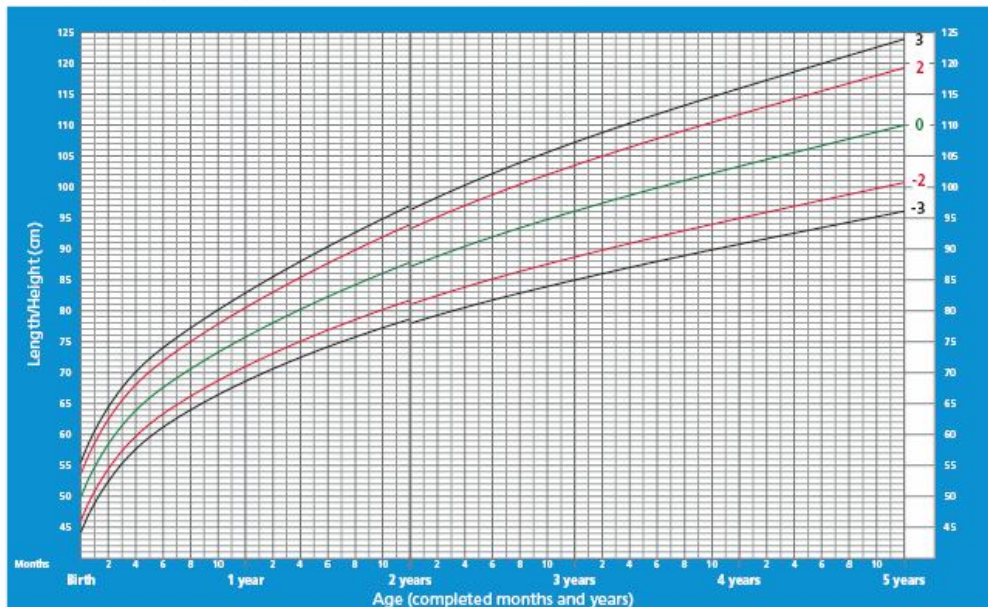
Length/height-for-age GIRLS

Birth to 5 years (z-scores)



Length/height-for-age BOYS

Birth to 5 years (z-scores)



Annexure 2: WHO Child Reference Curves (5-19 yrs)

Weight-for-age GIRLS

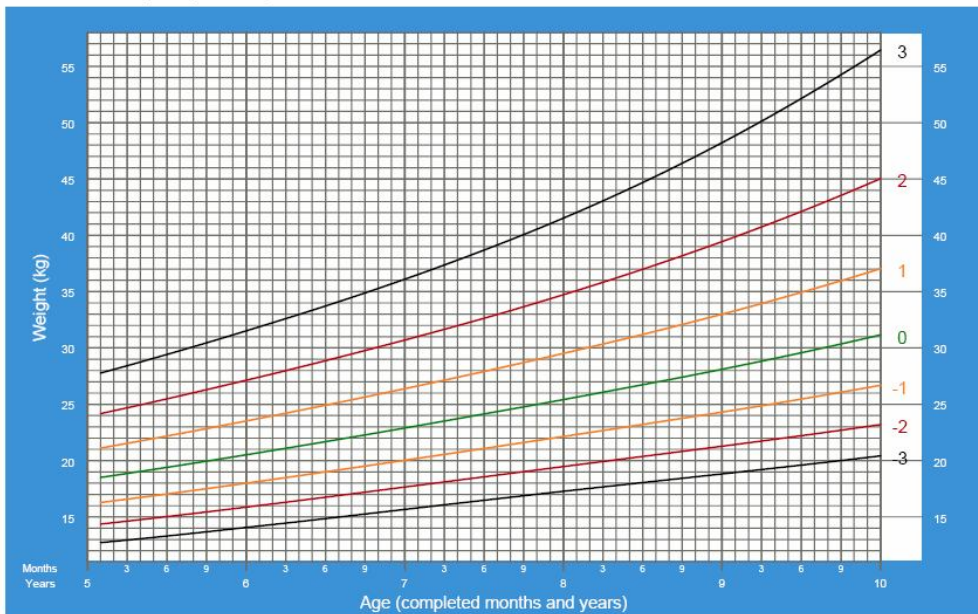
5 to 10 years (z-scores)



2007 WHO Reference

Weight-for-age BOYS

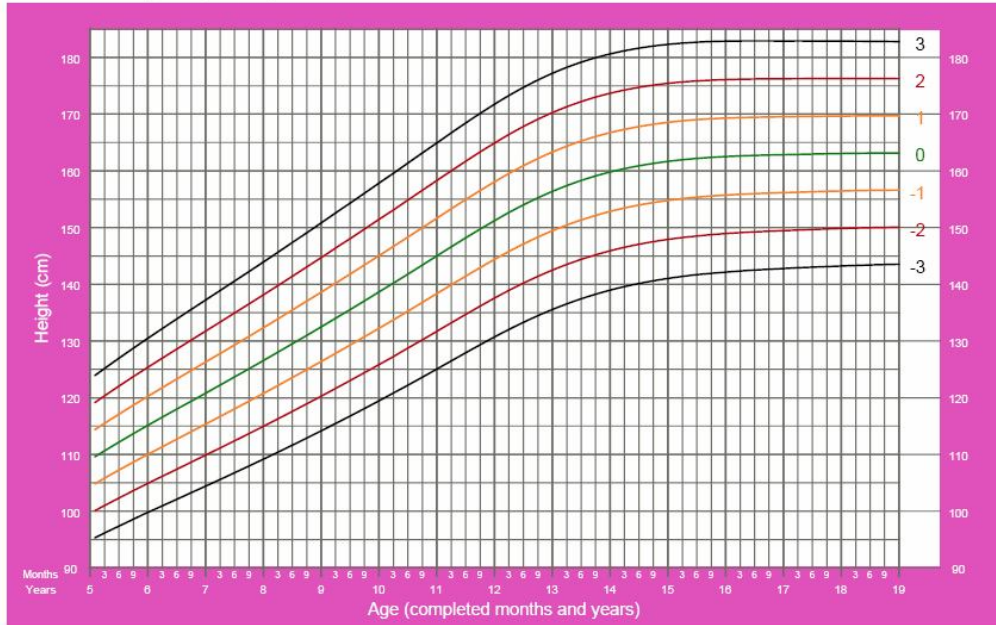
5 to 10 years (z-scores)



2007 WHO Reference

Height-for-age GIRLS

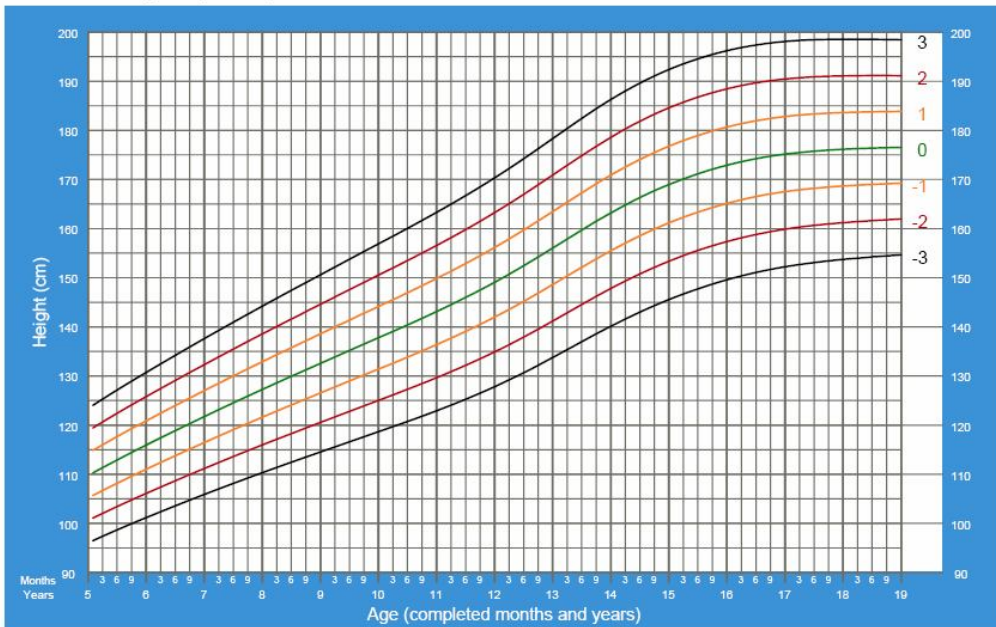
5 to 19 years (z-scores)



2007 WHO Reference

Height-for-age BOYS

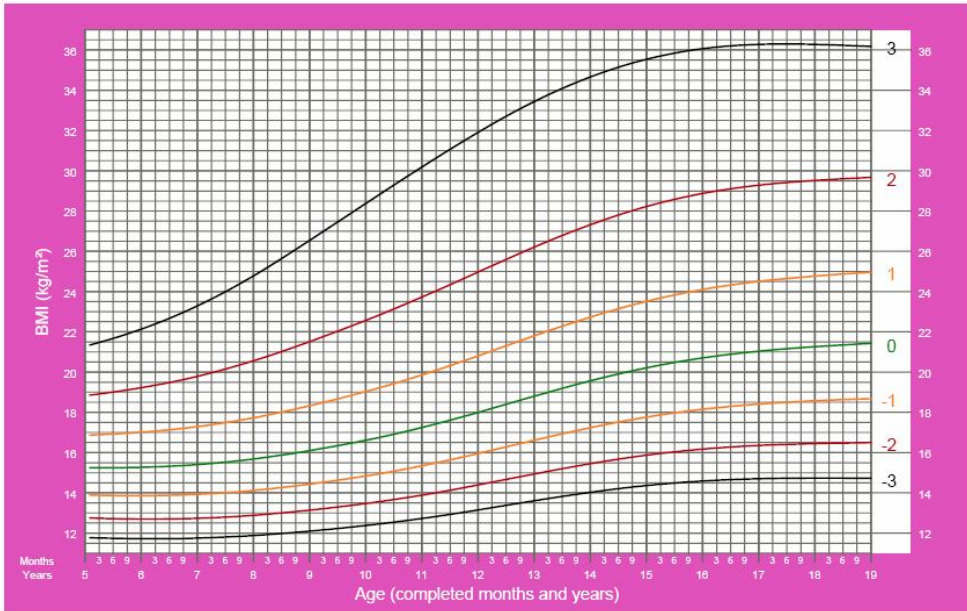
5 to 19 years (z-scores)



2007 WHO Reference

BMI-for-age GIRLS

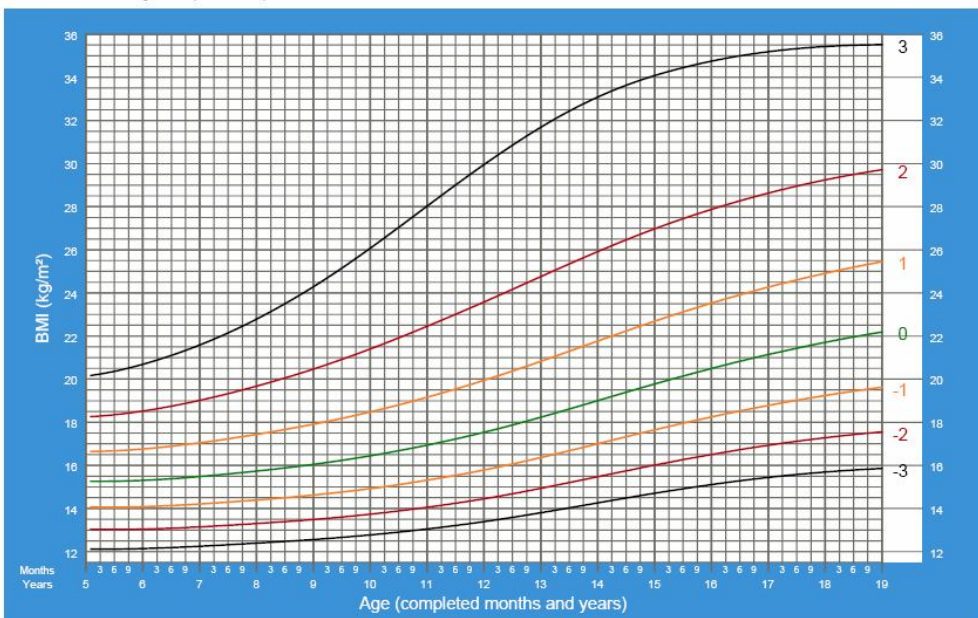
5 to 19 years (z-scores)



2007 WHO Reference

BMI-for-age BOYS

5 to 19 years (z-scores)



2007 WHO Reference

Annexure 3: Mother and Child Protection Card

Integrated Child Development Services
Maternal and Child Protection Card

Parental Information:
 Mother's Name: _____
 Father's Name: _____
 Address: _____
 Mobile No.: _____
 Date of Birth: _____
 Date of Marriage: _____
 Date of Pregnancy: _____
 Date of Delivery: _____
 Date of Postnatal Visit: _____
 Date of Next Visit: _____

Health Status:
 Is the child healthy? Yes No
 Is the child growing well? Yes No
 Is the child eating well? Yes No
 Is the child sleeping well? Yes No
 Is the child playing well? Yes No
 Is the child talking well? Yes No
 Is the child walking well? Yes No
 Is the child crawling well? Yes No
 Is the child holding objects well? Yes No
 Is the child holding a spoon well? Yes No
 Is the child holding a cup well? Yes No
 Is the child holding a pencil well? Yes No
 Is the child holding a paper well? Yes No
 Is the child holding a block well? Yes No
 Is the child holding a ball well? Yes No
 Is the child holding a toy well? Yes No
 Is the child holding a string well? Yes No
 Is the child holding a wheel well? Yes No
 Is the child holding a ring well? Yes No
 Is the child holding a square well? Yes No
 Is the child holding a circle well? Yes No
 Is the child holding a triangle well? Yes No
 Is the child holding a diamond well? Yes No
 Is the child holding a star well? Yes No
 Is the child holding a heart well? Yes No
 Is the child holding a cross well? Yes No
 Is the child holding a square well? Yes No
 Is the child holding a circle well? Yes No
 Is the child holding a triangle well? Yes No
 Is the child holding a diamond well? Yes No
 Is the child holding a star well? Yes No
 Is the child holding a heart well? Yes No
 Is the child holding a cross well? Yes No

Feeding, playing and communicating with children helps them grow and develop well!

0 to 6 months:
 Breastfeed on demand, day and night.
 Introduce complementary feeding at 6 months.
 Use a spoon and cup to feed your child.
 Encourage your child to play and communicate.

6 to 24 months:
 Continue to breastfeed.
 Offer a variety of complementary foods.
 Use a spoon and cup to feed your child.
 Encourage your child to play and communicate.

2 to 5 years:
 Continue to breastfeed.
 Offer a variety of complementary foods.
 Use a spoon and cup to feed your child.
 Encourage your child to play and communicate.

5 to 6 months:
 Breastfeed on demand, day and night.
 Introduce complementary feeding at 6 months.
 Use a spoon and cup to feed your child.
 Encourage your child to play and communicate.

6 to 24 months:
 Continue to breastfeed.
 Offer a variety of complementary foods.
 Use a spoon and cup to feed your child.
 Encourage your child to play and communicate.

2 to 5 years:
 Continue to breastfeed.
 Offer a variety of complementary foods.
 Use a spoon and cup to feed your child.
 Encourage your child to play and communicate.

BOY: Weight-for-age - Birth to 3 years
(As per WHO Child Growth Standards)

GIRL: Weight-for-age - Birth to 3 years
(As per WHO Child Growth Standards)

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ADOLESCENT NUTRITION AND FOOD HABITS

Dr. Abhay K. Shah

Adolescence has been defined by WHO as the period of life spanning between 10 to 19 years. This stage of life is very critical in terms of extreme emotional sensitivity, increased perception of liking and disliking and at the same time it is a period of high stress both physically and psychologically. Among the factors that influence the growth and development of adolescent child, nutrition plays a key role. Adolescent nutrition is the key to positive national health, and in fact it is an underestimated wealth of the nation.

THE PERIOD OF RAPID GROWTH

Adolescence is a period of rapid growth which depends upon factors like nutrition, genetic factors and hormonal factors.(1) It is during this period that the final growth spurt occurs. For boys, growth velocity is highest between 12 to 15 years and for girls between 10 to 13 years. They attain adult stature between 18 to 20 years but bone mass continues to increase up to age of 25. Almost 20% of the adult weight and height may be added during adolescent years. About 40 to 45 % of skeletal muscle mass is attained during and after adolescent growth spurt. During adolescence, children gain 15 to 20 kg and 30 to 40 cm height and they also add calcium and other vital nutrients. Lean body mass increases from 25 to 60 kg in boys and from 22 to 45 kg in girls, body fat increases from 7 to 9 kg in boys and 5 to 14 kg in girls and body calcium increases from 300 g to 1000 g in boys and 300 to 750 g in girls. They develop secondary sexual characters and assume the adult role physically and mentally to a great extent. This transition is faster and near complete in girls than in boys. Increased growth rates occur in girls between 10 to 12 years of age and in boys about 2 years later, although individual variations exist. Growth in girls is accompanied by a greater increase in the proportion of body fat than in boys, and in boys, growth is accompanied by a greater increase in the proportion of lean body mass and blood volume than in girls.(2) This rapid increase in weight and height puts a great demand for nutrients on the adolescent body.

IMPORTANCE OF ADOLESCENT NUTRITION

Adolescents constitute more than 22% of the population.

Healthy eating and life style behavior practised in these years would go a long way in preventing and /or postponing the onset of nutrition related diseases in the later years.

Adolescence is the last chance to correct the growth lag and malnutrition.

Restricted food intake in the physically active adolescent results in diminished growth and a drop in basal metabolic rate and amenorrhea in girls.

The nutrient intake for adolescents should be sufficient and balanced to meet the demands of physical growth and adequate stores for pregnancy in girls but simultaneously avoiding over nutrition.

A stunted adolescent female gives birth to a low birth weight baby, and the cycle keeps on repeating leading to stunted generations.

THE NUTRIENT REQUIREMENTS

In general, need for calorie and protein intake increases during adolescence peaking at around 12 years in girls and 16 years in boys. It is recommended that diets of adolescents should provide 55-60 % calories from complex carbohydrates. Fat should contribute nearly 30% of total calories with less than 10% saturated fats and 300 mg of cholesterol. Due to profound growth during adolescence, there is an increased demand for energy, protein, minerals, and vitamins.

Energy: Caloric needs increase with the metabolic demands of growth and energy expenditure. Adolescence is the second-largest growth spurt in a lifespan. Caloric needs of males and females are different and can be seen in the chart below.

Proteins: Protein needs represent 12 to 14 percent of energy intake. Protein intake usually exceeds 1g/kg of body weight. This meets growth needs for the pubertal changes in both sexes and for the developing muscle mass in boys.

Minerals

Calcium: About 150 mg of calcium must be retained each day to allow for the increase in bone mass. Because of accelerated muscular and skeletal growth calcium need are higher. This is the age when the gain in bone density is to

its maximum (up to 90%) and lack of calcium intake at this time can have a detrimental affect on bone growth.

Iron is needed for hemoglobin synthesis and is crucial for expansion of blood volume and for myoglobin needed for muscle growth. Female adolescents lose 0.5 mg of iron per day by way of menstruation. If this lost iron is not replaced, it predisposes one to iron deficiency and anemia. Iron need to be combined with vitamin C rich foods for proper fulfillment of nutrition.

Zinc: It is needed for growth and sexual maturation. Growth retardation and hypogonadism have been reported in adolescent boys with zinc deficiency.

Vitamins

The need for thiamine, riboflavin and niacin increases directly with increased caloric intake. Folic acid and B12 are essential for DNA and RNA synthesis, and needed in higher amounts when tissue synthesis is occurring rapidly. Tissue growth involves amino acid metabolism, particularly transamination to synthesis of nonessential amino acids, so the requirement for B6 increases. Skeletal growth requires vitamin D, while the structural and functional integrity of newly formed cells depends on the availability of vitamins A, C, and E.

Age	Sex	Weight	Net energy Kcal/day	Protein Gm/day	Fat g/day	Calcium mg/day	Iron mg/day
10-12 years	Boys	35.4	2190	54	22	600	34
	Girls	31.5	1970	57	22	600	19
13-15 years	Boys	47.8	2450	70	22	600	41
	girls	46.7	2060	65	22	600	28
16-18 years	Boys	57.1	2640	78	22	500	50
	girls	49.9	2060	63	22	500	30

Nutrient	Boys 13-15 years	Girls 13-15 years	Boys 16-18 years	Girls 16-18 years
Vitamin A mcg	600	600	600	600
Beta Carotene mcg	2400	2400	2400	2400
Thiamine mg	1.2	1.0	1.3	1.0
Riboflavin mg	1.5	1.2	1.6	1.2
Niacin mg	16	14	17	14
Pyridoxine mg	2	2	2	2
Ascorbic acid mg	40	40	40	40
Folic Acid mcg	100	100	100	100
Vitamin B12 mcg	0.2 to 1	0.2 to 1	0.2 to 1	0.2 to 1

Nutritional considerations for pregnancy

Because adolescent growth spurt is not complete until a few years after menarche, fetal demands for nutrients could place maternal growth in jeopardy. This is especially true when pre-pregnancy nutrition of girls is unsatisfactory. Pregnant adolescents are just as likely as other teenage girls to skip meals, ingest poor quality snacks, and be over concerned about weight with limited food

choices. UNICEF has recommended 45 kg weight and 145 cm height as the ideal pre-pregnancy standards for the prospective mothers. (4)

DIETARY GUIDELINES

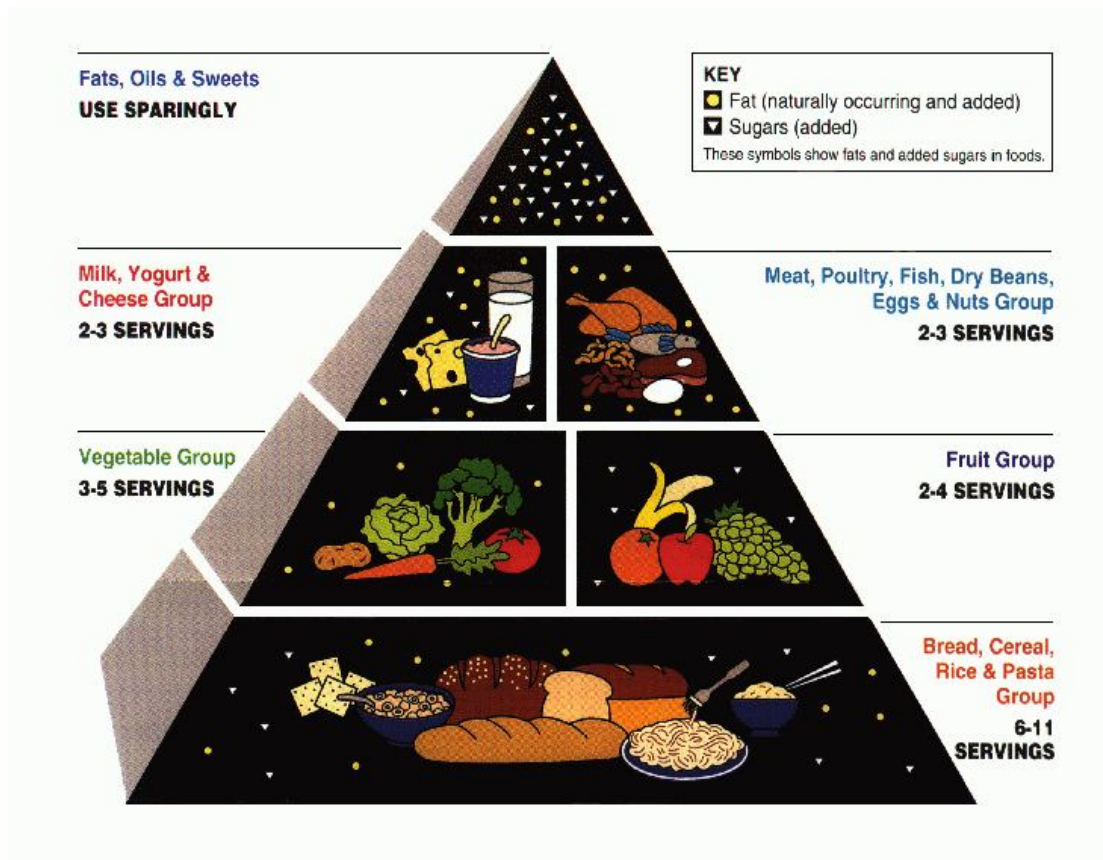
Ensure balanced diet by including all food groups. Include cereal-pulse combinations, roots-tubers in adequate quantities, vegetables and fruits liberally, milk and milk products and meat group in moderation and oils, fats and sugar in small quantities. (Figure I)

Morning breakfast is very vital.

Food fads should be avoided and ensure variety with each food group

Avoid empty calorie foods, such as carbonated drinks

Iron-rich foods should be included in the diet to prevent anemia. Weekly iron during these years is a useful intervention



Calorie and protein-rich foods should be taken to support growth spurt. Adolescent boys should eat as much as father eats (2400 calories) and girl should eat a little more than what the mother eats (2100 calories)

Eating habits should be independent of emotions

Adolescent girls should take enough calcium-rich foods to increase bone density, which delays the onset of osteoporosis

EATING BEHAVIOR AMONG ADOLESCENTS

The foundation of adolescent's food habits are laid in the family and the family appears to be the one and the main influence. The others are the peer group, the evolving independent personality and the society in general. Adolescence is a transitional stage with flexible food habits, but soon they settle down and re-establish the eating behavior of the family. Thus, they decide the eating habits of the future families. That is why nutrition education is regarded as a million dollar investment for a country. Few peculiarities seen at this age are:

Missing meals: Breakfast is brain's food and missing it may affect classroom performance, especially in those with poor nutrient reserve. High energy breakfasts, with higher intakes of vitamins and minerals are associated with lower serum cholesterol and improved nutritional indices. A fortified cereal in breakfast would definitely meet the adolescent calcium and iron needs.

Snacks: Structured meals are often abandoned in favor of "snacking". Frequent snacking results in weight problems and less than desirable intake of vitamins and minerals. Snack foods that complement the regular meals are preferred choices towards good nutrition.

"Fast, take-away or carry home food and junk food": These do not provide balanced nutrition and safety of these foods is also a concern. Additives and colors added to them and the frying and refrying of them may be toxic and harmful to the body. Repeated frying and refrying liberates many free radicals and oxides, causing antioxidant deficiency.

Unconventional meals: Teenage boys and girls, who have otherwise an excellent track record in terms of their food habit, are also likely to succumb to bizarre, unbalanced diets. The conventional family meal becomes less and less important for them. They tend to avoid important food group like dairy products, vitamins, minerals etc.

Soft drinks and other fun drinks: They provide only 'empty calories' and often kill the appetite and result in nutritional deficiencies. Promotion of natural foods, tender coconut water, butter milk etc. as alternatives to alcohol and soft drinks may help to discourage these habits. These fluid drinks often replace plain water intake which is an essential requirement for good health

Low intake of micronutrients, protective food and antioxidants: Failure to consume all food items will result in multiple deficiencies especially iron, calcium, zinc, vitamin-A, vitamin-C etc. This may lead to early onset of degenerative disorders.

Dieting/Exclusion: Around 10% of adolescents are obese and they curtail food drastically but, as they are still in the growing age it is wise to increase exercise rather than curtail food. Girls may have anorexia nervosa and bulimia that may need psychotherapy. Some avoid fatty foods and sugary items for fear of acne vulgarism. Confectioneries, fatty foods, chocolates and alcohol drinks tend to worsen acne, but polyunsaturated fatty acids (PUFA), vitamin-A and zinc tend to improve acne.

Overeating: Near the age of peak height velocity, some tend to over eat especially high calorie starch and sugars. They may eat much more than what is needed, even up to 4000 kilocalories. Overeating may pave the way for obesity and early onset of degenerative disorders.

Vegetarianism / non-vegetarianism: Some claim that vegetarians are healthier than others. Vegetarians have low risk of obesity, coronary artery disease, and hypertension and colon cancer. Vegetarians, who eat no animal products, are at risk of calcium, iron, zinc and vitamin-D and vitamin-B12 deficiencies. Whole grains and germinated seeds are beneficial in them. Lacto-ovo-vegetarians who eat milk and egg have very little nutritional risk except iron deficiency due to lack of haem-iron. Fruitarians eat only fruit and are at risk of protein, sodium and other deficiencies.

NUTRITIONAL DISORDERS IN ADOLESCENTS

Under nutrition: An adolescent with BMI less than 5th percentile is undernourished. According to National Nutrition Monitoring Board, 39% of adolescent girls and boys are stunted and thinness ranged up to 77.6%.

Iron deficiency anemia: It is the commonest deficiency in teenagers. In India, its prevalence ranges from 11 to 79 %, depending on the socio-economic group and gender. In developed countries also its incidence is as high as 9 %.(5) A national program to prevent anemia in adolescent girls is going on.

Eating disorders: The hormonal shifts, social interaction, preoccupation with body image, impact of media all account for eating disorders.

Obesity: A BMI of greater than 85th percentile is overweight and BMI of greater than 95th percentile is called obesity. The hormonal changes, the growth spurt, the erratic dietary habits, psychological dispute, conflicts and maladjustment are important factors for obesity. At least 60 minutes of daily exercise is recommended for adolescents.

PROGRAMMES FOR ADOLESCENTS

Kishori Shakti Yojana (to improve health and nutritional status of girls), Reproductive and Child Health Program, Nutritional Program for Adolescent Girls (NPAG) are some of the ongoing projects. After much delay, the women and child development ministry will finally launch the Rajiv Gandhi Scheme for Empowerment of Adolescent Girls - SABLA - in November 2010. SABLA aims at empowering adolescent girls between 11 to 18 years of age by improving their nutritional and vocational skills. SABLA would replace the existing Nutrition Program for Adolescent Girls (NPAG) and Kishori Shakti Yojana (KSY).(6)

REFERENCES

1. Nutrition and child development. K E Elizabeth, third edition.
2. Pediatric Nutrition Handbook, sixth edition, American Academy of Pediatrics.
3. Course manual for adolescent health, Part II, IAP-International Training Program on Adolescent Health.
4. Website UNICEF.
5. IAP text book of Pediatrics, 4th edition.
6. Website Health Department, GOI.

JUNK FOOD

Dr. Kamlesh Parekh

What is Junk Food?

Junk food is an informal term applied to some foods which are perceived to have little or no nutritional value, or to products with nutritional value from ingredients considered unhealthy when regularly eaten, or to those considered unhealthy to consume at any time. The term was coined by Michael Jacobson, director of the Centre for Science in Public Interest in 1972^[1] and by the start of the 21st century “junk food” has gone global.

Are ‘Ready-to-eat’ food same as Junk food?

Foods more likely to be considered junk food generally are those that are more convenient and easy to obtain in a ready-to-eat form, though being such does not automatically define the food as “junk food.”

What is basically wrong with junk food?

Junk food tends to replace other, more nutritious foods. Most junk foods contain less than 5% of the recommended daily allowances (RDA) of any one of eight basic nutrients^[1].

Generally, they offer little in terms of protein, vitamins or minerals and lots of calories from sugar or fat in a small volume. The term “empty calories” reflects the lack of nutrients.

They are high in sugar in liquid form.

They may be high in total fat content, more so, cholesterol promoting saturated fats and other bad lipids.

They’re low in satiety value - which can lead to overeating. 4:

They taste so good and are so convenient that they encourage overeating which results in obesity & related life style diseases.

They are low in fiber/roughage [which is otherwise found in whole grains] and causes constipation and is implicated in colorectal cancers.



Being high in salt, they can aggravate hypertension.

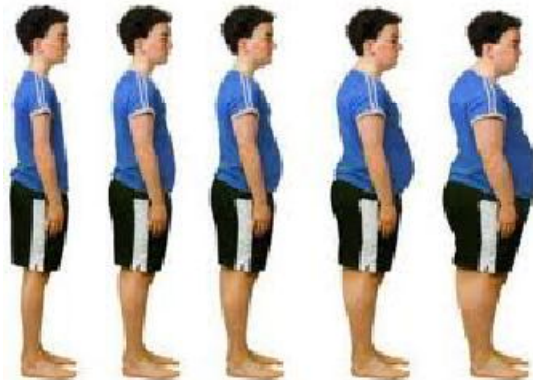
Their high phosphate content may lead to osteoporosis

Some may contain Mono Sodium Glutamate e.g. in Chinese dishes, which can cause 'Chinese Restaurant Syndrome' in a susceptible child.

There is a school of thought typified by a study by Paul Johnson and Paul Kenny at The Scripps Research Institute has suggested that junk food alters brain activity in a manner similar to addictive drugs like cocaine or heroin.^[2] After many weeks on a junk food diet, the pleasure centers of rat brains became desensitized, requiring more food for pleasure. After the junk food was taken away and replaced with a healthy diet, the rats starved for two weeks instead of eating nutritious fare.^[3]

Research has shown that kids whose diets are saturated with high sugar, low-nutrition containing junk food function poorly in the classroom. Their cognitive skills are impaired and most frequently they face anxiety and inattention & hyperactivity^[4].

With junk food, there is an onslaught of over 4000 artificial additives put in junk foods today, ranging from artificial sweeteners, artificial colors and preservatives, to chemically altered fake fats, harmful effects of many may cumulate.



Name some of the foods that fall in the Junk food category.

Salted snack foods, candy, gum, most sweet desserts, fried fast food and carbonated beverages are some of the major junk foods. Popular snack foods are usually commercially prepared and packaged, like chips, cheese puffs, crispy salty snacks, candy bars, snack cakes, and cookies.

Which are the categories of Junk Food?

Snack food: Crisps, Chocolate, Sweets, Biscuits, Icecream, Hot-dogs; Donuts,

Fast food: Chips, Pizza, Burger; Noodles, Pasta, Sausages, beans;

and Fried chicken

Soft drinks: Coke, Fanta, Pepsi, Sprite, Lemonade etc

? Breakfast cereals. [They seem innocent enough, but some of them could definitely be considered "junk food," as they mostly contain sugar or high-fructose corn syrup and

white flour or milled corn. The crisping agents added to flakes preparations are known carcinogenic]

Is there evidence that 'junk food causes Obesity?

A World Health Organization / Food and Agriculture Organization expert group found^[5]:

‘Convincing’ evidence that eating a lot of energy-dense foods is a risk factor for obesity

Heavy marketing of fast foods and drinking a lot of sugary drinks were ‘probable’ risk factors

Large portion sizes were a ‘possible’ risk factor

What percentages of ingredients are usually associated with junk food?

More than 35% of calories from fat (except for low-fat milk)

More than 10% of calories from saturated fats

Any trans fat

More than 35% of calories from sugar, unless made with 100% fruit and no added sugar

More than 200 calories per servings for snacks

More than 200 mg per serving for sodium (salt) for snacks

More than 480 mg per serving for sodium (salt) for entrees

What is this fiber issue? What does a refined food mean?

It can be said that refined foods are unhealthy whereas whole grains offer special cardiovascular benefits because they “consist of bran, germ, and endosperm components. When refined, the carbohydrate-rich endosperm component is retained, while many biologically active agents, such as fiber, vitamins, minerals, antioxidants, and other plant compounds (lignans, phytosterols, etc.) are removed with the bran and germ.”

“Western lifestyle patterns” i.e. refined carbohydrates are linked to obesity and diabetes, type 2. Whereas, whole grains [amaranth, barley, buckwheat, corn, millet, oats, quinoa, brown rice, rye, sorghum, teff, triticale, wild rice and wheat] appear protective. Fibers can be water soluble or insoluble. Soluble fibers are found inside plant cells and include pectin, dextrin and gum. Fibers in the cell walls of plants that are water insoluble include cellulose, hemi cellulose and lignin found in grains, legumes, vegetables and fruits

If there are issues with bread made from refined flour, why they are there in the market?

Apart from taste, the most important reason for refining flours and grains is that the high lipid concentration in the germ and aleuronic layer significantly shortens the shelf life of flour and whole grains, causing them to become rancid in just weeks and therefore stored food requires their removal by refining.

On the other hand, some foods actually require processing. Whole grains as harvested are generally not consumed directly by humans, but require some type of processing (e.g., milling of grains) or parboiling [of rice] prior to consumption. What's more, refining certain foods helps in addition of nutrients. Commercial wholegrain breads are supplemented with calcium carbonate, Vitamins B1, B2, B3, Iron and Folic acid. Decline in the birth defects, e.g. spina bifida; reduction in the incidence of Pellagra and Beriberi were reported within the first five year of using enriched flours in USA.

Is the calorie content of the food really high or is it hyped?

Typical menus at McDonald's, KFC and Burger King contain 65 % calories per bite, which make it far too easy for customers to overeat without even realizing it^[6].

Junk food is also a major cause in the 23 % of American children who are overweight^[7].

Fast food and the increasingly available category of junk food are strongly correlated to the "300 percent increase in the rate of U.S. children who are either overweight or obese."^[8] US per capita consumption of sugar has risen to 158 pounds per annum.

Between 1977 and 1996 in Chile, the contribution of snack calories to total calories for children between 2 and 5 years old increased by 30%^[9]..

In the study, from the Children's Hospital in Boston^[10], teens aged 13-17 took in about half of their daily calorie needs in one meal of fast food.

Are we talking about western world or India?

The total value of junk food consumed in India in 2003 was about Rs. 41,000 crore^[11]. This figure in 2010 must have sky rocketed.

Which are the avenues from which the junk food becomes so readily available?

Junk food is readily available at restaurants across the country in the form of french-fries, chicken nuggets, shakes, soda, etc; retail outlets & grocery shops; fast food centers, roadside hawkers and even school canteens

Why Junk food is so appealing?

The Time Factor: Ready to eat / Easy to prepare: e.g. potato wafers, Cheese balls, etc. Pizzas and burgers served at your door step hot.

The Taste Factor: Great taste owing to lavish usage of oils, salts and/or sugar

The Advertising Factor: Tempting and catchy multimedia campaigns

Is there any correlation between Junk Food and TV?

Many of the food commercials aimed at children are for foods high in fat, sugar, and/or salt, and low in nutritional value. Research suggests that watching such ads encourages children to eat more of them.



Researchers from the University of Liverpool^[12] found that the children ate more after the food advertisements than after the commercials for toys. The obese children in the study increased their consumption of food the most (134%), compared to overweight children (101%) and normal-weight children (84%) after watching the food ads.

How to eat more healthfully in our junk-food-filled world? — Taking the 'Junk' out of Junk Food.

Here are the tips:

1. Choose fast-food restaurants that offer healthier choices. And no matter where you are, opt for food and beverages that are made up mostly of ingredients that offer nutrients along with calories. Enjoy freshly squeezed orange juice or a whole-wheat bagel instead of soda or donuts. Buy a bean burrito, pizza topped with vegetables, or a grilled chicken sandwich, idli on a whole-grain bun instead of tortilla chips with processed cheese sauce, frozen pizza rolls; fried chicken pieces, samosas, pakoras and French fries. Avoid sweetened beverages.
2. Look for products low in sugar, high-fructose corn syrup, milled grains, and partially hydrogenated oils. Choose a 100% whole-wheat cracker made with canola oil, for example, or snack on a cheese and fruit plate instead of a bowl of cheese puffs. Y•:
3. Limit TV viewing, for yourself and your kids. Certain TV shows seem to attract more junk food commercials more than others, so parents might want to discourage kids from watching

these shows. Or try TIVO (where you can fast-forward through commercials) or watch DVDs.

How can we influence eating habits of a child for junk food?

A lot of parents don't want to struggle with the issues so they give up, letting kids make their own choices, but children's judgment is less mature and they still depend on parents to guide them. It is best to start training children about foods as soon as they can talk since they are most influenced by their families during the preschool years. Additionally, research has shown that heart and blood vessel disease can begin very early and that hardening of the arteries (arteriosclerosis or atherosclerosis) can be associated with a high-fat diet.

Involving young children in the food preparation process by giving them growing responsibility along with sensible access may help. For example, teach children how to set the table during their preschool years. Take them grocery shopping. Let them choose some fruits and vegetables as well as the occasional treats. If children are properly prepared; they are more likely to make healthy food choices once they enter school.

What about changing the diet of children who have already fallen into the junk food habit?

Once children reach age 10 or 12, it is very difficult to change their habits or coerce them into eating healthier foods. Calling a family meeting to rationally discuss ways to eliminate most junk foods and substitute more nutritious ones may be of some help.

Who else can help?

Schools and even individual teachers and students can begin to make an impact on cutting out the sugar and fat saturation of school cafeterias. However, it is a challenge; most students who consume these products are addicted and will demand more. Across the country, teachers and students are tired of the negative effects junk food is having on student attention and they are beginning to change their school's offerings while properly educating students on practical nutrition information that will allow them to become informed consumers. The results from those schools that have made the changes are very promising.

Proper advocacy may help for the cause. The Food Standards Agency has been successful in imposing a ban on advertising during children's television in UK^[13].

What is the message?

Stop eating junk food for improving nutrition and health!

Remember, that all processed foods are designed to enrich the profits of food companies, rather than to enrich your nutrition.

Junk food is food that has been processed to the extreme.

Start improving your nutrition by reading food labels! So you can avoid eating processed food that is more artificial than real.

The more real or whole foods that you eat, the healthier you will be. So, buy some produce from your local grocery store, too.

Rather than taking a radical approach and banning all but the simplest foods, judge each food based on the list of ingredients and Nutrition Facts label found on packages. When reading the list of ingredients, look for sugar, fat or salt as one of the first three ingredients.

Good choices in processed foods are

- More real than a processed food;
- Low in fat (i.e., 3 grams or less total fat per serving; cholesterol < 300 mg/day);
- Unsweetened; Sugar < 4gms except natural fruits;
- Low in salt or salt free. < 2300 mg/day
- Dietary fiber content > 2 to 5 gm per serving is good.

Stop Eating **Junk Food!**

- A. Always consider the quality of the food that you are eating.
- B. Avoid these common Junk Foods:
1. Do NOT eat at Fast Food Restaurants.
 - a. Do NOT eat anything deep fried or otherwise saturated with some type of hydrogenated vegetable oil, Trans fatty acids, or saturated fat.
 2. Do NOT eat anything sold in vending machines.
 - a. Real food does NOT come out of plastic bags.
 - b. Do NOT eat chips, pretzels, popcorn, crackers, etc.
 3. Do NOT eat pastries, cakes, or cookies.
 - a. Eat fewer highly refined-grain, rapidly digested carbohydrates and more whole-grain, slowly digested, carbohydrates.
 - b. Pastries, cakes, and cookies are high in saturated fat.
 4. Do NOT eat Processed Foods more man made than real.
 - a. In other words, drink orange juice, the real deal, NOT "Tang" the drink of astronauts.
 5. Do NOT eat any kind of candy.
 6. Do NOT turn a salad into junk food, by including too much cheese, meat, or saturating it with any kind of processed salad dressing.

Item	Amount	Calories
Pavbhaji	1 Plate	235 Cal
PopCorn	35Gm	140
Jalebi	100Gm	412
Pepsi	300ml	131
Glucose Biscuit	2	67
Bun	1	150
Nan Butter	1	235
Softy Icecream	1	360
Aloo Paratha	1	290
Veg. Pulao	1 plate	321
Rawa Masala Dhosa	1	385
Paper Dhosa	1	465
Egg Curry	1	277
Anjir	100gm	550
Cashewnuts	100gm	596
Almonds	100gm	655
Pista	100gm	626
Pomphret Curry	2-3 pieces	389
Mutton Biryani	1 plate	470
Pauwada	1no.	295
Veg Cutlet	2	320
Rava Sheera	150gm	357
Gulab jamun	2	300
Kajukatri	2	200

Know the fats, cholesterol, calories and salt present in fast food and junk food items in the following table. [The values in the table have been compiled from manufacturer's brochures]

Item	Cholesterol (mg)	Fat (g)	Calories	Sodium (mg)
Pizza supreme (1/3 regular)	16	14		
English muffin w/ butter	13	5.8	189	386
Burrito w/ beans cheese	13.5	5.8	188	584
Grilled sandwich, plain	60	7.0	288	758
Scrambled egg	200	7.6	100	105
Hamburger, plain	44	17	275	387
French fries, regular	0	12.0	235	124
Taco salad (1½ cup)	4	13.1	288	886
Pancakes w/ butter & syrup (3 cakes)	57	14.0	519	1103
Hot dog	44	14.5	242	671
Sub sandwich w/ cold cuts	35	18.6	456	1650
Baked potato w/ cheese sauce	31	21.9	481	701
Chicken filled sandwich, plain	60	29.5	515	957
Egg & bacon + 1 biscuit	353	31.1	457	999
Coco Cola Large	0	0.0	205	
Fanta Large	0	4.5	260	
Milk, 2% (1 cup)	18	4.7	121	122
Vanila shake (10 oz.)		12.5	474	
Chocolate shake (10 oz.)	37	13.1	494	

REFERENCES

1. Michael Jacobson: Eater's Digest: The Consumer's Fact-Book of Food Additives, Doubleday & Company Inc. (June 1972) ASIN B000H7GB4K
2. Johnson, Paul M.; Kenny, Paul J. (2010). "Dopamine D2 receptors in addiction-like reward dysfunction and compulsive eating in obese rats". *Nature Neuroscience*. Doi: 10.1038/nn.2519.
3. Goodwin, Jennifer. Junk Food 'Addiction' May Be Real. *Business Week*. March 29.
4. Crute 20005. Growing Pains Crute, Sheree March 2005 (National Education Association).
5. Diet, Nutrition and the Prevention of Chronic Diseases, Joint WHO/FAO expert consultation, WHO, Geneva, 2002
6. <http://www.megaessays.com/viewpaper/21696.html>
7. Assuras, 2001. Fast Food, Fat Children Assuras, Thalia 2001 CBS News
8. Lempert, <http://www.nutritioncrashcourse.com/health-foods.html>. 2005
9. Revista Medica de Chile
10. Boston Hospital Study, Available at: <http://www.childrenshospital.org/dream/DreamWin04/obesity.html>
11. The Hindu Business Line. Wednesday, Jul 13, 2005.
12. University of Liverpool; Available at: <http://www.liv.ac.uk/researchintelligence/issue31/foodads.htm>
13. Foods standard Agency; <http://collections.europarchive.org/tna/20100907111047/http://food.gov.uk/healthiereating/advertisingtochildren/promotion/promofacts/>

BREASTFEEDING AND ADULT ONSET DISEASES

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Breast-feeding is an unequalled way of providing ideal food for the healthy growth and development of infants. It is also an integral part of the reproductive process with important implications for the health of mothers.

Breastfeeding and Rheumatoid arthritis

A Swedish study indicates that breastfed babies are less likely to develop rheumatoid arthritis as adults. An earlier University of North Carolina/Duke University study had indicated breastfed children were only 40% as likely to develop juvenile rheumatoid arthritis (1). In a large cohort, breast-feeding for >12 months was inversely related to the development of RA. The effect was duration-dependent, with a significant trend toward lower risk with longer duration of breast-feeding (2).

Breastfeeding and Inflammatory Bowel Disease (IBD)

Several studies have shown that breast-feeding may help babies avoid developing Crohn's Disease in later life. In a recent meta-analysis, studies that reported outcome in early-onset disease (<16 years of age) and "any exposure" to breast milk as the variables were studied and a possible protective effect for breast milk in the development of early onset IBD was postulated (3). Breast-feeding has also shown to protect against the development of ulcerative colitis in adulthood (4).

Breastfeeding and Allergies

Diet during early childhood is an important determinant of the development of allergy, particularly in high-risk infants who have a parental history of atopy. Bioactive factors in breast milk like cytokines and immunoglobulins influence the development of gut-associated lymphoid tissue and thymus. This influences the infant's immune responses and can explain the higher allergic tendencies seen in babies on formula feeds. These beneficial effects of breastfeeding on immunity have been observed for as long as 18 years of age (5,6). Breast-feeding is known to have a protective effect against development of asthma and atopic dermatitis. The effects are dose-dependent. Babies breastfed for > 3 months duration are 1.9 times less likely to have asthma compared to their counterparts who are breastfed for lesser duration (7).

Breastfeeding and Multiple Sclerosis

Although multiple sclerosis is thought to be multifactorial in origin, and without a clearly defined etiology, lack of breast-feeding does appear to be associated with an increased incidence of multiple sclerosis (8).

Formula feeding and Diabetes

There are many studies linking the development of Type I diabetes to the lack of breast-feeding. Most studies suggest that the early introduction of complex foreign proteins may be a risk factor for beta cell autoimmunity, and a pilot intervention trial has implied that weaning to a highly hydrolyzed formula may decrease the risk of beta cell autoimmunity. Introduction of dairy products at an early age, and high milk consumption during childhood increases the level of cow's milk antibodies in the children's systems as well as islet cell auto-antibodies. This factor is associated with an increased risk of IDDM (9). Now a new study has indicated that breast-feeding in infancy may help reduce the risk of Type 2 diabetes (10).

Formula feeding and Obesity

Metabolic factors acting during pre and postnatal development can induce lasting effects on health and disease risk in later life up to old age, including later obesity risk, i.e., *early metabolic programming of long-term health*. Breast-feeding protects against later obesity by reducing the occurrence of high weight gain in infancy and that one causative factor is the lower protein content of human milk compared to usual infant formulas (the "*early protein hypothesis*"). A study of 32200 Scottish 3 year old children found that the incidence of obesity was significantly lower among those who had been breastfed, after adjusting for socioeconomic status, birth weight and gender (11). A Czech study found that the even older children who had been breastfed were less at risk for overweight/obesity (12).

In a systematic review of 70 studies it was concluded that mean BMI is lower among breastfed as compared to formula fed subjects. However, the difference was small and was likely to be strongly influenced by publication bias and confounding factors. Promotion of breast-feeding, although important for other reasons, may not reduce mean BMI (13).

The protection for obesity may be related to certain properties of breast milk and breast-feeding. Breastfed babies do not overfeed as they can curb or regulate their intake according to their satiety. Formula-fed babies have higher insulin levels and a more prolonged insulin response. Also leptin levels relative to the body fat are higher in breastfed babies. All these factors can contribute to lower risk for obesity in breastfed babies.

Breast-feeding and Cholesterol

Some studies have found that breast-feeding seems to be associated with lower levels of harmful cholesterol in adulthood. In a recent review cumulative clinical data from 17 previously published research studies including 17,498 patients, was analyzed (14). Altogether, 12,890 study volunteers reported being breastfed as babies, while 4,608 were primarily fed with baby formula during infancy. All of these adult volunteers had blood cholesterol levels measured as part of these 17 clinical studies. When analyzing differences in blood cholesterol levels among the 17 previously published clinical studies, the authors of this new review study adjusted their analysis to correct for differences in age, socioeconomic status, body weight and smoking status among the study volunteers. They concluded that initial breastfeeding may be associated with lower blood cholesterol concentrations in later life.

Babies on breastfeeds have also been reported to have lower cholesterol levels than formula fed babies. A study on hypercholesterolemia on 400 Indian babies wherein the lipid profiles of exclusively breastfed and mixed-fed term healthy infants in the first 6 months of life were compared concluded that breastfed babies had significantly higher TC and LDL-C compared to mixed fed babies in the first 6 months of life with improving HDL-C/LDL-C ratio at 6 months.(15) This may have implications for lipid profile in adulthood.

Breast-feeding and Hypertension

Breast-feeding may protect against high blood pressure in later life. In a prospective cohort study (ALSPAC, United Kingdom), a total of 7276 singleton, term infants born in 1991 and 1992 examined at 7.5 years concluded that the systolic and diastolic blood pressures of breast-fed children were significantly lower than those who were never breastfed (16)

Breastfeeding and Malignancies

Breast Cancer

Women who were formula-fed as infants have higher rates of breast cancer as adults. For both premenopausal and postmenopausal breast cancer, women who were breastfed as children, even if only for a short time, had a 25% lower risk of developing breast cancer than women who were bottle-fed as infants (17).

Childhood Cancers

Biological mechanisms support an inverse association between exposure to breast milk in infancy and the risk of cancer (18). In a study done from Minnesota it was found that babies who were

breast fed for at least one month had a 21% less chance of getting leukemia than formula fed babies (19). The risk was inversely related to the duration of breast-feeding. In another study no relationship was seen between breast-feeding in infancy and development of CNS tumours in childhood (20). In another meta-analysis lower risk associated with having been breast-fed of 9% for acute lymphoblastic leukemia, 24% (3-40%) for Hodgkin's disease and 41% (22-56%) for neuroblastoma were reported (21)

Breast-Feeding and Osteoporosis in the Child

In a 20-year follow-up study of 202 subjects, born preterm, the effect of breast milk versus formula milk was evaluated with respect to anthropometry; whole body (WB) bone mineral content (BMC) and bone area (BA) measured using DXA and bone turnover markers. Babies were randomized to: (i) preterm formula versus banked breast milk or (ii) preterm versus term formula; as sole diet or supplement to maternal milk. Subjects receiving >90% human milk had significantly higher WB and BA (by 3.5%, $p=0.01$) and BMC (by 4.8%, $p=0.03$) than those receiving <10%. The higher WB bone mass associated with human milk intake, despite its low nutrient content, may reflect non-nutritive factors in breast milk (22). These findings may have implications for later osteoporosis risk.

Breastfeeding and Psychological Health

Human breast milk enhances brain development and improves cognitive development in ways that formula cannot. An 18-year longitudinal study of over 1,000 children found that those who were breastfed as infants had both higher intelligence and greater academic achievement than children who were infant-formula fed (23). Breast-feeding has an effect on adult intelligence too. A significant positive association between duration of breast-feeding and intelligence was observed in 2280 young adults, assessed with 2 different intelligence tests, in Denmark (24). A protective effect of breast-feeding against the risk of later schizophrenia has also been reported before (25). Evidence for effects of breast-feeding on juvenile delinquency is still emerging.

DISEASES IN MOTHERS WHO HAVE NOT GIVEN BREASTFEEDING

For mothers, failure to breastfeed is associated with an increased incidence of diseases too, especially, premenopausal breast cancer, ovarian cancer, retained gestational weight gain, type 2 diabetes, myocardial infarction, and the metabolic syndrome.

Risk of Ovarian Cancer

Breast-feeding for a total of 12 to 24 months can reduce the risk of ovarian cancer by up to one-thirds in mothers (26).

Risk of Breast Cancer

Recently, data from 47 studies in 30 countries was re-examined and concluded that breast-feeding could account for almost two-thirds of estimated reduction in breast cancer incidence (27). In another study, women with deleterious BRCA1 mutations who breast-fed for a cumulative total of more than 1 year had a statistically significantly reduced risk of breast cancer (28).

Risk of Endometrial Cancer and Endometriosis

Breast-feeding is associated with reduced estrogen, a profile that is known to be protective for endometriosis and endometrial cancer. Breast-feeding may help stabilize progress of maternal endometriosis, which may in turn be a risk factor for endometrial carcinoma. In a case-control study in Japanese women with endometrial cancer, compared with parous women who had never breastfed, the multivariate OR for women with a history of breast-feeding was 0.37 (29).

Risk of Osteoporosis

Parous women who had breastfed were only half as likely to have hip fracture compared to parous women who had never breastfed (30).

Risk of type 2 diabetes mellitus

Diet and exercise are widely known to impact the risk of type 2 diabetes, but few people realize that breast-feeding also reduces mothers' risk of developing the disease later in life by decreasing maternal belly fat. A study in 2,233 women, aged 40-78 years, reported that 27% of mothers who did not breastfeed developed type 2 diabetes. They were almost twice as likely to develop the disease as women who had breastfed or never given birth. On the other hand, mothers who breastfed all of their children were no more likely to develop diabetes than women who never gave birth (31).

Risk of Cardiovascular Disease

Among postmenopausal women, increased duration of lactation was associated with a lower prevalence of cardiovascular disease. In a study, involving 139,681 postmenopausal parous women (median age 63 years) it was concluded that a lifetime history of more than 12 months of lactation

were less likely to have hypertension (odds ratio [OR] 0.88, $P < .001$), diabetes (OR 0.80, $P < .001$), hyperlipidemia (OR 0.81, $P < .001$), or cardiovascular disease (OR 0.91, $P = .008$) than women who never breast-fed, but they were not less likely to be obese (32).

Mental Health

Researchers have pointed out that the bond of a nursing mother and child is stronger than any other human contact. Holding the child to her breast provides most mothers with a powerful psychological experience which sets the health and psychological foundation for the mother-infant pair for life.

Since breastfed babies are statistically healthier than their formula fed peers, the parents of breastfed babies spend less time out of work taking care of sick children. A breast-feeding mother gets more sleep, especially if she sleeps with baby, but even if she doesn't, there are no bottles to prepare and warm. Also since the breastfed babies have less gas and allergies, they are likely to sleep longer. Breast-feeding the baby allows the father to get more sleep too, even if he helps with baby burping, diapering, and baby toting, as there are no bottles to deal with. Also, breastfed babies tend to need much less burping after the first few months.

CONCLUSION

Breast-feeding is a '*modifiable risk factor*' for disease in both infant and mother.

REFERENCES

1. Jacobsson LT, Jacobsson ME, Askling J, Knowler WC. Perinatal Characteristics and risk of rheumatoid arthritis. *BMJ* 2003; 326: 1068-1069.
2. Karlson EW, Mandl LA, Hankinson SE, Grodstein F. Do breast-feeding and other reproductive factors influence future risk of rheumatoid arthritis? Results from the Nurses' Health Study. *Arthritis Rheum.* 2004; 50(11):3458-67.
3. Barclay AR, Russell RK, Wilson ML, Gilmour WH, Satsangi J, Wilson DC. Systematic review: the role of breast-feeding in the development of pediatric inflammatory bowel disease. *J Pediatr.* 2009; 155(3):421-6. Epub 2009 May 22.
4. Koletzko S, Griffiths A, Corey M, Smith C, Sherman P. Infant feeding practices and ulcerative colitis in childhood. *BMJ.* 1991; 302(6792): 1580-1.
5. Saarinen UM, Kajosaari M. Breast-feeding as prophylaxis against atopic disease: prospective follow-up study until 17 years of age. *Lancet* 1995; 346: 1065-69.

6. Chandra RK. Food allergy and nutrition in early life: implications for later health. *Proc Nutr Soc.* 2000; 59(2): 273-7.
7. Gdalevich M, Mimouni D, Mimouni M. Breast-feeding and the risk of bronchial asthma in childhood: a systematic review with meta-analysis of prospective studies. *J Pediatr.* 2001;139(2):261-6.
8. Pisacane A, Impagliazzo N, Russo M, Valiani R, Mandarini A, Florio C, Vivo P. Breastfeeding and multiple sclerosis. *BMJ.* 1994; 308(6941):1411-2.
9. Gerstein HC. Cow's milk exposure and type 1 diabetes mellitus. *Diabetes Care.* 1994;17:13-19
10. Young TK, Martens PJ, Taback SP, Sellers EA, Dean HJ, Cheang M, Flett B. Type 2 diabetes mellitus in children: prenatal and early infancy risk factors among native Canadians. *Arch Pediatr Adolesc Med.* 2002;156(7):651-5.
11. Armstrong J, Reilly JJ; Child Health Information Team. Breast-feeding and lowering the risk of childhood obesity. *Lancet.* 2002;359(9322):2003-4.
12. Toschke AM, Vignerova J, Lhotska L, Osancova K, Koletzko B, Von Kries R. Overweight and obesity in 6- to 14-year-old Czech children in 1991: protective effect of breast-feeding. *J Pediatr.* 2002;141(6):764-9.
13. Owen CG, Martin RM, Whincup PH, Davey-Smith G, Gillman MW, Cook DG. The effect of breast-feeding on mean body mass index throughout life: a quantitative review of published and unpublished observational evidence. *Am J Clin Nutr.* 2005;82(6):1298-307.
14. Owen CG, Whincup PH, Kaye SJ, Martin RM, Davey Smith G, Cook DG, Bergstrom E, Black S, Wadsworth ME, Fall CH, Freudenheim JL, Nie J, Huxley RR, Kolacek S, Leeson CP, Pearce MS, Raitakari OT, Lisinen I, Viikari JS, Ravelli AC, Rudnicka AR, Strachan DP, Williams SM. Does initial breast-feeding lead to lower blood cholesterol in adult life? A quantitative review of the evidence. *Am J Clin Nutr.* 2008;88(2):305-14.
15. Harit D, Faridi MM, Aggarwal A, Sharma SB. Lipid profile of term infants on exclusive breast-feeding and mixed feeding: a comparative study. *Eur J Clin Nutr.* 2008;62(2):203-9.
16. Martin RM, Ness AR, Gunnell D, Emmett P, Davey Smith G; ALSPAC Study Team. Does breast-feeding in infancy lower blood pressure in childhood? The Avon Longitudinal Study of Parents and Children (ALSPAC). *Circulation.* 2004;109(10):1259-66.

17. Freudenheim JL, Marshall JR, Graham S, Laughlin R, Vena JE, Bandera E, Muti P, Swanson M, Nemoto T. Exposure to breastmilk in infancy and the risk of breast cancer. *Epidemiology*. 1994;5(3):324-31.
18. Ortega-García JA, Ferrís-Tortajada J, Torres-Cantero AM, Soldin OP, Torres EP, Fuster-Soler JL, Lopez-Ibor B, Madero-López L. Full breast-feeding and paediatric cancer. *J Paediatr Child Health*. 2008;44(1-2):10-3.
19. Shu XO, Linet MS, Steinbuch M, Wen WQ, Buckley JD, Neglia JP, Potter JD, Reaman GH, Robison LL. Breast-feeding and risk of childhood acute leukemia. *J Natl Cancer Inst*. 1999;91(20):1765-72.
20. Mallol-Mesnard N, Menegaux F, Lacour B, Hartmann O, Frappaz D, Doz F, Bertozzi AI, Chastagner P, Hémon D, Clavel J. Birth characteristics and childhood malignant central nervous system tumors: the ESCALE study (French Society for Childhood Cancer). *Cancer Detect Prev*. 2008;32(1):79-86.
21. Martin RM, Gunnell D, Owen CG, Smith GD. Breast-feeding and childhood cancer: A systematic review with metaanalysis. *Int J Cancer*. 2005;117(6):1020-31.
22. Fewtrell MS, Williams JE, Singhal A, Murgatroyd PR, Fuller N, Lucas A. Early diet and peak bone mass: 20 year follow-up of a randomized trial of early diet in infants born preterm. *Bone*. 2009;45(1):142-9.
23. Horwood LJ, Fergusson DM. Breast-feeding and later cognitive and academic outcomes. *Pediatrics*. 1998;101(1):E9.
24. Mortensen EL, Michaelsen KF, Sanders SA, Reinisch JM. The association between duration of breast-feeding and adult intelligence. *JAMA*. 2002;287(18):2365-71.
25. Morensen HJ, Mortensen EL, Reinisch JM, Mednick SA. Breast-feeding and risk of schizophrenia in the Copenhagen Perinatal Cohort. *Acta Psychiatr Scand*. 2005;112(1):26-9.
26. Jordan SJ, Siskind V, C Green A, Whiteman DC, Webb PM. Breast-feeding and risk of epithelial ovarian cancer. *Cancer Causes Control*. 2010;21(1):109-16.
27. Collaborative Group on Hormonal Factors in Breast Cancer. Breast cancer and breast-feeding: collaborative reanalysis of individual data from 47 epidemiological studies in 30 countries, including 50302 women with breast cancer and 96973 women without the disease. *Lancet*. 2002 Jul 20;360(9328):187-95.
28. Jernström H, Lubinski J, Lynch HT, Ghadirian P, Neuhausen S, Isaacs C, Weber BL, Horsman D, Rosen B, Foulkes WD, Friedman E, Gershoni-Baruch R, Ainsworth P, Daly M, Garber J, Olsson H,

-
- Sun P, Narod SA. Breast-feeding and the risk of breast cancer in BRCA1 and BRCA2 mutation carriers. *J Natl Cancer Inst.* 2004;96(14):1094-8.
29. Okamura C, Tsubono Y, Ito K, Niikura H, Takano T, Nagase S, Yoshinaga K, Terada Y, Murakami T, Sato S, Aoki D, Jobo T, Okamura K, Yaegashi N. Lactation and risk of endometrial cancer in Japan: a case-control study. *Tohoku J Exp Med.* 2006;208(2):109-15.
30. Cumming RG, Klineberg RJ. Breast-feeding and other reproductive factors and the risk of hip fractures in elderly women. *Int J Epidemiol.* 1993;22(4):684-91.
31. Schwarz EB, Brown JS, Creasman JM, Stuebe A, McClure CK, Van Den Eeden SK, Thom D. Lactation and maternal risk of type 2 diabetes: a population-based study. *Am J Med.* 2010;123(9):863.e1-6.
32. Schwarz EB, Ray RM, Stuebe AM, Allison MA, Ness RB, Freiberg MS, Cauley JA. Duration of lactation and risk factors for maternal cardiovascular disease. *Obstet Gynecol.* 2009;113(5):974-82.

NUTRITIVE VALUES OF COMMONLY USED FOOD

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The dietary allowances for Indians were first recommended in 1944 by the Nutrition Advisory Group. These recommendations were revised in respect of energy and protein in 1958. In 1968 and 1978, a set of recommendations were made for all the nutrients, except calories. An Expert Group constituted by the ICMR met again in April 1988 to consider the revision of nutrient allowances for Indians. The committee revised the earlier recommendations wherever new data were available. The revised recommendations include energy, fat, vitamin A. The latest recommendations are given in Appendix.

Average intake of nutrients by rural and urban groups (g/CU/day)			
Foodstuff	Rural (1981)	Urban MIG*	(1984) Slum
Cereals & Millets	553	361	416
Pulses	35	49	33
Leafy vegetables	14	21	11
Other vegetables	51	89	40
Fruits	35	66	26
Milk	70	250	42
Fish & flesh foods	10	22	19
Fats & Oils	9	35	13
Sugar/ Jaggery	19	31	20

Nutrient content of rural and urban diets			
	Rural (1981)	Urban MIG*	(1984) Slum
Protein (g)	64	63	53
Calories (Kcal)	2409	2364	2008
Calcium (mg)	471	821	492
Iron (mg)	32	27	25
Vitamin A (µg)	373	555	248
Thiamine (mg)	1.51	1.37	1.27
Riboflavin (mg)	0.90	1.17	0.81
Niacin (mg)	17	15	15
Vitamin C (mg)	42	70	40

COMMONLY USED INDIAN FOODS.
(All values per 100 gms of edible portion)

Name of Indian Foods stuff	Minerals gm	Crude Fiber gm	Vit C mg	Folic Acid µg	Thia-mine mg	Ribo-flavin mg	Niacin mg
1 CAREALS, GRAINS AND PRODUCTS							
Rice	0.9	0.6	0	11.0	0.21	0.5	3.8
Wheat	1.5	1.2	0	36.6	0.45	0.17	5.5
Bajra	2.3	1.2	0	45.5	0.33	0.25	2.3
Jowar	1.6	1.6	0	20.0	0.37	0.13	3.1
Ragi	2.7	3.6	0	18.3	0.42	0.19	1.1
Maize	1.5	2.7	0	20.0	0.42	0.10	1.8
2 PULSES AND LEGUMES							
Bangal Gram, whole	3.0	3.9	3	186	0.3	0.15	2.9
Black Gram, dhal	3.2	0.9	1	147.5	0.48	0.18	2.4
Green Gram, whole	3.5	4.1	0	-	0.47	0.27	2.1
Lentil	2.1	0.7	0	36	0.45	0.2	2.6
Red Gram, dhal	3.5	1.5	0	103	0.45	0.19	2.9
Soyabean	4.6	3.7	-	100	0.73	0.39	3.2
3 LEAFY VEGETABLES							
Amaranth (Stem)	1.8	1.2	10	-	0.01	0.18	0
Cabbage	0.6	1.0	124	23.0	0.06	0.09	0.4
Colocasia Green	2.2	2.9	12	-	0.22	0.26	1.1
Coriander Leaves	2.3	1.2	135	-	0.05	0.6	0.8
Curry Leaves	4.0	6.4	4	93.9	0.08	0.21	2.3
Drumstick Leaves	2.3	0.9	220	-	0.06	0.05	0.8
Fenugreek Leaves	1.5	1.1	52	-	0.04	0.31	0.8
Mint	1.9	2.0	27	114	0.05	0.26	1.0
Spinach	1.7	0.6	28	123	0.03	0.26	0.5
Carrot	1.1	1.2	3	15.0	0.04	0.02	0.6
Radish pink	0.9	0.6	17	-	0.06	0.02	0.4
Potato	0.6	0.4	17	7.0	0.1	0.01	1.2
Beetroot	0.8	0.9	10	-	0.04	0.09	0.4
Brinjal	0.3	1.3	12	34	0.04	0.11	0.9
Cauliflower	1.0	1.2	56	-	0.04	0.1	1.0
Cucumber	0.3	0.4	7	14.7	0.03	0	0.2
Ladies finger	0.7	1.2	13	105.1	0.07	0.10	0.06
Mango, raw	0.4	1.2	1	-	0.01	0.03	0
Onion	0.8	1.6	11	6	0.08	0.01	0.4

	Peas, Green			9 -	0.25	0.1	0.8
	Tomato			27 30	0.12	0.06	0.4
4	FRUITS						
	Papaya	0.5	0.8	57 -	0.04	0.25	0.2
	Amla	0.5	3.4	600 -	0.03	0.01	0.2
	Apple	0.3	1.0	1 -	-	-	0
	Banana	0.8	0.4	7 -	0.05	0.08	0.5
	Dates Dry	2.1	3.9	3 -	0.01	0.02	0.9
	Figs	0.6	2.2	5 -	0.06	0.05	0.6
	Grapes Green	0.6	2.9	1 -	-	-	0
	Guava	0.7	5.2	212 -	0.03	0.03	0.4
	Jackfruit	0.9	1.1	7 -	0.03	0.13	0.4
	Mango	0.4	0.7	16 -	0.08	0.09	0.9
	Musk Melon	0.4	0.4	26 -	0.11	0.08	0.3
	Water Melon	0.3	0.2	1 -	0.02	0.04	0.1
	Orange	0.3	0.3	30 -	-	-	-
	Peach	0.8	1.2	6 -	0.02	0.03	0.5
	Pear	0.3	1.0	0 -	0.06	0.03	0.2
	Pineapple	0.4	0.5	39 -	0.2	0.1	0.1
	Plum	0.4	0.4	5 -	0.4	0.1	0.3
	Pomegranate	0.7	5.1	16 -	0.06	0.1	0.3
	Strawberry	0.4	1.1	52 -	0.03	0.02	0.2
5	NUTS & OILSEEDS						
	Coconut Fresh	1.6	6.6	1 12.5	0.05	0.1	0.8
	Ground nut	2.4	3.1	0 20	0.9	0.13	19.9
	Mustard	4.2	1.8	0 -	0.65	0.26	4.0

Sl No.	Name of Indian Foods stuff	Calories Kcal	Protein gm	Fat gm	Carbo-hydrates gm	Iron mg	Calcium mg	Phos-phorus mg
1 CAREALS, GRAINS AND PRODUCTS								
	Rice	346	6.8	0.5	78.2	0.7	10	160
	Wheat	346	11.8	1.5	71.2	5.3	41	306
	Bajra	361	11.6	5.0	67.5	8.0	42	296
	Jowar	349	10.4	1.9	72.6	4.1	25	222
	Ragi	328	7.3	1.3	72.0	3.9	344	283
	Maize	342	11.1	3.6	66.2	2.3	10	348
2 PULSES AND LEGUMES								
	Bangal Gram, whole	360	17.1	5.3	60.9	4.6	202	312
	Black Gram, dhal	347	24.0	1.4	59.6	3.8	154	385
	Green Gram, whole	334	24.0	1.3	56.7	4.4	124	326
	Lentil	343	25.1	0.7	59.0	7.5	69	293
	Red Gram, dhal	335	20.3	1.7	57.6	2.7	73	304
	Soyabean	432	43.2	19.5	20.9	10.4	240	690
3 LEAFY VEGETABLES & ROOTS								
	Amaranth (Stem)	19	0.9	0.1	3.5	1.8	260	30
	Cabbage	27	1.8	0.1	4.6	0.8	39	44
	Colocasia Green	56	3.9	1.5	6.8	10	227	82
	Coriander Leaves	44	3.3	0.6	6.3	1.42	184	71
	Curry Leaves	108	6.1	1.0	18.7	0.93	830	57
	Drumstick Leaves	92	6.7	1.7	12.5	0.85	440	70
	Fenugreek Leaves	49	4.4	0.9	6.0	1.93	395	51
	Mint	48	4.8	0.6	5.8	15.6	200	62
	Spinach	26	2.0	0.7	2.9	1.1	73	21
	Carrot	48	0.9	0.2	10.6	1.03	80	530
	Radish pink	32	0.6	0.3	6.8	0.37	50	20

SI No.	Name of Indian Foods stuff	Calories Kcal	Protein gm	Fat gm	Carbo-hydrates gm	Iron mg	Calcium mg	Phos-phorus mg
	Potato	97	1.6	0.1	22.6	0.48	10	40
	Beetroot	43	1.7	0.1	8.8	1.19	18.3	55
	Brinjal	24	1.4	0.3	4.0	0.38	18	47
	Cauliflower	30	2.6	0.4	4.0	1.23	33	57
	Cucumber	13	0.4	0.1	2.5	0.6	10	25
	Ladies finger	35	1.9	0.2	6.4	0.35	66	56
	Mango,raw	44	0.7	0.1	10.1	0.3	10	19
	Onion	41	0.9	0.2	8.9	7.4	50	50
4	FRUITS							
	Papaya	32	0.6	0.1	7.2	0.5	17	13
	Amla	58	0.5	0.1	13.7	1.2	50	20
	Apple	59	0.2	0.5	13.4	0.66	10	14
	Banana	116	1.2	0.3	27.2	0.36	17	36
	Dates Dry	317	2.5	0.4	75.8	7.3	120	50
	Figs	37	1.3	0.2	7.6	1.0	80	30
	Grapes Green	71	0.5	0.3	16.5	0.5	20	30
	Guava	51	0.9	0.3	11.2	0.27	10	28
	Jackfruit	88	1.9	0.1	19.8	0.56	20	41
	Mango	74	0.6	0.4	16.9	1.3	14	16
	Musk Melon	17	0.3	0.2	3.5	1.4	32	14
	Water Melon	16	0.2	0.2	3.3	7.9	11	12
	Orange	48	0.2	0.3	10.9	0.3	26	20
	Peach	50	1.2	0.3	10.5	2.4	15	41
	Pear	52	0.6	0.2	11.9	0.5	8	15
	Pineapple	46	0.4	0.1	10.8	2.4	20	9
	Plum	52	0.5	0.4	11.2	0.6	10	12
	Pomegranate	65	1.6	0.1	14.5	1.79	10	70
	Strawberry	44	0.7	0.2	9.8	1.8	30	30
5	NUTS & OILSEEDS							
	Coconut Fresh	662	6.8	62.3	18.4	7.8	400	210
	Ground nut	564	25.3	40.1	26.1	2.5	90	350
	Mustard	541	20.0	39.7	23.8	7.9	490	700

Commonly used Food	Portion gm	Calories Kcal	Carbo-hydrates gm	Protein gm	Total Fat gm
Aloo Baigan Mixed Vegetable	100	103	32.3	1.3	4.7
Aloo Beans Mixed Vegetable	100	134	34.3	2.4	8.7
Alloo Curry	100	105	14.4	1.2	5.0
Baigan Ka Bharta	100	70	5.7	1.2	4.7
Bhindi	100	161	12.1	3.9	10.7
Cabbage	100	131	7.0	2.3	5.0
Chole	100	74	3.3	4.3	4.1
Curry, Cuddy	100	100	15.0	2.9	5.1
Gatte ke Subji	148	275	-	-	-
Methi Aloo	100	121	16.0	2.2	5.4
Mutter Paneer	100	147	10.7	8.5	8.1
Kaddu	100	67	6.7	1.6	3.8
Rajmah	100	102	10.7	4.7	3.4
Shahi Paneer	95	283	-	-	-
Shimla Mirch Aloo	100	93	12.8	1.5	3.4
Stuffed Tamato	100	85	11.0	2.1	3.4
Torai	100	65	4.0	1.2	4.7
Vegetable Jalfarani	98	159	-	-	-
Vegetable Kofta Curry	100	147	13.3	2.6	9.1
Vegetable Korma	100	88	8.7	1.4	5.3
Arhar Dal	100	53	8.0	2.8	1.2
Chana Dal	100	99	12.8	4.5	3.2
Dal Makhani	100	117	14.0	6.8	1.3
Maa ki Dal	146	92	-	-	-
Moong Dal	100	211	31.3	12.8	3.7
Masoor Dal	100	165	24.7	10.3	2.7
Urad Dal	100	107	14.0	6.0	3.0
Sambhar	100	5.0	2.6	15.0	1.8
Dal Dhokli	105	238	-	-	-
Boiled Rice	100	111	25.0	2.2	0.2
Pulao	100	119	19.0	3.2	3.4
Khichari	100	215	33.0	4.3	7.4
Milk (Buffalo)	100	117	5.0	4.3	6.5
Milk (cow)	100	67	4.4	3.2	4.1
Curd (Cow's Milk)	100	60	3.0	3.1	4.0
Butter Milk	100	15	0.5	0.8	1.1

Commonly used Food	Portion gm	Calories Kcal	Carbo-hydrates gm	Protein gm	Total Fat gm
Skimmed Milk	100	29	4.6	2.5	0.1
Paneer (Cow's Milk)	100	265	1.2	18.3	20.8
Paneer (Buffalo's Milk)	100	292	7.9	13.4	23.0
Khoa (Whole Milk)	100	421	20.5	20.0	25.9
Khoa (Skimmed Milk)	100	206	25.7	22.3	1.6
Cheese	100	348	6.3	24.1	25.1
Lassi	100	69	3.2	5.7	0.5
Samosa	1 no.	369	48.1	6.3	17.6
Besan Laddu	40	315	-	-	-
Carrot Halwa	135	460	-	-	-
Coconut Barfi	30	157	-	-	-
Kaju rolls	14	83	-	-	-
Kheer Rice	150	345	-	-	-
Kulfi Malai	75	210	-	-	-
Kulfi Mango	70	147	-	-	-
Malpua	40	342	-	-	-
Naan Katai	45	150	-	-	-
Rasgulla	40	194	-	-	-
Sandesh	7	30	-	-	-
Shikhand	105	465	-	-	-
Til Laddu	20	55	-	-	-
Boondi Raita	145	169	-	-	-
Coriander Chutney	25	72	-	-	-
Coconut Chutney	20	83	-	-	-
Dosa	1 no.	145	21.5	2.8	5.2
Idli	1 no.	69	15	1.2	0.2
Pakoda Onion	58	315	-	-	-
Pakoda Paneer	125	376	-	-	-
Potato Tikki	1 no.	60	3.4	0.2	5
Rava Dosa with Chutney	1 no.	97	-	-	-
Fish (Cora)	100	83	0.2	18.8	0.8
Mutton	100	194	-	18.5	13.3
Beef Meal	100	410	0.2	79.2	10.3
Egg Hen	100	173	-	13.3	13.3
Jaggery	100	383	95	0.4	0.1

FOODS RICH IN IRON (mg/100 gm edible portion)			
Vegetables	 Cereals	
Cauliflower leaves	40	Ragi	3.9
Chaulai	22.9	Maize flour	2.3
Muli leaves	18	Barley	1.67
Suva ni bhaji	17.4	Rawa	1.6
Phudina	15.6	Dry fruits	
Arvi pan green	10	Black til	56.7
Carrot laeves	8.8	Til	9.3
Green onion	7.43	Coconut-dry	7.8
Cothmir	1.42	Kaju	5.81
Palak	1.14	Badam	5.09
Arvi pan black	0.98	Walnut	2.64
Sargava pan	0.85	Singdana	2.5
Milk & its products		Pulses	
Mava-khoa	5.8	Soyabean	10.4
Cheese	2.1	Moth	9.5
Sugars		Chauli	8.6
Gud	2.64	Lentil-massor	7.86
Sago	1.3	Mutter-dry	7.05
Meat		Channa dal	5.3
Liver-sheep	6.3	Rajmah	5.1
Egg-hen	2.1	Mung	4.4
Cereals		Mung dal	3.9
Rice flakes-poha	20	Uddad dal	3.8
Bajra	8	Tuvar dal	2.7
Rice puffed-mamra	6.6		
Wheat flour	4.9	Poppy seeds	15.9
Jowar	4.1		
Vermiceli-sev (wheat sev)	2		

FOODS RICH IN CALCIUM (mg/100 gm edible portion)		FOODS RICH IN ZINC (mg/100 gm edible portion)	
<i>Milk products and dry fruits</i>		Gingelly seeds	12.2
Til	1450	Bengal gram-desi	6.1
Cheese	790	Cashew nut	5.99
Khoa	650	Safflower seeds	5.2
Coconutdry	400	Mustard seed	4.8
Black til	300	Cow pea	4.6
Badam	230	Omum	4.52
Milk bufflo	210	Rajmah	4.5
Curd	149	Soyabean black	4.4
Pista	140	Poppy seeds	4.34
Milk cow	120	Ground nut	3.9
Watermelon seed	100	Samai almond	3.7
Walnut	100	Betal leaves	3.44
<i>Cereal, pulses</i>		Soyabean white	3.4
Ragi	344	Black gram-whole	3.3
Rajmah	260	Coriander seeds	3.26
Soyabean	240	Bajara	3.1
Moth	202	Lentil dhal	3.1
Channa	202	Red gram whole	3.1
Uddad dal	154	Fenugeek seeds	3.08
Mung	124	Black gram-dhal	3
Tuvar dal	73	Green gram whole	3
Channa dal	56	Sanwa millet	3
Cashew nut	50	Bengal gram-kabuli	2.9
Poppy seeds	1584	Cardomom	2.81
Almond	230	Maize dry	2.8

REFERENCES

1. Nutritive Value of Indian Foods, 2009 by G. Gopalan, B.V. Rama Sastri & S.C. Balasubramanian, Reprinted 2009
2. www.fatfreekitchen.com/nutrition/indian-foods.html

Section VIII

GUIDELINES

INDIAN ACADEMY OF PEDIATRICS

NATIONAL GUIDELINES ON INFANT AND YOUNG CHILD FEEDING 2010

Objectives of National guidelines on infant and young child feeding

To formulate, endorse, adopt and disseminate guidelines related to Infant and Young Child Feeding from an Indian perspective (including infant feeding in the context of HIV infection).

APPROPRIATE & OPTIMAL INFANT & YOUNG CHILD FEEDING PRACTICES

A. TECHNICAL GUIDELINES

1. Breastfeeding.
2. Complementary feeding
3. Feeding in the context of HIV infection.
4. Feeding in other specific situations.

B. OPERATIONAL GUIDELINES

1. Recommendations for Governmental and International Agencies.
2. Role of NGOs.
3. Recommendations for the media.
4. Training recommendations.

A. TECHNICAL GUIDELINES

1. Breastfeeding

- a) Breastfeeding should be promoted to mothers and other caregivers as the gold standard feeding option for babies.

- b)** Pre-birth counseling individually or in groups organized by maternity facility regarding advantages of breastfeeding and dangers of artificial feeding should prepare expectant mothers for successful breastfeeding.
- c)** Breastfeeding must be initiated as early as possible after birth for all normal newborns (including those born by caesarean section) avoiding delay beyond an hour. In case of operative birth, the mother may need motivation and support to initiate breastfeeding within the first hour. Skin to skin contact between the mother and new born should be encouraged by ‘bedding in the mother and baby pair’. The method of “Breast Crawl” can be adopted for early initiation (3). Mother should communicate, look into the eyes, touch and caress the baby while feeding. The new born should be kept warm by promoting Kangaroo Mother Care and promoting local practices to keep the room warm (4).
- d)** Colostrum must not be discarded but should be fed to newborn as it contains high concentration of protective immuno-globulins and cells. No pre-lacteal fluid should be given to the newborn.
- e)** Baby should be fed “on cues”- The early feeding cues includes; sucking movements and sucking sounds, hand to mouth movements, rapid eye movements, soft cooing or sighing sounds, lip smacking, restlessness etc. Crying is a late cue and may interfere with successful feeding. Periodic feeding is practiced in certain situations like in the case of a very small infant who is likely to become hypoglycemic unless fed regularly, or an infant who ‘does not demand’ milk in initial few days. Periodic feeding should be practiced only on medical advice.
- f)** Every mother, specially the first time mother should receive breastfeeding support from the doctors and the nursing staff, or community health workers (in case of non institutional birth) with regards to correct positioning, latching and treatment of problems, such as breast engorgement, nipple fissures and delayed ‘coming-in’ of milk.
- g)** Exclusive breastfeeding should be practiced from birth till six months. This means that no other food or fluids should be given to the infant below six months of age unless medically indicated. After completion of six months of age, with introduction of optimal complementary feeding, breastfeeding should be continued for a minimum for 2 yrs and beyond depending on the choice of mother and the baby. Even during the second year of life, the frequency of breastfeeding should be 4-6 times in 24 hours, including night feeds.
- h)** Mothers need skilled help and confidence building during all health contacts and also at home through home visits by trained community worker, especially after the baby is 3 to 4 months old when a mother may begin to doubt her ability to fulfil the growing needs and demands of the baby.

- i) Mothers who work outside should be assisted with obtaining adequate maternity/breastfeeding leave from their employers, should be encouraged to continue exclusive breastfeeding for 6 months by expressing milk for feeding the baby while they are out at work, and initiating the infant on timely complementary foods. They may be encouraged to carry the baby to a work place crèche wherever such facility exists. The concept of “Hirkani’s rooms” may be considered at work places (Hirkani’s rooms are specially allocated room at the workplace where working mothers can express milk and store in a refrigerator during their work schedule). Every such mother leaving the maternity facility should be taught manual expression of her breast milk.
- j) Mothers who are unwell or on medication should be encouraged to continue breastfeeding unless it is medically indicated to discontinue breastfeeding.
- k) At every health visit, the harms of artificial feeding and bottle feeding should be explained to the mother. Inadvertent advertizing of infant milk substitute in health facility should be avoided. Artificial feeding is to be practiced only when medically indicated.
- l) Health and Nutrition (ICDS) workers should be trained in various skills of counseling and especially in handling sensitive subjects like breastfeeding and complementary feeding.
- m) If the breastfeeding was temporarily discontinued due to an inadvertent situation, “re-lactation” should be tried as soon as possible. Such cases should be referred to a trained lactation consultant / health worker. The possibility of “induced lactation” shall be explored according to the situation.
- n) All efforts should be taken to remove hurdles impeding breastfeeding in public places.
- o) Adoption of latest WHO Growth Charts is recommended for monitoring growth (5).

2. Complementary Feeding (6)

- a) Appropriately thick homogenous complementary foods made from locally available foods should be **introduced at six completed months** to all babies **while continuing breastfeeding *ad libitum*** (7,8,9). This should be the standard and universal practice. During this period breastfeeding should be actively supported and the term “Weaning” should be avoided (10).
- b) To address the issue of a small stomach size which can accommodate limited quantity at a time, each meal must be made **energy dense** by adding sugar/jaggery and ghee/butter/oil. To provide more calories from smaller volumes, food must be thick in consistency - thick enough to stay on the spoon without running off, when the spoon is tilted (11). (Photograph/image in figure 1).

- c) Foods can be **enriched by making a fermented** porridge, use of **germinated or sprouted flour** and toasting of grains before grinding (10, 12).
- d) Adequate total energy intake can also be ensured by addition of one to two nutritious snacks between the three main meals. **Snacks are in addition to the meals and should not replace meals.** They should not to be confused with foods such as sweets, chips or other processed foods (12).
- e) Parents must identify the staple **homemade food comprising of cereal-pulse mixture** (as these are fresh, clean and cheap) and make them caloric and nutrient rich with locally available products.
- f) The research has time and again proved the disadvantages of bottle feeding. Hence **bottle feeding shall be discouraged** at all levels.
- g) Population-specific dietary guidelines should be developed for complementary feeding based on the food composition of locally available foods. A list of **appropriate, acceptable and avoidable** foods can be prepared.
- h) Iron-fortified foods, iodized salt, vitamin A enriched food etc. are to be encouraged.
- i) The food should be a **“balanced food”** consisting of various (as diverse as possible) food groups / components in different combinations. As the babies show interest in complementary feeds, the variety should be increased by adding new foods in the staple food one by one. Easily available, cost-effective seasonal uncooked fruits, green and other dark colored vegetables, milk and milk products, pulses / legumes, animal foods, oil / butter, sugar / jaggery may be added in the staples gradually (10,11).
- j) **Avoid Junk and Commercial food.** Avoid giving ready-made, processed food from the market, e.g. tinned foods/juices, cold-drinks, chocolates, crisps, health drinks, bakery products etc
- k) Avoid giving drinks with low nutrient value, such as tea, coffee and sugary drinks.
- l) **Hygienic practices** are essential for food safety during all the involved steps viz. preparation, storage and feeding. Freshly cooked food should be consumed within one to two hours in hot climate unless refrigerated. **Hand washing** with soap and water at critical times- including before eating or preparing food and after using the toilet (7,11,12).
- m) **Practice responsive feeding.** Young children should be encouraged to take feed by praising them and their foods. Self feeding should be encouraged despite spillage. Each child should be fed under supervision in a separate plate to develop an individual identity. Forced feeding, threatening and punishment interfere with development of good / proper feeding habits (11). Along with feeding mother and care givers should **provide psycho-**

social stimulation to the child through ordinary age-appropriate play and communication activities to **ensure early childhood development**.

- n) A skilled help and confidence building is also required for complementary feeding during all health contacts and also at home through home visits by community health workers.
- o) Consistency of foods should be appropriate to the developmental readiness of the child in munching, chewing and swallowing. Avoid foods which can pose choking hazard. Introduce lumpy or granular foods and most tastes by about 9 to 10 months. Missing this age may lead to feeding fussiness later. So do not use mixers/grinders to make food semisolid/pasty. The details of food including; texture, frequency and average amount are enumerated in Table 1.

Table 1: AMOUNTS OF FOODS TO OFFER (12,13)			
Age	Texture	Frequency	Avg. Amt each meal
6-8 mo	Start with thick porridge, well mashed foods	2-3 meals per day plus frequent BF	Start with 2-3 tablespoonfuls
9-11 mo	Finely chopped or mashed foods, and foods that baby can pick up	3-4 meals plus BF. Depending on appetite offer 1-2 snacks	½ of a 250 ml cup/bowl
12-23 mo	Family foods, chopped or mashed if necessary	3-4 meals plus BF. Depending on appetite offer 1-2 snacks	¾ to one 250 ml cup/bowl
If baby is not breastfed, give in addition: 1-2 cups of milk per day, and 1-2 extra meals per day.			
The amounts of food included in the table are recommended when the energy density of the meals is about 0.8 to 1.0 Kcal/g. If the energy density of the meals is about 0.6 Kcal/g, recommend to increase the energy density of the meal (adding special foods) or increase the amount of food per meal. Find out what the energy content of complementary foods is in your setting and adapt the table accordingly			

3. HIV and Infant Feeding

- a) As regards infant feeding the earlier 2006 guidelines suggested that health workers should individually counsel all HIV positive mothers and help them each determine the most appropriate infant feeding strategy for their circumstances (14). However, the current 2009 recommendations state that national health authorities should promote a single infant feeding practice as the standard of care (15). Hence based on various considerations like international recommendations, socioeconomic and cultural contexts of the country's population, the availability and quality of health services, the local epidemiology including HIV prevalence among pregnant women and main causes of infant mortality and under-

nutrition, the National health authorities should decide upon the strategy that will most likely give infants the greatest chance of remaining HIV uninfected and alive. They will have to decide whether they will recommend that all HIV infected mothers *will breastfeed and receive ARV interventions OR will avoid all breastfeeding*. Currently WHO is developing guidance to assist countries in this decision-making process and will lay out steps to reach these standards of care. Whichever option is chosen, **mothers should be helped and empowered to sustain that option.**

- b) Current WHO recommendations advocate that all mothers known to be HIV-infected should be provided with **antiretroviral therapy or antiretroviral prophylaxis** to reduce mother to child transmission and in particular to reduce postnatal transmission through breastfeeding. Details about these interventions can be seen in the document- *Revised WHO recommendations on the use of antiretroviral drugs for treating pregnant women and preventing HIV infection in infants 2009*. available at <http://www.who.int/hiv/topics/mtct/>
- c) Pregnant women and mothers known to be HIV infected should be informed of the infant feeding strategy recommended by the national authority to improve HIV free survival of HIV exposed infants and informed that there are alternatives that mothers might wish to adopt.
- d) Hence, **Mothers who are known to be HIV negative OR whose HIV status is unknown OR infants of HIV positive mothers known to be HIV-infected** should exclusively breastfeed their infants for the first six months of life and then introduce complementary foods while continuing breastfeeding for 24 months or beyond.
- e) **HIV-infected mothers on antiretroviral therapy or prophylaxis (whose infants are HIV uninfected or of unknown HIV status)** should exclusively breastfeed their infants for the first 6 months of life, introducing appropriate complementary foods thereafter, and continue breastfeeding for the first 12 months of life. Breastfeeding should then only stop once a nutritionally adequate and safe diet without breast milk can be provided. As per the new guidelines, baby should receive daily Nevirapine from birth until one week after all exposure to breast milk has ended if the mother received only Zidovudine prophylaxis and Nevirapine from birth to 6 weeks if mother has received triple ARV prophylaxis (16).
- f) If a HIV positive mother chooses not to breast feed in spite of receiving ARV prophylaxis, Zidovudine or Nevirapine is indicated for 6 weeks for the baby from birth. Replacement feeding as mentioned below is advocated in this situation.
- g) Whenever HIV-infected mothers decide to stop breastfeeding, it should be done gradually within one month. Mothers or infants who have been receiving ARV prophylaxis should continue prophylaxis for one week after breastfeeding is fully stopped.

- h) Infants born to HIV infected women receiving ART for their own health should receive daily Nevirapine from birth till 6 weeks of age and for those being breastfed daily, Zidovudine or Nevirapine from birth until 6 weeks of age is recommended.

Alternatives to breastfeeding include:

For infants less than 6 months of age:

- i. Expressed, heat-treated breast milk
- ii. Unmodified animal milk
- iii. Commercial infant formula milk.

(The choice / selection shall be based on AFASS criteria)

For children over 6 months of age:

- iv. All children can be given complementary foods from six months of age (as discussed in the section on complimentary feeding). Meals including; foods, combination of milk (based / containing) feeds (especially in those who consume strict vegetarian diet) and other foods, should be provided.

Other options for all ages:

- v. Breastfeeding by another woman who is HIV negative (**wet-nursing**)
- vi. Human milk from **breast milk banks**

Replacement feeding (RF) is the process of feeding a child who is not receiving any breast milk, with a diet that provides all the nutrients until the child is fully fed on family foods. The replacement feeding option should be selected, only if all of the **AFASS criteria** are completely fulfilled (AFASS refers to Acceptability, Feasibility, Affordability, Safety and Sustainability) (14). Cup feeding should be the method of choice if replacement feeding needs to be done and bottles should be totally avoided. If any of the AFASS criteria is not met, the mother should practice exclusive breastfeeding till 6 months along with early treatment of breast and nipple problems of HIV+ve mother.

Mixed feeding must be avoided (except the short transition period of around a month when breastfeeding is being gradually stopped) as it causes a two fold increase in the risk of postnatal HIV transmission. Local breast conditions like nipple fissures can increase the risk of HIV transmission and hence should promptly be treated.

Mothers known to be HIV infected may consider expressing and heat-treating breast milk as *an interim feeding strategy* in special circumstances such as:

When the infant is born with low birth weight or is otherwise ill in the neonatal period and unable to breastfeed; **or**

When the mother is unwell and temporarily unable to breastfeed or has a tempo-rary breast health problem such as mastitis; **or**

If antiretroviral drugs are temporarily not available.

4. Feeding in other specific situations

- a) **Feeding during sickness** is important for recovery and for prevention of under nutrition. Even sick babies mostly continue to breastfeed and the infant can be encouraged to eat small quantities of nutrient rich food but more frequently and by offering foods that the child likes to eat. After the illness the nutrient intake of child can be easily increased by increasing one or two meals in the daily diet for a period of about a month; by offering nutritious snacks between meals; by giving extra amount at each meal; and by continuing breastfeeding.

b) Infant feeding in maternal illnesses:

1. Painful and / or infective breast conditions like breast abscess and mastitis and psychiatric illnesses which pose a danger to the child's life e.g. postpartum psychosis, schizophrenia may need a temporary cessation of breastfeeding. Treatment of primary condition should be done and breastfeeding started as soon as possible.
2. Chronic infections like tuberculosis, leprosy, or medical conditions like hypothyroidism need treatment of the primary condition and don't warrant discontinuation of breastfeeding.
3. Breastfeeding is contraindicated when the mother is receiving certain drugs like anti-neoplastic agents, immuno-suppressants, antithyroid drugs like thiouracil, amphetamines, gold salts, etc. Breastfeeding may be avoided or continued with caution when the mother is receiving following drugs - atropine, reserpine, psychotropic drugs. Other drugs like antibiotics, anesthetics, antiepileptics, antihistamines, digoxin, diuretics, prednisone, propranolol etc. are considered safe for breastfeeding (17).

c. Infant feeding in various conditions related to the infant:

- a) Breastfeeding on demand should be promoted in normal active babies. However, in difficult situations like very LBW, sick, or depressed babies, alternative methods of feeding can be used based on neuro-developmental status. These include feeding expressed breastmilk through intra-gastric tube or with the use of cup and spoon. For very sick babies, expert guidance should be sought.

- b) **Gastro-Esophageal Reflux Disease (GERD):** Mild GERD is often treated conservatively through thickening the complementary foods, frequent small feeds and upright positioning for 30 minutes after feeds.
- c) **Primary Lactose Intolerance** is congenital and may require long term lactose restriction. **Secondary Lactose Intolerance** is usually transient and resolves after the underlying GIT condition has remitted. Most of the cases of diarrhea do not require stoppage of breastfeeding.
- d) Various **Inborn Errors of Metabolism** warrant restriction of specific offending agent and certain dietary modifications e.g. in Galactosemia, dietary lactose and galactose should be avoided. This is probably the only absolute contraindication to breastfeeding.
- e) **During emergencies**, priority health and nutrition support should be arranged for pregnant and lactating mothers. Donated or subsidized supplies of breastmilk substitutes (e.g. infant formula) should be avoided, must never be included in a general ration distribution, and must be distributed, if at all, only according to well defined strict criteria. Donations of bottles and teats should be refused, and their use actively avoided.

B. OPERATIONAL GUIDELINES

1. Recommendations for Governmental and International Agencies.

- a) Global legislation, binding to all states and private organizations including labor benefits, **6 (Six) months maternity and appropriate paternity leave** is strongly recommended.
- b) Scientific and unbiased IYCF practices must be promoted through **regular advertisements** in state, public or private owned audiovisual and print media. Public should be made aware that **artificial, junk or packaged food can be injurious to the health** of the children.
- c) Necessary and adequate arrangements should be made for **propaganda and implementation** of the provisions of Infant Milk Substitute (**IMS**) Act which prevents advertising or promoting infant milk substitutes. In addition, further strengthening of the existing Act must be tried.

National Guidelines on Infant and Young Child Feeding 2010 & Indian Scenario

- d) Adopt a National policy to avoid conflict of interests in the areas of child health and nutrition. Popularization of “**unscientific health claims**” by commercial ads through media needs to be restricted.
- e) Government should explore the possibility of appointing or making **Lactation counselor** available at least at Block level.
- f) Government along with International agencies should formulate **National policy on Fortification** of food with micronutrients.
- g) The experts, academicians and government shall formulate / develop guidelines for **management of Severe Acute Malnutrition** (including effective home based care and treatment) in children.

2. Role of NGOs

- a) Various programs or community projects should be initiated to provide home care and counseling on IYCF through formation of **mother support groups** especially by women’s organizations.
- b) The voluntary organizations should understand and advocate important recommendations at all levels. Various **like-minded organizations** should work preferably on the same platform and co-ordinate with each-other in promoting the IYCF practices.

3. Recommendations for Media

- a) Media has to take concrete steps to **avoid directly or indirectly glamorizing/promoting** bottle feeding, artificial, commercial and ready to use food. Instead, the risks involved in artificial feeding and other suboptimal feeding practices should be advertised **prominently in bold prints**.
- b) **Media support** is even more important on certain occasions, celebrations, and social mobilization activities such as World Breastfeeding Week and Nutrition Weeks.

4. Recommendations for training

It is recommended that all the community health workers, PPTCT counselors, and other personnel caring for children including doctors should undergo three days skill training on IYCF (including IMS Act). IYCF should also be **included in the curriculum of** undergraduate and postgraduate medical education, nursing education, home science, child

nutrition courses etc. Anganwadi workers, ASHA, Dai's and other grass root level workers should be empowered by basic, scientific information related to IYCF.

Baby Friendly Concepts

Baby Friendly Hospitals Initiatives (BFHI) is recommended to be spread to all especially medical college hospitals departments. The revised and expanded version of BFHI has been implemented by UNICEF and WHO in 2009 (18). BFHI was implemented partially in some states of India in 1992 but over the years it has not been reinforced or reevaluated. Strengthening of this initiative in the community would lead to better child survival.

These guidelines do not provide all of the answers but through the applications of these guidelines in day to day practices, child nutrition in the Indian subcontinent will improve remarkably.

REFERENCES

- (1) <http://www.nfhsindia.org>
- (2) www.planningcommission.nic.in/plans/planrel/fiveyr/10th/default.htm
- (3) <http://breastcrawl.org/10steps.shtml>
- (4) Kangaroo mother care: a practical guide 2003. World Health Organization, Dept. of Reproductive Health and Research.
- (5) http://www.who.int/childgrowth/standards/chart_catalogue/en/index.html
- (6) Infant and young child feeding: Model Chapter for textbooks for medical students and allied health professionals, WHO 2009.
- (7) Kathryn Dewey, Chessa Lutter. Guiding principles for Complementary Feeding of the Breast-fed child, Pan American Health Organization World Health Organization, earlier reviewed and commented by WHO Global Consultation on Complementary Feeding, December 2001.
- (8) Nancy F. Butte, Mardia G. Lopez-Alarcon, Cutberto Garza. Nutrient adequacy of Exclusive Breastfeeding for the term infant during the first six months of life. Department of Nutrition for health and development. Department of Child and Adolescent health and development. WHO 2002.

- (9) The optimal duration of exclusive Breastfeeding Report of an Expert consultation. Geneva, Switzerland 28–30 March 2001. Department of Nutrition for health and development. Department of Child and Adolescent health and development. WHO 2002
- (10) Ann Burgess, Peter Glasauer. Family Nutrition Guide. Food and Agriculture Organization of the United Nations Rome, 2004.
- (11) Randa Saadeh, Jose Martines. Complementary Feeding: Family foods for Breastfed children. Geneva: World Health Organization, 2000.
- (12) Complementary Feeding Counseling: Training Course. WHO 2004
- (13) Complementary Feeding: Report of the Global consultation, and summary of Guiding Principles for Complementary Feeding of the Breastfed child. WHO 2002
- (14) World Health Organization. HIV and infant feeding. Update based on the technical consultation held on behalf of the Inter-agency Team (IATT) on Prevention of HIV Infections in Pregnant Women, Mothers and their Infants, Geneva, 25-27 October 2006. Available from: URL: http://whqlibdoc.who.int/publications/2007/9789241595964_eng.pdf. Accessed on April 12, 2010.
- (15) HIV and Infant feeding .Revised principles and recommendations. Rapid Advice 2009. World Health Organization.
- (16) Use of antiretroviral drugs for treating pregnant women and preventing HIV infection in infants.2009. World Health Organization.
- (17) The Transfer of Drugs and Other Chemicals into Human Milk. American Academy of Pediatrics. Pediatrics 2001; 108(3); 776-789.
- (18) Baby-Friendly Hospital Initiative Revised, updated and expanded for integrated care WHO 2009