CHAPTER -II

REVIEW OF LITERATURE
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2.1 Issues in Infant Feeding

2.1.1. The Physiological basis of lactation

The issues of lactation, breastfeeding, complementary feeding and infant growth are as old as humanity itself. According to Cuthbertson (1999) human milk is presumed to have evolved over about 2 – 2.5 million years to meet the varying circumstances of Hominid species and their environment. The social and physical conditions of life, availability of milk and infant foods as well as the prevalence of diseases have undergone tremendous change since Stone Age. Not surprisingly concepts about lactation, breastfeeding and the appropriate time of introduction of foods other than breast milk, themselves have been changing periodically. Infant growth is to a large extent determined by the above factors and has been a chief concern of public health personnel in developing countries where the prevalence of childhood malnutrition affecting infant growth is high.

The secretion of milk after parturition is preceded by mammary gland development, which is completed during pregnancy. The gland becomes competent to secrete milk sometime after mid pregnancy. The onset of copious milk secretion or lactogenesis is held in check until after parturition. In humans lactogenesis (referred to as the time when the milk "comes in") starts about 40 hours after the infant’s birth and is largely completed within five days (Anand et al. 2002). Contrary to popular belief that early and frequent sucking by the infant is what triggers milk production there is now enough proof that removal of placenta without any residue is what acts as a primary triggering mechanism for lactogenesis (Woolridge, 1996). This is then sustained by the sucking of the infant.

Early milk secreted is a watery fluid known as colostrum, rich in immunoglobins. Milk secreted during the period between colostrum
secretion and mature milk is called transition milk. Full lactation, or the secretion of mature milk, continues as long as the infant receives substantial quantities of milk from its mother, up to three to four years in some cultures. When nursing ceases the gland undergoes partial involution, which is completed only after menopause. Every stage, namely, mammary development, mammogenesis, lactogenesis, lactation and involution is specified by both systemic and local hormonal control mechanisms.

There are points of both agreement and disagreement regarding lactation. The concepts on which there is consensus are

1. All mothers can lactate and mothers who produce no milk at all are very rare.

2. The production of milk is programmed to meet the demands made by the child (i.e) the quantity produced is based on the amount consumed by the child. Woolridge (ibid) describes this is a calibration process wherein breast milk production is fine-tuned to meet the baby’s demands.

3. Breast milk differs from most products known to the developed nations in that it is highly variable and not standardized (Cuthbertson, opcit). Mothers vary in their ability to lactate and the amount and composition secreted varies greatly, since each mother’s output is tailored for the particular child’s needs.

4. Mothers’ milk varies in many ways, even during the period of a single feed, from day to day suckling, during the course of lactation and from one lactation to another.

5. There is no doubt about the value of breast milk to the infant’s growth especially in terms of protection against diarrhoeal diseases and lower
respiratory diseases as well as otitis media and from many other infections (Heinig and Dewey, 1996).

6. Though there is considerable variability among mothers with regard to quantum of milk production, there is an upper limit to milk output in all mothers. Chavez and Martinez (1982) studied the phenomenon of lactation among underprivileged mothers in Mexico and arrived at the conclusion that milk production continues to rise from birth (regarded as the first stage) reaches a point of peak production, then stabilizes and levels off as a plateau (regarded as the second stage). There is a third stage wherein the production is characterized by a definite drop irrespective of introduction of other foods which occurs at around 13 months of age of the child. This period is very critical not so much due to changes in the quantity and quality of milk as in the resumption of menstruation and the possibility of a new pregnancy.

7. Milk production is also determined by infant demand. The birth weight of the infant and its subsequent behaviour to self regulate its intake determines the level of production (Perez et al. 1995).

The issue on which there are differing viewpoints is whether lactation performance of mothers is affected by their nutritional status. The ‘plasticity’ of milk production is well recognized by most authors since it is found that the actual quantity and quality of milk produced varies with the needs of the infant. This is perhaps why some researchers have used growth, or rather growth faltering, shown by the infant as the yardstick for deciding the period of exclusive lactation, rather than the actual amount of milk produced. Nevertheless considerable debate has been raised over the quantum of production and the ability of well-nourished and malnourished mothers mothers to sustain the growth of infants exclusively on breast milk for a period of four to six months.
Research on the adequacy of lactation has used three parameters, mostly independently and sometimes in combination, for assessment, namely, a comparison of the milk output of well nourished and malnourished mothers, effect of lactation on the nutritional status of the mothers and growth of infants. Early studies on lactation in England (Deb and Coma, 1962) showed that milk output in well nourished and malnourished women ranged from 600 – 700 ml per day and from 500 – 700 ml per day respectively during the first six months.

Chavez and Martinez (opcit) opine that the amount of 800 ml of secretion reported in classic European literature was actually carried out on wet nurses and did not include more representative groups of women. Later studies with better sampling techniques have shown much lesser values. There is evidence from around the world that in the human species breast milk is insufficient as the sole source of nourishment from very early stages in the life of the child.

The earliest studies on the lactation performance of undernourished mothers from Indonesia (Oomen and Malcolm, 1958) and India (Gopalan and Belavady, 1961) have recorded production levels of 500 to 750ml/day during the first six months, 500 to 600 ml during the second six months and about 400ml per day during the third six months. Rajalakshmi et al. (1974) reported an output of 600ml (range 350 – 1100) and 735 ml (range 540 – 1100) at three months.

According to Gopalan (1958) volumes reported varied greatly and seemed to be lowest in communities with poor levels of nutrition and inadequate living conditions, whether urban or rural. Jelliffe and Jelliffe (1978) warn that results are only approximations and comparisons are made difficult by variables in the nutritional status of mothers, both between mothers in a particular group and between various communities and by the possibilities of different degree of adaptation.
The degree and duration of deprivation, methods of assessment and previous nutrition situation can have many a varying combination.

In 1973 the World Health Organization (1985) undertook a global study to assess the quantity and quality of breast milk to compare the lactation performance of mothers from different socioeconomic, geographic and ethnic backgrounds through well-defined and standardized methodologies. The aim was to find out the breastfeeding performance of undernourished mothers in the developing world who may not have best physiological performance. The countries selected were Hungary, Guatemala, Phillipines, Sweden and Zaire. Three groups were studied.

Those belonging to economically advantaged and educated families in urban areas.
- Those who were poor and belonged to poorly educated families in urban area.
- Families in rural areas usually following a traditional way of life and often dependent on subsistence agriculture and local marketing.

Hungary and Sweden were two countries where the mothers enjoyed relatively higher economic and nutritional status and where prolonged breastfeeding was not in vogue at the time of the study. There were 2942 mother child pairs, who were distributed over the five countries in three different groups mentioned earlier. The size of the groups varied from 90 at the least to 722 at the highest.

Breast milk quantity and composition were established in mothers with infants of different ages. Sampling at 1,3,6,9 and 18 months was mandatory and additional studies at 2,4,12 and 24 months were optional. The quantity of milk ingested/produced was measured by test weighing the baby for a 24-hour period. The mean breast milk quantities recorded were the highest for Sweden at 640 ml at the first
month and 676 ml at the third month with an average of 4-6 test weighings per day. Significantly lower values were recorded for well to do Phillipine mothers (524 ml at the first month) and undernourished impoverished mothers of Zaire (201 ml at the first month and 273 ml at the third month with less than 8 test weighings).

The study recorded that Phillipino mothers though well to do, were giving 70% of the infants breast milk substitutes and another 80% energy supplements. This resulted in the infants suckling less at the breast, demanding and consuming less breast milk. However in Zaire the mothers rarely used breast milk substitutes, demand fed the infants, gave more number of feeds but were poorer in nutritional status. Beyond this there were no consistent differences over the range of age groups studied.

The study postulated that breast milk quantity is determined by the interplay of maternal supply and child’s demand which are affected by a number of factors including the breastfeeding routine. In all groups the volume increased when the feeds increased. This may be interpreted as evidence that more frequent stimulation leads to increased secretion. However an alternative explanation that mothers who have less milk feed less frequently is equally possible. This was supported by the quite large volume differences between the intake of infants with different number of feeds as seen in the urban poor and rural groups in Guatemala, Phillipines and Zaire.

Both interpretations are correct depending on the circumstances. For the urban poor and rural groups, in spite of giving only breast milk through demand feeding and without the use of breast milk substitutes, the output was lesser than those of well nourished mothers. These observations mean that breast milk volume may be at or near the maximum that mothers could supply due to their poor nutritional status. On the other hand the study did not throw light on why well
nourished mothers from the higher socioeconomic group who produced more milk than their undernourished counterparts gave breast milk substitutes while the latter did not choose to do so. This study highlighted the fact that poor nutritional status can limit a mother’s capacity for lactation while good health with a higher probability for successful lactation is alone not sufficient for successful breastfeeding.

The flow of milk in mothers as measured by the quantity sucked by the child in fifteen minutes was also calculated. Low results were obtained for the undernourished mothers in Zaire indicating a genuine deficiency in milk production. The weight index decreased in most study groups since the production of breast milk uses up maternal fat stores accumulated during pregnancy. In Zaire however, the weight index did not fall with the stage of lactation, implying that maternal fat stores were low and milk production depended on current food consumption.

The quantity of breast milk was not correlated with any of the maternal characteristics. A threshold value below which the flow of milk could be regarded as impaired could not be detected except for Zaire, where mothers with low serum albumin had significantly lower breast milk volume than those with higher albumin values. The cross sectional nature of the study with large differences amongst mothers could have made the search for a threshold ineffective. The study concludes that advocates of prolonged breastfeeding should also devote some time and research to teaching mothers when to supplement the diet of breastfed infants. Further the ‘infection’ argument put forth to avoid early supplement holds true for other food supplements and for breast milk substitutes.

Though the absolute volume of milk produced is not so important, since the variability amongst mothers is due to the child’s consumption pattern, the question of sufficiency is certainly important. For how long do mothers produce enough milk (irrespective of how much
they produce) to maintain optimal growth of their children exclusively on breast milk? When does it become necessary to introduce complementary foods along with breast milk? Is there a difference among well-nourished and malnourished mothers?

Reddy (1993) argues that there is growing evidence that the volume of milk produced by women is primarily a function of infant demand and is unaffected by maternal factors such as nutrition, age, parity (except at very high parities). The author subscribes to this view since, despite maternal undernutrition infants seem to grow well for the first 4 – 6 months. Breast milk output is affected only in severe under nutrition in the mother. Ghosh (1999) considers milk output to be well-buffered against maternal nutrition, and may falter only when there is negative balance (i.e) when mothers lose weight.

A study in Honduras (Perez et al. 1995) investigated the role of maternal anthropometric status and lactation performance. Breast milk volume and composition was assessed at 4, 5 and 6 months in 141 low-income primiparous women who had given birth to healthy term infants. These mothers were randomly assigned to exclusively breastfeeding group for the first six months or group that complemented breast milk at four months. The results showed that mothers with a higher body mass index (BMI) gave birth to babies with a higher birth weight and the milk of these mothers had a higher concentration of energy. On the contrary milk volume, which averaged at 797 + or – 139 g/dl at four months, was positively associated with birth weight but did not show significant association with maternal anthropometry. There was an inverse realtionship between milk energy density and milk volume.

The authors postulate that this inverse relationship could be governed by infant demand (i.e) infants of mothers with low milk energy density breastfeed more often and stimulate a higher milk volume.
However no statistically significant relationship could be detected between milk energy density and breastfeeding frequency or total time breastfeeding per day. This is because the establishment of a high milk volume in response to low energy density occurs early in lactation, and that the breastfeeding frequency and time required to maintain that volume at 4-6 months postpartum are not as great as required initially.

None of the maternal characteristics (age or BMI) was significantly related to milk volume or residual milk volume. The authors conclude that lactation performance is not primarily determined by maternal anthropometric status but is regulated to a large extent by the infant. However the study does not throw light on how mothers with low anthropometric values and milk with lower energy content, coped with the demand for frequent feeding, leading to increased milk output.

Gopalan and Puri (1992) argue that scrutiny of available data from suggest that while severe nutritional deprivation could significantly impair lactation, marginal maternal undernutrition has apparently no significant effect on output. An average Indian woman is able to secrete 500 – 800 ml of milk daily for the first six months. Further comparison of data for output by mothers and intake by infants have shown little difference as between affluent and less developed nations. The authors also offer an explanation for the contradictory reports regarding adequacy of breast milk in relatively undernourished mothers of developing countries. Since infants modulate maternal milk yield, those of undernourished mothers weigh less at birth and right through infancy as compared to those born to well nourished women. Since body size determines requirement, the nutrient needs of these infants are likely to be lower and this may be one of the reasons for lower milk ingestion by these infants. The lactation potential of the relatively undernourished mothers of the developing countries is not inferior to that of mothers of developed countries and is just as adequate, which satisfies their infants.
Gopalan and Puri (ibid) opine that in India since undernourished rural women successfully initiate lactation and continue to breastfeed their offsprings for periods up to 24 months, maternal undernutrition does not have any adverse effect either on initiation or the duration of lactation. In assessing the adequacy of breast milk to sustain growth of infants in poor communities living under poor environmental conditions, it is pointed out that in India exclusively breastfed infants grow well during the first three months of life. Their growth during this period is comparable to that of infants born to well nourished mothers. Observed differences in quality and quantity of milk secreted by undernourished women do not have any impact on growth. Since the advantage of early supplementation is to prevent growth faltering, mild to moderate faltering does not matter, as against infection that is likely to be introduced.

On the other hand, Gopalan and Patnaik (2002) hold that it is wrong to assume that no matter how poor the diet may be, mothers will be able to deliver milk of the right quality and quantity for the infant. Nursing women in poor communities in India with body weights ranging from 35-50 kg generally subsist on diets, which provide 1400 – 2200 calories with a protein intake of 27-50 gm, largely derived from plant sources. There is little difference between the diets of non-pregnant, pregnant and lactating women. Even with poor diets the average output of breast milk ranged from 480-570 cc daily for the first six months.

The protein intake of infants range from 2g/kg of body weight in the first fortnight to 1g/kg body weight in the sixth month. Protein supplements to mothers during lactation have not resulted in significant improvement in the protein concentration of milk, probably due to metabolic and hormonal adjustments in lactation which lead to more efficient maternal utilisation of dietary energy and proteins. However there are limits to metabolic and hormonal adaptations and when maternal diets are highly inadequate, lactation failure is to be expected.
Gopujkar et al. (1984) carried out a study on infant feeding practices of mothers belonging to poor communities in the urban, peri-urban and rural areas of Mumbai, Kolkata and Chennai. The objectives were to survey the infant feeding practices in the community with special reference to the use of commercial infant foods, to obtain qualitative data on the type of food, including milk other than breast milk and the reasons for using or not using such food, to study the manner and mode of use of different foods and to obtain some health indicators of the infants associated with these practices. The sample size was 1820 mother-infant pairs in Mumbai, 1377 in Kolkata and 1729 in Chennai.

It was found that a high proportion of mothers could not exclusively breastfeed their infants for even up to four months. The percentage of exclusively breastfed infants at the end of fourth month had declined to 66% at Mumbai, 35% at Kolkata and 45% at Chennai. The rate was significantly lower in Kolkata as compared to Mumbai and Chennai. Fourteen percent of infants in Mumbai, 36% at Kolkata and 42% at Chennai had received commercial milk foods. This was not due to lack of motivation since mothers continued to breastfeed well beyond infancy.

According to Gopujkar et al. (ibid) as in most physiological phenomena, lactation performance is also subject to individual variability. In situations where the maternal nutritional status is normal, even mothers who represent the lowest ends of the normal physiological range of lactation may be able to provide enough breast milk to meet the growing needs of their infants in the early stages of infancy. However in the event of stress, as in severe deprivation leading to impairment in lactation, women in the upper levels of the normal range may be able to secrete adequate amounts whereas women in the lower levels of the normal range may not be able to do so.
In a subsequent study carried out a few years later (NFI, 1988) in urban slums of Mumbai, Kolkatta and Chennai, this hypothesis was tested along with an additional input of iron supplementation to mothers to see if lactation could be improved through improved nutritional status. About five thousand mothers were initially screened in all the three centres and those with a haemoglobin level between 8 and 10-gram percent were chosen. Four hundred twenty one mothers in Bombay, 457 in Calcutta and 380 in Madras (a total of 1258) were taken up for further study. They were divided into control and experimental groups.

About 400mg of iron was injected intravenously as iron dextran. The aim was to improve the haemoglobin status of mothers by about 3 gm%. In Chennai and Kolkatta this dosage was neither effective in markedly improving the status nor was it sustained beyond three months. Hence 800 mg of iron was injected to another experimental group. A positive effect of iron supplementation was noticed since in all three centres higher proportions of mothers in the experimental group were exclusively breastfeeding up to three months. However in Kolkatta a higher percentage (30%) as compared to Chennai (7%) had stopped exclusively breastfeeding in the first month itself due to insufficiency of breast milk. This figure increased to 56% and 39% respectively in both centres by fourth month. During the entire study period, the Kolkatta mothers lost about 4 kgs of weight. The lactation performance of Kolkatta mothers was poorer than those in the other two centres, not due to poor motivation but due to genuine decrease in milk output.

Chavez and Martinez (1982) opine that in the developed countries it is only textbooks that say that lactation is sufficient. In these countries, many mothers upon the doctors’ advise resort to early supplementation before the age of three months. The authors by means of a longitudinal study over a period of ten years in the nineteen sixties, made an in-depth analysis of milk production and lactation performance.
amongst malnourished mothers and infants in a Mexican village, where there was scarcity of food and abundance of contamination. One group of mothers was given supplementary feeding and its outcome on lactation performance was also studied.

An etho-ecological approach was used to study behaviour of mothers and infants, along with quantitative parameters such as measurement of milk volume and anthropometric measurements of mothers and infants. Qualitative analysis of the composition of breast milk of a single mother over an one year period was carried out for all the mothers in the village. The development of infants with regard to language, motor and cognitive skills in relation to their growth and the mother-child interaction was also studied. The production of milk was measured when the infants were 2, 8, 16, 24, 36, 56 and 78 weeks of age. The children consumed an average of 183.23 litres of mother’s milk during the first year of life (i.e) on an average about half a litre a day.

Milk output averaged at 590 ml a day during the first six months of life, which may be considered acceptable but not optimal. During illness consumption dropped by about 15% in the first few months of life of the infant. Demand feeding was the norm and the child was given the breast on demand to the point of exaggeration. Every time the child cried, the child was immediately put to the breast and it was only when the child rejected the breast and continued crying, that mothers thought that something else was the matter.

With regard to pattern of milk production, there was a low start, with a period of gradual increase until a peak was reached, a sharp drop and a long period of stabilization. There were two groups of mothers, namely, ‘the early producers’ and the ‘late producers’. Half of the mothers were early producers, who increased their production very rapidly, giving an early maximum peak at eight weeks. The other half
increased production slowly, reaching a late peak, at 24 weeks. The older and more multiparous mothers formed the early production group, while the younger less parous mothers took a longer time to reach the peak. Thus there appeared to be a phenomenon of ‘training for lactation’ which had the greatest influence on the type of lactation.

However the volume of milk produced by both the groups was the same, the only difference being the time of maximum availability. While the children in the early secretion group got a lot of milk in the beginning, the supply dropped off after two to three months. In the slow production group the peak was reached only at the sixth month after which it dropped off but more slowly. This difference had important nutritional consequences for the infants. Those who had a good supply in the beginning grew better, even though there was a shortage later. The infants of the late starters lagged behind. In the rapid production group the infants had enough milk during the first two months, but this decreased thereafter. In the slow production group the supply though steady, was restricted even at the beginning.

Half of the infants in the Mexican study, started life with sufficient milk, though this got reduced by the second or third month. On the other hand the other half did not receive a sufficient quantity even from the beginning. According to the authors the so called ‘weaning malnutrition’ seen later at eight months is a culmination of a chronic situation that had begun long before the weaning stage. It was due to prolonged caloric deficiency, in turn caused by insufficient lactation. If this was the pattern in the first semester, in the second semester lactation was characterized by stability and there was no difference amongst mothers. In the third semester production gradually decreased.

In the Mexican study, the three different stages of lactation had a different significance. Early lactation was very dynamic;
there was abundant production in response to the infant’s demand since the child was small and also since the maternal physiology had a greater capacity for response. The child also demanded less number of feeds. This phase ended more or less briskly, between the second and the third month due to the inability of the mother to produce at the same rate. The difference between the well-nourished and malnourished mothers was in the abruptness with which it ended for the latter group. Production also reached a veritable crisis for the malnourished mothers. The supplemented group showed a different pattern. Their daily production was more regular, reached a peak at 16 weeks and dropped gradually. Beyond 9 months of age supplementation had no value since production levels in both supplemented and non-supplemented groups were the same.

In the stable period, called intermediary lactation, mothers set a limit to the infants’ consumption since they could only produce a certain quantity and no more. Though production is enough to prevent serious malnutrition, it is not sufficient to maintain normal growth pattern and if the infants’ diet is not supplemented, development suffers. The length of the period between the drop in milk production after the peak and the introduction of complementary foods is what produces a nutrition gap and determines the future growth of the child. This is the point at which adaptation starts and the infant learns to survive on little food.

With regard to the impact of nutritional status of infants on the caring behaviour of mothers, two factors considered outstanding are highlighted. Many of the mothers’ actions were child-initiated (i.e.) infants who demanded care and attention got them. The demand itself was determined by the physiological conditions of the infant, his energy, activity, temperature and health. Poor nutrition depressed many of the infant’s responses and so a malnourished child who cried less or was less alert could not attract the mother’s attention in the same way.
Shah (1981) compares the maternal stores laid in pregnancy amongst well-nourished Scottish women and Indian women and its relationship to lactation. A Scottish woman who gains 12.5 kg in weight during pregnancy has an energy bank which amounts to over 35,000 Kcal and enters the last stage of pregnancy with a very considerable buffer against food deprivation. What remains at the end of pregnancy can be used as a subsidy for lactation. However women from developing countries are not able to build up such a buffer. Their weight after delivery does not differ from that before pregnancy. Indian women were able to store only about 1 kg during the earlier part of pregnancy, and the end of pregnancy used up most of it. During lactation there is a net energy loss of about 600 kcal daily, which must be balanced by the energy intake or subsidized from the body stores. Little or no information exists to permit an assessment of the manner in which mothers in developing countries meet the energy cost of lactation.

However in spite of their inadequate diets women from low socioeconomic group produced about 400 – 600 ml daily. In a prospective study in 20 Indian villages Shah (ibid) observed that only 31% of the newborns weighing 2.5kg or below and born to severely malnourished women attained a normal nutritional status at 3 months of age. On the other hand 62% of infants with a birth weight of 3.1 kg and above of well-nourished or mildly malnourished mothers, attained normal nutritional status earlier. The infants were breastfed and the introduction of solids was advised at 4 or 5 months of age.

The study postulates that mothers who have a good nutritional status before pregnancy deliver babies with a relatively higher birth weight. They also secrete more milk with a higher content of fatty acid and their infants are in a better condition to draw more of the milk to grow up healthy. Athavale (1969) observed that milk intake by neonates in the first 2 hours is determined by their weight. According to Jelliffe and
Jelliffe (1978) many accounts from different parts of the world suggest that malnourished women often lactate with unexpectedly little clinically obvious deterioration of their nutritional status. However in recent years there may be increasing evidence of shorter periods of satisfactory lactation than previously supposed, at least in some parts.

2.1.2. Issues in Complementary feeding

There is no doubt that exclusive breastfeeding is recognized as the best way to feed infants during the first few months of life. However at some point, breast milk alone is insufficient to meet the growing needs of the child warranting the introduction of complementary foods (i.e) foods needed in addition to breast milk to sustain growth.

According to Hendricks and Badruddin (1992) the issue of when to begin complementary feeding has been extensively researched, but while there is a vast deal of literature on the subject, scientific data is less comprehensive. According to Dewey et al. (1992) ‘the optimal age of introduction of complementary foods to breastfed infants is a topic of considerable debate.’ Infant feeding, progresses from one stage to another at different periods and can be broadly categorized as

- Period of exclusive breastfeeding where the infant is offered nothing but the breast
- Transitional Phase - involving introduction of complementary foods suitable in quantity, quality and consistency along with breast milk
- Period of modified adult diet with breastfeeding by one year of age.

Too early weaning carries the risk of increase in morbidity due to diarrhoea. Food allergies as external challenges are introduced into an infant’s gut. There is also the danger of displacement of breast milk since the introduction of other foods will cause a decrease in
milk output due to reduced demand. On the other hand weaning too late will lead to growth faltering and decreased immune protection, which will also precipitate diarrhoea and malnutrition.

In 1990 the WHO issued guidelines regarding the appropriate age to begin complementary feeding and suggested that infants be exclusively breastfed during the first four to six months of life (WHO, 1998). This age range was considered a transitional period to allow breastfed infants to adjust to consuming semi-solid foods. In 1992 the World Health Assembly reiterated this. In 1994 the 47th World Health Assembly urged member nations to promote sound infant and young child nutrition by ‘fostering appropriate complementary feeding practices from the age of about six months, emphasizing continued breastfeeding and frequent feeding with safe and adequate amounts of local foods’. UNICEF then adopted the wording ‘about six months”.

In 1995 the report of a WHO Expert Committee reaffirmed four to six months as the timing of exclusive breastfeeding since ‘given the worldwide variation in growth velocity, an age range is an essential element of this feeding recommendation’. This ignited a debate on whether an explicit age range of four to six months should be stated or the phrase ‘about six months’ be retained to indicate the desired flexibility. The conclusion arrived at that time was that since the scientific basis for the recommendation of four to six months of exclusive breastfeeding was not adequately documented, more evidence and further information was necessary to bring about a change in the recommendation. At that time it was felt that there was strong evidence of increased risk of morbidity due to complementary feeding between four and six months in developing countries but with regard to growth there was ‘neither a clear advantage nor disadvantage’. There was confusion over how to define and measure the length of time for which exclusive breastfeeding was adequate.
In 1998 the WHO undertook another review exercise based on newer studies to consider the time frame for recommending complementary feeding. The issues considered were, infant growth, risk of micro nutrient deficiencies in exclusively breastfed infants during the first six months of life and the current health scenario in developed and developing nations. The results of observational and experimental studies from both developing and developed countries were considered.

Of particular interest were the results of a study conducted in Honduras (Cohen et al.1994) in which low income primiparous mothers who had exclusively breastfed during first four months postpartum were randomly assigned to one of three groups. Those who would continue exclusive breastfeeding upto six months (n=63), those who introduced complementary foods at four months with ad libidum nursing from 4 to 6 months (n=51) and those who introduced complementary foods at 4 months with baseline nursing frequency from 4 to 6 months (n=50).

The foods offered to the infants were designed to satisfy the requirements for all essential nutrients and were commercially prepared, precooked and sealed in jars to assure that they were free of microbial contamination. Mothers were provided with lactation guidance throughout. At 4, 5 and 6 months weights of infants were taken along with infant intake of foods and breast milk composition. Of the 164 infants who participated in the study, 141 completed all measurements upto 6 months. The drop-outs were not very different from the experimental group in terms of maternal age, education, body mass index, marital status, prenatal care, income, infant birth weight, sex, weight gain from birth to 4 months or breast milk intake at 4 months. Two drop-outs left the study because of perceived ‘insufficient milk’ while others had to introduce complementary foods because they had to go back to work.
The results showed that when complementary foods were introduced, nursing frequency declined spontaneously. Mothers who were in the baseline nursing frequency group said that the infants showed no interest in breast milk. Between 4 and 6 months breast milk intake was unchanged in exclusively breastfed infants but decreased significantly in the groups given complementary food. Total energy intake was the same across groups. In all three-intervention groups, infants did not consume all of the breast milk that was potentially available to them at 4, 5 and 6 months, implying that their energy needs were satisfied both before and after the intervention. Weight gain and length of infants was uniform across the groups both during the intervention or thereafter. Rates of morbidity were also uniform probably due to the hygienic conditions in which the complementary foods were given.

Data when analysed with regard to mothers’ body mass index (BMI) showed that the provision of complementary foods did not alter the growth performance of the infants of mothers with low BMI. However since the sample size was limited, no conclusions could be drawn, and data from populations with more severe maternal malnutrition was considered necessary for any decisive conclusion.

While the above observations hold true for infants with normal birth weight, low birth weight infants are particularly vulnerable since their mothers themselves are likely to be malnourished. The Honduras study had too few numbers of the LBW category to be able to draw definite conclusions regarding the impact of the interventions. However the data suggested that there were no differences in growth or intake among the groups.

With regard to the risk of micro - nutrient deficiency, especially that of iron which can occur among exclusively breastfed infants during the first six months, the authors opine that complementary
foods may or may not reduce the risk of such deficiencies. Maternal dietary supplementation is likely to be more effective and will benefit both the mother and the child. Supplemental iron drops are recommended for low-birth-weight infants. Brown et al. (1995) in a study of Peruvian infants support the above observations. In a study of Peruvian infants it was found that infant growth during the first six months was positively related to the proportion of energy consumed from breast milk. The pattern of growth of predominantly breastfed low-income Peruvian infants did not differ from those of predominantly breastfed Californian infants of affluent mothers.

Eregie and Abraham (1997) followed up 276 term infants divided into two groups (114 exclusively breastfed and 62 partially breastfed) for six months. At each succeeding completed month the weights and rates of weight gain were recorded. When compared, no significant differences between mean weights and weight gains were observed between both the groups. However, a significant difference between the mean weights at four and six completed months for exclusively breastfed infants was observed. Maternal factors such as age, parity, socioeconomic status did not influence the pattern of growth. The authors recommended exclusive breastfeeding up to six months of age.

The primary authors of the WHO review committee (1998) also recommend six months of exclusive breastfeeding and give the following rationale though they admit to differing viewpoints.

♦ Growth rates of fully breastfed infants in developing countries are generally similar to those of their counterparts in more affluent populations during the first six months of life, though definite conclusions cannot be drawn due to possible attrition bias in observational studies.
In affluent populations, growth rates of infants exclusively breast-fed during the first six months or more are similar to those of infants given solid foods between four and six months. Thus there is no additional advantage of giving solid foods. They may only replace breast milk.

In disadvantaged populations, data from observational studies in five countries show that there is no significant difference in growth velocity from four to six months between groups, which are exclusively breastfed and those given complementary foods.

Based on two observational studies, the risk of diarrhoeal morbidity in poor populations is two to 13 times higher, when exclusively breastfed infants are given complementary foods between 4-6 months.

The authors agree that it may be argued that their evidence base for such a recommendation is minimal, since barring infant growth and morbidity there is lack of information on outcomes such as maternal nutritional status. However maternal dietary supplementation for improving the nutritional status of mothers can be attempted to prevent deficiency in both the mother and infant rather than complementary feeding which is more hazardous. The phrase ‘about six months’ was considered as a stimulus to convince mothers to exclusively breastfeed.

While the design and the methodological rigour of the above mentioned studies are quite sound in spite of low sample size, the conclusions, based on which a blanket recommendation for exclusive breastfeeding for six months is recommended, give rise to several questions. In all the studies the samples were self-selected up to a point. The design could only include mothers who were exclusively breastfeeding at four months of age. This gives rise to the question as to what proportion of mothers actually reach the stage of exclusive breastfeeding at four months. This is perhaps one of the reasons why the investigators had to contend with a small sample size in the first place.
The Honduras study by Cohen et al. (1994) consisted of only primiparaous mothers and did not include those with multiple pregnancies. Even in this group sample attrition by way of dropout was observed, due to other variables, which shows that variability amongst mothers is the norm and in the real field situation there cannot be any control. Other factors such as mothers’ work, details about family, time available for feeding etc would have thrown light on why and how many mothers are actually able to exclusively breastfeed.

Garza and Frongillo (1998) are of the view that from the perspective of feeding recommendations, there may not be a single optimal age for the introduction of complementary foods for all breastfed infants. There are likely optimal ages that one determines by multiple factors (eg, birthweight, prepartum maternal nutritional status and environmental conditions) that must be considered.

Breastfeeding is unlikely to confer sufficient homogenity to make blanket or restrictive recommendations optimal for all populations. Despite the well documented nutritional, immunologic and other benefits of human milk, its provision does not completely level the uneven playing field created by social and environmental conditions that lead to high rates of low birth weight, poor maternal status and other undesirable outcomes. Feeding recommendations could be considered from three perspectives.

1. If growth outcome is a criterion for determining feeding recommendations, adopting either mode of feeding within the age interval of 4 – 6 months most likely results in indistinguishable outcomes in well-nourished populations.
2. If morbidity is the criterion, there is evidence to prove that exclusive breastfeeding through 6 months is protective against high endemic rates of infection of poor complementary foods especially in developing countries.
3. If sustaining micronutrient sufficiency is the criterion, iron adequacy may be a problem especially in populations with a high prevalence of birthweight less than 3000 grams.

Garzo and Frongillo (ibid) opine that development of feeding recommendations requires recognition of diversity of needs and the evaluation of multiple outcomes such as growth, illness, micronutrient status and behavioural development. In the Indian context Ghosh (1999) suggests that what is more relevant is to study the adequacy of breastfeeding in relation to growth and then determine the timing of complementary feeding which would be around 5 to 6 months. Giving an exact timing has its problems due to the risk of strict adherence. If only growth was better recorded and the first evaluation of growth faltering identified, would we have a sound indicator of when to start complementary feeding. For the vast majority in India knowledge regarding starting semi-solids is scanty both among families and among health workers. Promotional activities have also been meagre, in contrast to those for breastfeeding. This is the origin or cause of malnutrition, which starts around 5 – 6 months of age and reaches its peak at 24 months.

Anandiah and Choe (2000), on studying the National Family Health Survey (NFHS –1) data concluded that in India complementary feeding is more beneficial to infants under four months of age than exclusive breastfeeding alone. Three possible explanations are offered in favour of this hypothesis. First, supplementary food given to infants might be more hygienically prepared than what is generally assumed. Some mothers especially in high mortality states may have inadequate breast-milk and hence the infants may need supplementation.
Finally, amongst infants with similar characteristics, those in poor health may be less active, and therefore receive only exclusive breastfeeding. Though the above observations are debatable, they nevertheless highlight the need for a dialogue on the norms recommended by WHO.

In India there is delayed initiation of complementary feeding, with only 31% of the children being given semi solids along with the breast between six and nine months of age according to NFHS 1 data for ‘92- ’93. However between four and six months the average is 44% (55% in urban and 41% in rural areas). The average hides the regional differences among states by way of location (viz) urban and rural. It is in Bihar, Rajasthan and Uttar Pradesh that the least percentage of infants (15% and 17% respectively) are introduced to semi–solids. The maximum number of infants introduced to complementary foods during this period are from the North Eastern States of Manipur, Meghalaya and Nagaland as well as Kerala in the South. For TamilNadu it is 55%, which increases to 79% at about 10–12 months.

There are inherent difficulties in comparing and interpreting the results of many studies on the feeding practices of mothers. Studies which report about the delayed introduction of solids as late as twelve months (Subbulakshmi and Udipi, 1989) have not appreciated the fact that mothers could have introduced liquid supplements earlier. So there is no information on exactly when these infants were fed with complementary food. On the other hand, studies which give the time of introduction of complementary foods as between 7 to 12 months have not reported the kind of foods given (Kusuma, 1987).

Unlike in the West where commercial foods are used as ‘transitory foods’ before that of a modified adult diet, in India, the type of complements include cow or goat milk, pulses, cereals, egg, fruits etc (Lingam and Mankad, 2001). On reviewing several studies it is observed
that a large proportion of Indian mothers give their infants home-made foods, but studies show there is an increasing trend towards the use of commercial infant foods, particularly among the poor.

Bavdekar et al. (1994) conducted a study in two slum areas in Mumbai, on 253 mothers, with children below two years to understand infant feeding practices. Data was collected through interviews. The timely complementary feeding rate (6-9 months) was 48%. Twenty three percent of mothers used bottle for administration of supplementary food or water. Only 16% of mothers used commercial milk formula and 9% used commercial weaning food.

According to Gillespie (1997) the culture of child feeding is deeply rooted in the maternal perception as to what is appropriate for a small child based on certain milestones, such as the ability to chew. Since mostly foods available in the family get introduced to infants, mothers and families do have opinions about what should be introduced and when. Few investigations have been devoted to examine in depth how the transition is made from breast milk to liquid supplements, solids and finally weaning off the breast. Bimola Devi (1994) found traditional beliefs playing a role in the choice of foods. She observed that in Manipur pulses were considered to cause indigestion and gastro-intestinal problems.

Murgai (1993) reports that mothers in Mumbai slums believe that ‘children should be given solids only after 12 months or when the child has learnt to walk. Solids should be introduced only when the child has teeth’. According to Gopaldas (1995) growth faltering that occurs around 6 to 24 months is due to high bulk, low energy diet and is accompanied by bouts of diarrhoea caused by the contaminated left over food. A simple household technology such as Amylase-Rich-Food or ARF has been found to be effective in addressing the twin problems of dietary bulk and poor energy density of most gruels from poor households. ARF
is germinated cereal flour which when added in small quantities can reduce the dietary bulk of any gruel and increase the energy concentration.

Bamji and Thimayamma (1999) studied the time spent by rural mothers on housework, childcare and economic activities and found that while 4.5 – 6 hours were spent on housework such as cooking, cleaning etc, 2 – 3 hours were spent on childcare including breastfeeding. Delayed introduction of complementary food was noticed more in mothers who carried out economic activities, than in those who were ‘housewives’. The presence of mothers at home probably helped in timely introduction.

In a case study on infant feeding and childcare practices in Rajasthan (NCCS, 1991) it was observed that a woman was able to spend only 10% of her time on childcare and generally did not have time to make childcare her first priority. The mother was overburdened and too tired to prepare special food for the infant. It was easier to put the child to the breast if she was lactating or to pacify the child’s hunger with pieces of roti or biscuit. In contrast she spent about 3 hours cooking food and serving the whole family.

According to McGuire (1991) both quantity and quality of infant foods is very important since clinical studies have shown that dietary quality can have a significant effect on infant nutrition. Very little information is available on the global prevalence of deficiencies even for Vitamin A, iodine and iron which are the best documented micronutrient deficiencies. Infant diets are generally analysed for calories and proteins, since the concept of dietary quality with regard to micronutrients is new and is only slowly gaining ground.

While the quantity and quality of supplementary foods is important in sustaining optimal growth in infants, the choice of feeding devices and hygiene practices in food preparation and handling will
influence the morbidity profile. There is comparatively less information on these aspects. The prevalence of bottle-feeding in various Indian states has been mentioned in NFHS 1 data. The use of bottles with nipples is not common in India, increasing from 10% for infants age 0 –3 months to 17% for infants age 4 – 6 months. At ages 10 – 12 months, 15% of the infants are bottlefed. The overall prevalence is 14% for infants below twelve months. There is a striking difference in the prevalence rate in Goa, where 67% of the infants are bottlefed. No explanation as yet is available for this high prevalence over the rest of the country. Micro level studies show that this practice is more prevalent in the upper socio economic group (Singhania et al. 1990).

There is great concern that given the unhygienic conditions in which people live the morbidity and mortality rates through bottle-feeding will increase alarmingly. Since it is difficult to sterilize the nipple properly the use of bottles exposes infants to an increased risk of diarhoea and other infectious diseases. Some micro level studies (Chitkhara and Gupta, 1987) have reported increased morbidity due to bottle-feeding. Paediatricians discourage the use of bottles at any age mainly out of concern of cleanliness and hygiene. Another area where research is lacking is the microbial contamination of complementary foods. Ghuliani and Kaul (1995) collected samples of complementary food and examined other sources of contamination such as water, mothers’ nails and utensils from low-income families in Chandigarh. Swab samples of feeding bottle nipple, mothers’ teats and infants’ hands were collected The incidence of E.coli isolation was 72% in the collected samples. In the water containers, 79% exhibited the presence of E.coli. Eighty percent of the infants had diarrhoea even when exclusively breastfed.

Sheth et al.. (2000) studied the hazards and critical control points during the preparation, feeding and storage of weaning foods fed to children 6-24 months of age belonging to low socio -
economic families in Baroda. The homes were rated as poor both for personal hygiene and environmental sanitation. High microbial counts were obtained for the weaning samples stored at temperatures of 25 – 35 degree centigrade. The microbes were coliforms, AMCC, yeast and mould. The hazards and critical control points identified were high initial contamination of raw foods, poor environmental sanitation and feeding hygiene and feeding of overnight moist foods with insufficient steaming.

2.2. Variables influencing feeding practices

Several variables are associated with feeding practices either directly or indirectly. These can be broadly classified as maternal, infant and environmental. ASCI (2001) analysed the data obtained from Government sources on under five nutritional status and validated it by cross checking the variables associated with childhood malnutrition by a team of experts all over India. The important maternal variables, both biological and social, identified as influencing malnutrition in childhood are, age at marriage for women, age of first child birth, education, female literacy and women’s employment. In addition parity, nutritional status, pregnancy, family characteristics and support to mothers have also been identified. Among infant variables, the age of the infant in months, its sex and birthweight are considered to influence feeding practices. Environmental factors include culture, home environment and media.

2.2.1 Age

As early as 1971 Srivatsava found that there was a higher incidence of low birth weight (< 2000 grams) amongst mothers below 20 years (13%) and amongst those between 35 and 39 years (11%). While maternal age does not appear to be an independent determinant of low birth weight (Kramer, 1987) a very young age at parturition does exert indirect influence on maternal height, weight and nutrition, affecting
birthweight. According to Udipi and Merchant (1995) the problems associated with low maternal age are both biological and behavioural. Young mothers are not only physically underdeveloped, but also lack emotional maturity, suffer from social and psychological pressures and hence may not be able to adequately care for their infants.

2.2.2 Parity and birth spacing

Very few studies have analysed the relationship between lactation, breastfeeding practices and birth spacing. According to Chavez and Martinez (1982) there is a physiological phenomenon of training for lactation wherein older and multiparous mothers show peak milk production at very early stages, thereby benefitting their infants. Kumari (1985) observed that children of higher birth order tended to be exclusively breastfed for longer time than children of lower birth order. Further breastfeeding in the former group was prolonged beyond six months with delayed introduction of supplementary foods.

Mukerjee and Sethna (1970) showed that mean birth weight was highest in birth intervals of two to two and a half years. Birth spacing may also influence feeding practices. Kumari (opcit) observed the highest prevalence of third degree malnutrition in children born after the shortest birth interval (12 months). Yasoda Devi (1990) found those children with higher birth order had better weight-for-age, weight-for-height than those with lower birth order. The author attributes this positive association to the fact that children with higher birth order were taken care of by the mother or another older female while the younger ones were taken care of by their older siblings who themselves were children.

While spacing and parity have an influence on feeding practices, the reverse is also true, since breastfeeding itself has a contraceptive effect. Shah et al. (1993) found that prolonged exclusive
breastfeeding rather than complementary feeding postponed the next pregnancy. However Lingam and Mankad (2001) are of the view that while breastfeeding could have a contraceptive effect, its effectiveness is not absolute since a woman may ovulate in the first menstrual cycle following the birth of a child and she may conceive without having any visible sign of menses.

2.2.3 Nutritional Status

There is considerable debate regarding the relationship between mothers’ nutritional status and their ability to breastfeed. Ghosh (1999) holds the view that the bulk of evidence suggests that breast milk production is relatively well buffered from maternal malnutrition and that adverse effects are unlikely unless the mother is both thin and in negative energy balance (i.e., losing weight). However, according to Ramalingaswami et al. (1997), women in South East Asia, especially India, are not able to breastfeed exclusively for the stipulated period due to their poor health when compared to those in Sub-Saharan Africa.

Gopujkar et al. (1984) studied the infant feeding practices of mothers in three areas of Mumbai, Chennai, and Kolkata and found that, Chennai mothers breastfed for a much longer period though they introduced supplements much earlier. Their diets lacked essential nutrients. Kolkata mothers who were the worst off in health, stopped breastfeeding much before their Mumbai and Chennai counterparts.

2.2.4 Literacy and Education

Maternal education is another important factor influencing child feeding and health. Caldwell (1998) conducted a research study in South India to discover just how maternal education translated into child survival. An educated mother was allowed more
freedom of decision-making and action by her husband and mother-in-law than was an illiterate mother. During periods of crisis the more educated mother was more likely to demand that family resources be utilized for child’s welfare.

At the health clinic mothers and their sick children spent a period of time with the physician roughly proportional to the duration of their schooling, although caste and social class were also of significance. The physician did not expect the uneducated woman to be able to communicate with him nor to understand what he was saying and to be able to carry out his instructions. A critical difference in behaviour was noticed when the treatment was not proving effective.

The most educated mothers reported the lack of progress by the sick child to the doctors since they regarded this in a more probabilistic way. A strategy that had offered hope had not worked. This should be reported and an alternative solution sought. Illiterate mothers frequently did not return to the centre even when the child’s condition was worsening. The reason was partly due to the fact that they felt closer to the Ayurvedic physician. They were afraid of the blame and rebuke of the physicians and nurses (who usually belonged to the upper caste and class) for allowing the situation to worsen.

While higher literacy level leads to greater empowerment and bargaining powers for women both within the family and outside, with regard to feeding practices however, studies present conflicting views. Sachdeva and Mehrotra (1995) studied the predictors for exclusive breastfeeding in early infancy, on a sample of 501 mothers with infants aged 0-6 months at Delhi. Educated and older mothers were positively related to exclusive breastfeeding as compared to younger and less educated ones. On the other hand Devi and Behera (1975) observed illiterate mothers of poor socioeconomic group having longer duration of breastfeeding. Jeeson and Richard (1989) on studying various factors
influencing breastfeeding duration found that maternal education had a negative influence. The NFHS I and II data also show that more ‘modernised’ women, (urban, educated and exposed to media) breastfeed for a shorter duration.

2.2.5 Multiple roles of mothers

Of all the factors identified as influencing the breastfeeding practices of mothers, the least understood perhaps is that of mothers’ work. Women perform multiple roles. The triple burden of housekeeping, child-rearing and economic activities have been very clearly set out (ShramShakti, 1988). The 1991 Census, defines work as participation in any economically productive activity, including unpaid work on farm or in family enterprise. Viewed from the context of both energy output and economic contribution, all women can be considered to be working women, whether it is unpaid household work that they do or paid work. All work can be performed both within and outside the home.

Soon after delivery all the household tasks that the mother had performed till then, gets redistributed amongst the family members. After a period of rest which may vary from one mother to another, mothers start resuming their roles either partially or fully. The extents to which mothers are able to combine their breastfeeding role with other household roles depend on the support that they receive from family members. Of all the roles performed by women, the least understood is that of paid work. Poverty is considered to be a causal factor in driving mothers of young children to take up paid work to contribute to the family income. The question of when mothers of infants resume their economic roles after childbirth and whether it affects the infants’ nutritional status or not has not been very satisfactorily answered since many studies do not have any consistent results.
According to Shatrugna et al. (1993) this was because in the early seventies and eighties the definition of women’s economic work was very narrow and was based on ideas derived only from men’s work (i.e) working outside the home at one single task for 8 hours. Therefore only 25% of Indian women were considered to be ‘working’ while a large majority were left invisible as workers.

Leslie (1988) while reviewing 28 studies from 20 countries observes that most studies showed remarkably similar patterns of infant feeding practices between employed and not employed women. These studies focused narrowly on time available for breastfeeding and were based on the presumption that only work done outside the home would reduce such time. They consequently missed out on women working and earning within the home and grouped them as ‘non working’ women. Further they did not consider the phenomenon that the child’s own nutritional status might influence a mother’s economic decision.

Van Esterick and Greiner (1981) opine that much of the data regarding women’s work and breastfeeding has been poorly interpreted and insufficient attention has been given to enhancing the compatibility of breastfeeding and work. Narayanan (1997) reports that in a study conducted in TamilNadu on women’s multiple roles and the management of breastfeeding, a sample of 969 mothers were drawn from both rural and urban areas. More than a quarter, with 1-4 month old infants, had resumed domestic duties within the first month. Sixteen percent each in the second, third and fourth months respectively resumed domestic work and only 5% remained free at the fourth month. With regard to 5-12 month old infants, all had resumed their normal duties. However as the work roles increased, the percentage of women giving the least number of feeds also increased from 29% to 44%.
As regards unpaid family labour, two out of eighteen mothers of 1-4 month old infants and four out of thirty two mothers of 5-12 month old infants had resumed unpaid family labour. With regard to paid work, 42% of mothers with infants less four months old had resumed work. Thirty three percent had dropped out of work force and twenty five percent had indefinitely postponed resumption. In the 5-12 month old category, 50% had gone back to paid work. Mothers had not given up breastfeeding for work. They used several strategies for combining work with breastfeeding. Those doing paid work changed from organized to unorganized sector, those who had dropped out of work force suffered from economic loss and compensated by foregoing one meal.

2.2.6 Family characteristics

In the Indian context, the family, its type and composition, is one of the most powerful variables in influencing feeding practices. Padmini and Krishnamurthy (1988) studied the effect of family type on the duration of exclusive breastfeeding, total breastfeeding as well as on the practices of scheduled or demand feeding and night feeding. The sample consisted of 120 women, from a village near Coimbatore, in TamilNadu who had had at least one live birth within the five years prior to the survey. Longer duration of breastfeeding (8 months) was observed in mothers belonging to extended families than from those of nuclear families. This was because of the presence of other members who helped the mother to breastfeed, by doing her household chores or by earning.

The study suggested late supplementation but an early end to breastfeeding among mothers in extended families as compared to those in nuclear families. On the other hand a case study in Rajasthan (NCCS, 1991) pointed out that mothers living in joint families were so overburdened with work that they were too tired to prepare special food for their infants.
Jeeson and Richard (1989) based on their study of the effect of socio-demographic variables on breastfeeding concluded that the extended family situation was more favourable to breastfeeding. On the other hand Kumar et al. (1989) found that the type of family did not have a significant influence on the prevalence of breastfeeding. Thus the ability and willingness of family members to help mothers is what determines the feeding practices rather than family type per se.

2.2.7. Support Structures

The presence or absence of a supportive climate is held to influence infant feeding practices. Lingham (1995) outlines the forms and sources of support.

♦ Familial support - from the husband, family members and friends
♦ Professional support – from health personnel, breastfeeding support groups etc.
♦ Institutional support – baby friendly hospitals and clinics, social policies and legislation by the Government, programmes targeting the poor such as the ICDS, provision of paid maternity leave, creches, housing and transport by employees.
♦ Support from Media – indirect support by way of advocacy, campaign and dissemination of information.
♦ Instrumental or material support – such as sharing of domestic work, giving enough time for the mother to rest, cash support.
♦ Emotional and Psychological support – by way of developing positive attitudes towards feeding, fostering an effective mother child relationship and problem solving.
♦ Information – about successful management of breastfeeding and complementary feeding practices, growth of children.
The family is the core institution for knowledge and support to mothers for infant feeding. Mothers trust family members more than others. Narayanan (1997) studied women’s multiple roles in the management of breastfeeding on 969 mothers in Tamil Nadu and found that 44% had initiated breastfeeding with the support of relatives. When asked as to what sort of help they needed and expected from their families, they identified sharing of domestic work and allowing the mother to take some rest. Swaminathan (1994) points out that with increasing urbanization, nuclearization and the break down of the joint family system the participation of men in household chores has to increase.

While the family can undoubtedly offer support to mothers, in terms of emotional comfort, sharing of work and childcare, it has also the potential to influence the feeding practices negatively. Kapil et al. (1995) while studying the use of commercial weaning foods in a sample of 818 mother child (0-35 months) pairs, found that out of the sixty eight mothers who had used commercial food, 75% had done so on the advice of family members.

Professional support also plays an important role in feeding practices. Mothers rely on the advice of the physicians and nurses especially during hospitalization for delivery or in the event of illness of the children. Gopujkar et al. (1984) in a survey of infant feeding practices found that in Mumbai 10% of the infants studied, who were born in hospitals, were given pre-lacteal feeds with commercial infant food by the nurses. Use of infant food increased with the time duration between birth and the first breastfeed. In a study by Banapurmath and Selvamuthukumaraswamy (1995) the correlation between mode of delivery and initiation of feeding practices of mothers was studied in 1279 infants born in General Hospital. The practice of giving prelacteal feeds was minimum among mothers having a normal vaginal delivery (25%) as compared to delivering by forceps extraction (78%), vaginal with
episiotomy (60%) and Caesarean Section (93%). Socio-demographic factors like maternal age, socio-economic status, literacy, parity and sex did not have any influence on the feeding practices like initiation, administration of prelacteal feeds and number of breast feeds.

Banapurmath and Selvamuthukumarasamy (ibid) studied the influence of antenatal advice and postnatal advice to mothers who delivered by Caesarian Section on 251 mothers. The mothers were divided into three groups (i.e) 111 mothers who did not receive any advice, 90 mothers who received antenatal advice on early initiation and avoidance of prelacteal feeding and 50 mothers who received both antenatal and postnatal advice on lactation management. Only 0.9% of the first group could initiate breastfeeding within the first four hours as compared to 12% and 58% respectively of the latter groups. The incidence of prelacteal feeding was the least in the last group. The study infers that while antenatal advice is important, active postnatal assistance by professionals is more effective in early initiation of breastfeeding, especially in case of Caesarian Section.

Institutional support primarily comes from the Government by way of laws, schemes and programmes to promote the welfare of the mother and child. In India, the Infant Milk Substitute and Regulation of Feeding Bottles Act was enacted in 1992. This law, regulatory in nature, controls the marketing and distribution of infant milk substitutes and feeding bottles and also regulates hospital practices. While regulatory laws are necessary to strengthen breastfeeding practices, laws for protecting and promoting breastfeeding are equally essential to safeguard the rights of its citizens.

Two laws that protect maternity entitlements are the Maternity Benefit Act of 1961 and the Employees State Insurance Act of 1948. Both are applicable only to women workers in the organized sector.
Both these acts provide three months of maternity leave to women working in establishments employing 10 (sometimes 20) workers. However, if exclusive breastfeeding is to be practised for 6 months as recommended by health authorities, then the period of three months as provided under the law is insufficient to enable women to breastfeed, considering that many women may avail some amount of leave prior to child birth. Even though maternity benefits are available to some categories of workers, very few actually avail the facility due of lack of awareness (Swaminathan, 1993).

For women in the unorganized sector none of the maternity benefits are applicable, since the employer is not clearly defined as in the case of domestic workers who work in several households. It is not possible to pinpoint one particular employer for providing services. Schemes will offer security to these women workers for maternity benefits. In this respect Tamil Nadu was a pioneer in launching cash entitlement scheme called the Muthulakshmi Reddy Scheme in 1982. According to this scheme, pregnant women above the age of eighteen and below poverty line were entitled to receive an amount of Rs. 500 for the first two children, to enable them to stay at home after delivery in order to take rest and breastfeed their infants. This scheme renamed the National Maternity Assistance Scheme is now being implemented by the Central Government.

However there are weaknesses in the structure and implementation of existing schemes. The eligibility criterion of being ‘below poverty line’ rules out mothers who may lie just above it. Like the laws, the schemes also adhere to the two-child norm, denying the right due to the mother for performing her maternal role. They also violate the rights of the newborn to good health and nutrition, as set out in the Convention on the Rights of the Child ratified by India. Corruption, red tapism and lack of awareness have led to poor utilization. Narayan (1997) reports that in a study conducted in TamilNadu out of the 370 eligible women only half were aware of the scheme and only about one - third had applied for it.
Only about one-tenth received even partial payment, that too after several visits. Only 5-6% had received complete payment.

The major programme addressing the needs of children aged below two years of age is the centrally sponsored ICDS (Integrated Child Development Services) The earlier World Bank supported, State-initiated TINP (TamilNadu Integrated Nutrition Project) has now been integrated into ICDS and operates as a single programme under the title of World Bank Assisted ICDS III. Though having near similar goals, the approach, thrust, scale of operation, scope administrative and implementation strategies set these two programmes apart and gave different results in the prevention of malnutrition.

ICDS commenced way back in 1976 and addressed children between 0-6 years with an integrated package of six services (Shanta, 1997). One of them was providing supplementary feeding to pregnant and lactating mothers and to children from 6 to 36 months. Blanket coverage of the entire target group was attempted. The concept was more of less welfare based and the scheme has not undergone much change till now. About 2,86,829 children less than two years of age were covered through 10,090 centres (ibid).

TINP was launched with a clear-cut goal of reducing malnutrition among under - two children. The major departure in the approach to feeding was that only selective feeding of highly malnourished children was done till they were rehabilitated. In the case of mild to moderate malnutrition, the focus was to educate, help and empower mothers to feed their children within the context of the home. About 14,03,976 children were reached through 19,500 centres (Shanta, opcit).
The reduction in severe malnutrition varied from as much as 40 to 55% among children 6-60 months old. Among children 6-36 months of age severe malnutrition fell by 26 to 42% (Chidambaram, 1989). Though the project also suffered from the malaise of all Governmental-Programmes with regard to lack of community participation and ownership, the decision to move away from the concept of passive service delivery to one of empowerment and decentralization were major reasons for the comparative success of the programme over ICDS.

2.2.8 Class and Economic Status

A collaborative study was undertaken by WHO (1981) to enquire into contemporary patterns of breastfeeding in various strata of society in selected parts of the world including India. It was found that the breastfeeding rates at birth, for urban upper income, middle income, poor and rural communities were 96%, 96%, 99% and 100% respectively. At six months while the rate continued to be 90% for the urban poor and rural groups, it declined by 50% for urban upper income group. At twelve months the rates became 75% for the former groups and 10% for the latter. The reasons for such a decline are not very clear and there is no information on other aspects such as mothers’work status. According to Gopujkar et al. (1984) the better the economic status, the lower is the period of exclusive breastfeeding. In general the socio-economic class is negatively correlated with breastfeeding.

2.2.9 Infant Characteristics

The infant characteristics considered important in influencing the feeding practices of mothers are age, birth weight and sex. Sohoni (1994) reports that the criterion for introducing complementary feeding is very often determined by the age of the infant. Kamat (1990) and Srivatsava (1994) report that mothers thought that one year was the
appropriate age for infants to be given adult diets. Chavez and Martinez (1982) opine that children born with higher birth weight, are more active, cry and demand attention from their mothers, while low birth weight infants are less demanding and thereby do not get much attention.

Gender bias in feeding practices and in the nutritional status of infants have been reported in many micro level studies. Maini (1992) on examining gender bias in a rural area near Delhi, observed that, while the duration of breastfeeding was longer in boys with a minimum of twelve months to three years, only one fourth of the girls were breastfed for nine months. Supplementary foods before six months were introduced in 20% of the girls, while all the boys were exclusively breastfed for six months. Between six and nine months of age 52% of the boys and 36% of the girls were given food supplements while 49% of boys and 44% of girls were exclusively breastfed. In case of the girls mothers attributed the shorter duration to conception soon after the birth of the girl. The study also noted that in four families having twins, the girl twin was exclusively breastfed for a shorter period. Parents justified food allocation between the sexes on the ground that men being breadwinners needed special attention.

2.2.10 Home Environment

For a growing infant, the maximum period of time is spent within the home. When the infant becomes mobile, the immediate surrounding environment, can become a potential source of infection. The role of infectious diseases, especially diarrhoea, in causing malnutrition is widely recognized. In the urban context, the congestion and overcrowding within the home, can place the infant in a hostile environment.

2.2.11 Culture

Culture is known to influence feeding practices. Sachdev and Choudhury (1995) report that about 70 to 90% of newborns in India
are not fed colostrum (first milk). Most Indian studies have focused on practices considered detrimental to the health of the mother and the infant and very few have studied those that positively influence the practices. Narayanan (1997) observed that the cultural practice of going to the natal home for delivery enabled mothers to stay away from domestic chores, have greater rest and breastfeed the infants more number of times.

2.2.12 Media

The media, especially the visual medium, has been used to influence health practices, especially with regard to immunization (e.g.) pulse polio advertisements. Anand (1994) suggests that the mass media be used to provide appropriate information on breastfeeding practices. The media has been criticised as promoting commercial infant food, but there is little evidence in reported scientific literature to corroborate this statement.

2.3. Infant Feeding Practices

2.3.1. Breastfeeding Practices in the West

Fildes (1988) traces the history of breastfeeding in pre-industrial Europe and America. The attitudes and practices depended on the social class, religion, regional custom, climate and nationality. Prior to the mid-18th century, mothers from the upper and middle classes did not breastfeed their own children. This was attributable to several reasons. The bad environment in towns was known to be harmful for young children and their best chance of survival was to be suckled by a healthy countrywoman. The mother’s social life, diet and dress curtailed breastfeeding. The family’s lineage and the possibility of their wives’ quickly becoming pregnant again if they did not breastfeed were the reasons behind the employment of the wet nurse, by upper class husbands. The contraceptive benefits of prolonged breastfeeding were known and
were particularly a factor in the use of wet nurse by families of status.

The Catholic countries of Europe maintained many foundling hospitals and employed large numbers of wet nurses, who undertook this job not merely for money but also for birth control. The strict Protestant sects such as Puritans in England, America and the Pietists in Germany regarded breastfeeding of infants by mothers as a sacred duty to God. The Roman Catholic Church approved of wet nursing since it allowed the husbands of upper class their conjugal dues. There was no need to feel guilty about resuming family life if your wife was not lactating and the infant was not out of sight. Some mothers administered extra nourishment in the form of cereal pap or animal milk from cup soon after birth. In country areas of France and Italy when mothers or wet nurses had insufficient breast milk, animals such as goats, sheep and asses suckled infants. Thus, it cannot be said that suckled infants were always exclusively breastfed.

The 18th century saw several changes in infant feeding methods, some related to the early industrialization in Britain. The industrial revolution of the nineteenth century and the subsequent world wars in the twentieth century, brought a sudden change in the lives of the people who had to shift from a subsistence economy to one of wage-earning (Helsing and Savage, 1984). Many mothers with infants had to work outside the home and this created a market for commercial milk foods. Thus the infant food industry was born nearly a hundred years ago in the Western world. The decline in breastfeeding that occurred in most industrialized societies from 1930, was not simply due to the fact that women wanted to be relieved of the chore of breastfeeding. They did not have the support mechanisms for breastfeeding and were probably discouraged when difficulties arose (Helsing and Savage, ibid).
Infant mortality and morbidity were high among bottle-fed infants owing to nutritional deficiencies and diarrhoeal diseases. This caused concern and infant nutrition became an important topic in paediatric research during the first thirty years of the twentieth century in the United States and United Kingdom (Zetterstrom, 1994). Efforts were made to improve infant formulae that could be given safely to non-breastfed infants. A major breakthrough was the invention of the rubber nipple together with Pasteur’s work on milk hygiene and increased knowledge of human nutrition.

By the middle of last century, there was general agreement about the proper composition of infant formulae and after this the interest of the medical community in infant nutrition waned. From then on, in most of Europe and the Western world the baby food manufacturers practically became the custodians of infant feeding. As a result, the prevalence of breastfeeding started declining continuously in the industrialized countries.

In Sweden, it was about 90% at three months of age in 1945, but was as low as 20% in 1972. In U.K. it fell from 60% in the nineteen twenties to 24% in the 1970’s (Heinig and Dewey, 1996). About 15 years later a similar trend was seen in some urban areas of the developing world too. Sometime around the latter half of the last century, the attention of the infant food manufacturers shifted to the Third World mothers as they were potential target groups since they were forced to take paid work under poor conditions. When an increasing number of infants were formula fed, the consequences were disastrous since the formulae were often overdiluted and contained high levels of pathogens. Some paediatricians and health workers became concerned with the situation and started promoting breastfeeding. While the intentions of such exercises were honourable, the main limitation was in perceiving the situation as one arising from cultural failure rather than due to the changed social situation.
With increasing studies on breast milk, the Western scientists discovered that breast milk was the ‘golden standard’ of infant food (Zetterstrom, opcit). It became apparent that breast milk was not only necessary to save the lives of babies in the poor countries but was also of great value to infants in affluent countries. Thus the process of reversal began in U.K, U.S.A. and other European countries in the late 70s with the paediatricians showing an active interest to promote breastfeeding.

However it was an uphill task since the advantages of breastfeeding could not be easily shown given the modern conditions of housing and hygiene which made artificial feeding safe (Heinig and Dewey, opcit). Breastfed infants showed a small but statistically significant advantage over bottlefed infants. Studies of many medical bodies failed to show any difference between the serum protein levels weight gains or general health of breastfed and artificially fed infants. Long term studies were planned to show the cumulative benefits of breast milk.

At this juncture however, dangers of over-concentration was recognized through heaped scoops of milk powder leading to hypertonic dehydration indicating excess energy and solutes. This was appreciated by health professionals and as a result effort started in full earnest to promote breastfeeding. However manufacturers of infant foods responded quickly and developed novel infant formula with lower electrolyte content and reduced renal bulk.

Once again clinicians had to contend with a large majority of mothers unwilling to breastfeed given the improved standards of hygiene and relative safety in the use of breast milk substitutes which were made to exacting standards of manufacturing, packaging and nutritive quality. Promotional campaigns for breastfeeding were mounted and the advantages of breastfeeding such as interpersonal relationship and bonding between mother and child and the immunological and anti-
infective properties of breast milk were outlined. The efforts had dividends since a marked increase was seen in the prevalence of breastfeeding in the Scandinavian countries, within a ten-year period, between 1973 – 1983. In the next decade proportion of infants breastfed at 3 months increased from about 20% in 1975 to 40% in 1985 (Heinig and Dewey, 1996).

These issues were raised in many international and national seminars. Yet the place of breast milk substitutes was also recognised since it was essential in case of lactation failure, or when mothers could not breastfeed for social and economic reasons. However the need for tight control was agreed upon. The expert groups on infant feeding said ‘although human milk because of its variability cannot be used as an exact chemical model for the composition of infant food, it is still the most useful reference standard. Any departure from this would cause harm. Artificial milk should approximate to the composition of breast milk as nearly as is practicable’. The infant food manufacturers quickly implemented the recommendations of expert groups.

The need to create a conducive environment which, will encourage mothers to breastfeed as well as help them to gradually introduce complementary foods is slowly being realized. According to Armstrong (1995), campaigns urging women to breastfeed without enabling them to do so were mounted in the 1970s and 1980s. These campaigns amounted to training sessions for health workers on the advantages of breastfeeding and the dangers of the bottle. Health workers imparted these messages to mothers but they could not help mothers in handling practical difficulties.

Breastfeeding may not entirely be a smooth process. Studies of long-term breastfeeders in the US (Armstrong, ibid) found that when they were chronically undernourished, they tended to breastfeed less, as they felt their strength depleting. Nutritional, psychological and
other supports are necessary for these mothers. Mothers for whom breastfeeding is not easy going need confidence. Intrusive or authoritarian help giving too many rules for mothers and babies who are just learning about each other will only succeed in making mothers feel less competent.

The issue of failure to thrive and the need for nutritional rehabilitation has to be handled sensitively. To quote Armstrong ‘------ there is no such thing as a bad mother. There is only inadequate mother - child relationship’. Ironically breast milk substitutes are distributed effectively help for breastfeeding is not. By the end of the twentieth century there was a growing realization that breastfeeding is the right of both the mother and the child, and that it is the duty of the society to provide a favourable environment for mothers to breastfed.

The current scenario in the area of infant feeding in the west can be summarized with the observations of Zetterstrom (1994) who says “it is obvious that infant feeding is no longer principally the concern of only the infant food industry as it was 25 years ago. Instead, scientists in the field of paediatrics and nutrition are leading the trend and thus have recovered the possibility to direct future development”

2.3.2. Feeding practices in the developing countries

The advent of the baby food industry in the Third World brought about a decline in the rate of breastfeeding, though it started twenty to thirty years later than in their affluent counterparts (Villalpando et al., 1996). Stephen (1981) in his report to the 34th World Health Assembly stated that at least one million infant deaths in developing countries were due to diarrhoea and malnutrition associated with formula feeding.
As a result, the World Health Organization adopted an International Code of Marketing of Breast-milk Substitutes in 1981. This code elaborates WHO guidelines on the appropriate use and promotion of infant formula. Articles specifically cover the roles of health care systems, manufacturers’ responsibilities, food standards, labelling and quality standards and the proposed implementation and monitoring of the Code. In the following World Summit for Children, many nations, including India, were signatories to the Code and pledged to direct national efforts towards curbing and reversing the prevalence of formula-feeding in developing countries.

In Indonesia, 40% of mothers by the first month had introduced solids and in the Philippines, 34% of the urban elite had never breastfed (Baumslam, 1992). Still there was a high incidence of diarrhoea and subsequent malnutrition with a higher mortality rate in Indonesia, India, Bangladesh, Egypt, Pakistan, Thailand and Jordan. Thus the decline was found to be in the period of exclusive breastfeeding rather than breastfeeding rate itself. The marked shift from exclusive breastfeeding to mixed breast and bottle feeding with early supplementation was labelled as ‘triple nipple syndrome’. The new trend of giving both the breast and the bottle created confusion in the mind of the infant and also resulted in insufficient milk syndrome with subsequent decline in breastfeeding.

However there was a lacuna in many of these studies. Baumslam and Putney (1989) recognized the need for clearer definitions that would be more inclusive to capture the complexities in practices prevailing in the Eastern and Asian countries. The typology for infant feeding practices given by WHO was found to be limiting in that it simply never existed in real life. Further, many of the studies had not asked the reasons for introducing infant foods thereby limiting interpretation. In a few, the findings, though not explicitly stated, could be discerned for.
In Tunisia and Yemen duration of exclusive breastfeeding was longer when an older daughter was present in the house. In Bangladesh male infants were given the breast longer and female infants were put on dairy products earlier (Baumslam and Putney, ibid). Notwithstanding the inadequate methodological levels on infant feeding practices in the developing countries, the authors draw attention to the overall trend towards bottle-feeding with early supplementation and decline in exclusive breastfeeding.

The need for standard definitions for international comparability of the results of research studies was realized and in 1991 WHO convened a meeting of experts to reach a consensus on definitions of key breastfeeding indicators and specific methodologies for measurement. The terminologies recommended for use in research studies on feeding practices were, exclusive breastfeeding, predominant breastfeeding, timely complementary feeding, continued breastfeeding at one and two years of age and bottle-feeding.

In 1996 the first global data was prepared by WHO on exclusive breastfeeding rate of less than four months of age and the median duration of breastfeeding. The indicators for breastfeeding were best for South East Asia where nearly half of the infants were exclusively breastfed upto four months of age and the median duration of breastfeeding was 25 months. In the African region though the median duration of breastfeeding was relatively high - 21 months only, 19% of infants under four months of age are exclusively breastfed. The shortest median duration of ten months is found in the Americas.

In the European region, exclusive breastfeeding rate less than four months of age was only 16% though the median duration was eleven months. This was due to the fact that coverage was only 19% of all infants (i.e) 4 out of 50 countries. Moreover breastfeeding practices in
Turkey, which were closer to WHO recommendations were quite different from that of the rest of the countries in the region. It was estimated that 35% of the world’s infants less than four months age were exclusively breastfed.

While the WHO (ibid) report had recorded greater compliance with its norms by Turkish mothers, another study conducted on 206 mothers one to four month old infants in Turkish private clinics investigated feeding errors (Potur and Kalmaz, 1995). These were lack of exclusive breastfeeding, incorrect dilution of formula milk, incorrect dilution of cow milk, rice flour feed prepared with water and the use of rice water as a food. In 20% of the cases where the infants had received formula milk and in 14% of cases where the infant had received cow milk, it was found to be over-diluted by more than 40%.

In another study (Lipsky et al., 1993) the breastfeeding and weaning practices of mothers in two rural Mexican towns were collected through interviews and focus group discussion. Women preferred breastfeeding to bottle-feeding. Eighty percent had initiated breastfeeding at birth and sixty nine percent gave colostrum. Complementary feeding started by four months and influence of doctors and nurses sometimes proved negative.

Urban and rural as well as socioeconomic differences prevailed in African countries also. Okele and Onycchi (1994) carried out a survey of 512 mothers in Nigeria to study factors related to weaning. Ninety eight percent of mothers breastfed their infants but simultaneously introduced bottles. Rural mothers breastfed longer (12-18 months) while urban mothers breastfed only up to six months. The lower the socioeconomic status, the longer was the duration. Older mothers and those with smaller families weaned infants earlier than younger ones. Urban mothers substituted other foods as a method of weaning, while rural
mothers weaned by discouraging breastfeeding. The former introduced protein rich foods earlier while the latter introduced starchy foods. There was a high correlation between income level and introduction of protein foods. A high incidence of diarrhoea was noted in most areas, related to inadequate water supplies.

A cross-epidemiological national survey of breastfeeding practices was taken up in the Latin American countries of Argentina, Brazil, Chile, Colombia, Ecuador, Mexico, Peru and the Dominican Republic by the Latin American Pediatric Association in which was again repeated six years later (Schmidt, 1991). Data was collected from 7069 children, of the lower socio economic group of whom 6960 were alive and 109 deceased. In the first phase, 7% were found not to have received any breast milk, 63% were breastfed upto six months and 29% for more than six months. At three months of age 26 to 72% were breastfed without the addition of any other milk and 45 to 90% received water, juice or liquids as early as first week of life. The factors associated with incidence of breastfeeding were children living in rural areas, few persons living in the home, prenatal care, length of pregnancy and opinions of husbands.

In the second phase, an increase in colostrum ingestion was observed in some countries and a decrease in a few others. The percent of children receiving milk other than breast milk doubled with 16% (as against 7% in the first phase). However less liquids were given in the second phase than in the first. There was no difference in the two phases with regard to duration of breastfeeding. The breastfeeding campaigns in the intervening periods seemed to have positively influenced some practices like colostrum but do not explain the increase in the percentage of those who did not breastfeed. The author suggests better understanding of factors that influence habits so that realistic interventions can be formulated.
Ibrahim et al. (1992) studied the breastfeeding and infant feeding practices prospectively on 210 boys and 221 girls in a cohort of children in a rural Somali community for five years. Though the median duration of breastfeeding was 19.5 months, all the children also received cow’s milk by cup from day one. Exclusive breastfeeding simply never existed, though colostrum was not discarded. Energy supplements in the form of sugar and oil were given everyday from early infancy. Staples, protein rich foods (beans and meat) vegetables and fruits were usually introduced between 12 and 18 months. Energy reinforced cow’s milk and human milk dominated the diet up to the age of one year. The authors opine that some of the practices such as not discarding colostrum and the choice of some foods by this community are quite different from that of the general African community, though reasons are not given for the same. While the dietary pattern for children was quite satisfactory from one year onwards in spite of delayed introduction of solids, the consumption of unprotected pond water was a major threat to children’s health.

Buyukgebiz et al. (1993) attempted to understand the relationship between certain sociocultural factors and the duration of breastfeeding. A questionnaire was administered to 1500 mothers attending a well baby clinic and a hospital in Ankara. Giving colostrum, demand feeding, night feeding, feeding with both breasts, rooming-in and planned pregnancy were factors found to have a positive effect on the duration of breastfeeding. Factors having a negative association included the use of prelacteal foods, mothers’ education, and smoking and maternal employment. For employed mothers, paid maternity leave before and after delivery did not effect the duration of breastfeeding, but unpaid maternity leave had a positive effect. Since the study was hospital based, it does not attempt to analyse the other dimensions, such as family, time and support available to mothers to breastfeed and their health and nutrition status. These factors could probably have explained how and why maternity leave given to mothers, enabled them or prevented them from breastfeeding.
A longitudinal study of feeding practices followed by mothers of 110 infants in rural Bangladesh was carried out by Das et al. (1992). The homes were visited on every alternate day to enquire about the type of food and frequency of consumption. All infants were breastfed from birth up to one year. By the third month, 60% of the infants had started receiving milk through bottles and by the fifth month this percentage rose to 80%. The complementary food was highly diluted, especially in the case of tinned milk. Thirty to 40% percent of infants between six months to one year received family foods such as rice and vegetables. Rural mothers withheld protein rich foods and fruits during infancy. The study concluded that complementary feeding practices were poor and mothers needed training and motivation to provide adequate complementary food for children.

Jackson et al. (1992) conducted a prospective study of breastfeeding duration and weaning practices of sixty mothers in northern Thailand from the time of birth of their infants up to two years of age. Rice based foods were given from soon after birth. Eighty one percent of the sample had received complementary foods by six weeks of age. Early complementary feeding was associated with rural residence, large household size, maternal employment in agriculture and maternal age. Girls and infants with lower birth weights tended to be given complementary food earlier. However breastfeeding was prolonged, the median duration being 12 months. Early introduction of complementary foods and their quantity, consumed in the first three months were not associated with duration of breastfeeding. However those who gave infant formula as the first complementary food had stopped breastfeeding slightly, as did younger mothers living in households with more children.

The infant feeding practices in the Asian, African and Latin American countries indicated prolonged breastfeeding with early or
late complementary feeding. Both home based and infant foods were used as complements. The sociocultural factors influencing feeding practices varied from one place to another.

### 2.3.3. Feeding Practices in India

In India, of the two issues in infant feeding, namely breastfeeding and complementary feeding, the former has received much attention over the latter. Breastfeeding is a deep-rooted cultural practice and is universal at birth, amidst all sections of society, whether rural or urban, as reported in the WHO study on breastfeeding (1981). In the ancient system of medicine, Ayurveda, still practised in India, infancy is divided into eight periods (Athavale, 1977). The first known as Ksheerada is the period where the infant survives only on mother’s milk, and the second known as Ksheerannada is the period where the infant in addition to mother’s milk partakes of other foods. The time period for Ksheerada or exclusive breastfeeding is six months. The time period of Ksheerannada or complementary feeding is from six months to two years.

Since the approach of Ayurveda to health is holistic, concerning lifestyle, instructions are given on various aspects of maternal and child health. These include infant feeding, mother’s health, management of illnesses in both the mother and child, support to the mother, problems with lactation, ways of increasing milk supply, feeding the infant in the event of the mother’s death and during failure of lactation (Shastri and Venkatraj, 1949).

NFHS 1 and 2 data provide information on exclusive breastfeeding for different states in India (Table 2.1). Not only is there a wide variability amongst states, there have been changes, over a period of time, in a given state. The overall prevalence rate is 55%, with a slight improvement in the national average over a five year period. A twelvefold
increase has occurred in Punjab, where from 3% in ’92 -’93 the percentage has gone upto 36% in ’98 – ’99. This is followed by Haryana, Madhya Pradesh, Jammu and Kashmir, Orissa, Gujarat and Kerala.

Kerala was recently declared a ‘baby friendly state’ for its sound policies in promoting breastfeeding in the hospitals. Punjab was one of the first states to have introduced six months maternity leave for women employed in the organized sector. Though these activities by themselves would not have brought about a change in the behaviour of the mothers at large, they nevertheless could have happened only in an overall supportive environment for breastfeeding.

Of concern is the steep fall in exclusive breastfeeding practices in the North Eastern States of Arunachal Pradesh, Assam and Nagaland for which there is no ready explanation. However data for Arunachal Pradesh is based on 25 – 40 unweighted cases and has to be interpreted with caution. Delhi, Himachal Pradesh, Rajasthan and Tamil Nadu have shown sizeable decline. The prevalence is lowest in Goa. There are practically no studies from Goa or the Northeast on infant nutrition.

The states of Bihar, Orissa and Andhra Pradesh which have a higher prevalence of exclusive breastfeeding than Tamil Nadu are those which have low developmental indicators for female literacy, healthcare and socioeconomic status, Tamil Nadu which is next to Kerala in some indicators lags behind the aforementioned states. This suggests that socio-economic progress will not automatically confer ideal conditions for the continued prevalence of practices. Since progress brings both negative and positive changes, there is a need to study the changes that have occurred and their role in influencing the practices.
Table 2.1 Prevalence of exclusive breastfeeding, complementary feeding and use of bottle as a feeding device (in percentage)

<table>
<thead>
<tr>
<th>State</th>
<th>Excl. bf 0-3 mth (%)</th>
<th>Excl. bf 0-3 mth (%)</th>
<th>Bf + solids</th>
<th>Bottlefed infants</th>
</tr>
</thead>
<tbody>
<tr>
<td>'92-93**</td>
<td>'98-'99*</td>
<td>'92 – ‘93</td>
<td>'92 – '93</td>
<td></td>
</tr>
<tr>
<td>India</td>
<td>51</td>
<td>55</td>
<td>31</td>
<td>14</td>
</tr>
<tr>
<td>Delhi</td>
<td>20</td>
<td>13</td>
<td>25</td>
<td>36</td>
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<tr>
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<td>47</td>
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<td>18</td>
<td>40</td>
<td>25</td>
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<tr>
<td>Jammu &amp; Kashmir</td>
<td>17</td>
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<td>45</td>
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<tr>
<td>Tamil Nadu</td>
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While the NFHS survey has reported the universality of breastfeeding in both urban and rural areas at 96% and 99% respectively, of particular interest and significance is the rural urban divide, in which
55% of rural mothers as compared to 33% of their urban counterparts are exclusively breastfeeding at three months. It is the exclusivity of breastfeeding in the first three months, which is missing in the urban areas. Given the universality of breastfeeding and willingness of mothers to continue to breastfeed it is not clear as to what considerations have made urban mothers resort to early mixed feeding. According to Lingam and Makad (2001) prolonged breastfeeding amongst rural mothers from lower socioeconomic classes and with lesser education may be attributed to economic compulsions rather than to sound practices or knowledge.

Most studies have focused only on traditional factors such as religion (Singh et al., 1992) region per se (Pandey et al., 1997) community (Choudhuri and Chatterjee, 1991) and culture (Punia et al., 1997) and have not come to any conclusive decisions. Some studies point to differences in the practice on the basis of income, education, location of stay and employment discussed in detail in the earlier sections. Singh et al. (1990) observed that breastfeeding was more prevalent among non-working mothers than working mothers. With regard to maternal literacy, there is differing viewpoint on the duration of exclusive breastfeeding.

Sachdeva and Mehrotra (1995) conducted a study in the paediatric outpatient department of a hospital in Delhi, on 501 children aged 0-6 months. Mothers were interviewed on a pre-tested questionnaire at monthly intervals for six months. Exclusive breastfeeding till six months of age was given to 61% of children. Older and more educated mothers were positively related to exclusively breastfeeding. On the other hand, NFHS I and II data note that median duration for exclusive breastfeeding is 2.1 to 2.4 months for illiterate mothers whereas it is 0.6 and 1.3 months respectively for mothers educated till high school and above.

In contrast several studies highlight the influence of increased education and literacy in empowering mothers with greater
knowledge and ability to have healthier children with appropriate feeding practices (Gupta et al. 1991). Swaminathan (1994) offers several explanations for this behaviour. The changed social scenario with more educated women taking up paid work in the organized sector with inadequate facilities for maternity leave and the increasing number of nuclear families which have decreased childcare support for mothers are but a few of the reasons. On the other hand wherever family support was available, mothers, irrespective of their educational status continued to breastfeed. In spite of the differences at the micro level, on the whole the practice of breastfeeding is universal in India.

The time of initiation of breastfeeding is considered important by health professionals. It is essential to put the child to the breast within a few hours of delivery since colostrum or the first milk is rich in immunoglobins and anti-infective factors. There is no consistency when initiation is considered with regard to rural or urban location. Bahl and Kaushal (1987) report that 92% of mothers in rural Himachal Pradesh initiated breastfeeding on the first day. On the other hand Banapurmath et al. (1996) found that 65% of mothers in central rural Karnataka initiated breastfeeding by the second day. NFHS –1 data suggests an urban – rural difference in the initiation of breastfeeding. Breastfeeding started within one hour for 9% of rural and 11% of urban children and within one day of birth for 25% rural and 33% urban children. Changes over time in the practice is evident since NFHS – 2 data shows increased early initiation with 15% rural and 20% urban children being put to the breast within an hour of birth and 35% and 45% respectively within a day of birth.

Tribals were found to be initiating breastfeeding early, within 24 hours after birth as recorded by Vimala and Ratnaprabha (1987) among the tribal communities of Andhra Pradesh and Mudgal et al. (1979) among the tribals of Madhya Pradesh. The NFHS 1 and 2 data have recorded the early initiation of breastfeeding in women with more
education and those delivering at a health facility by a health professional. Mode of delivery is reported to have an effect on the timely initiation of breastfeeding. Mathur et al. (1993) and Pai (1999) conclude that women delivering by Caesaerian Section (CS) tend to initiate breastfeeding late as compared to those who have a normal vaginal delivery (23% CS as against 57% vaginal delivery). On the other hand Kapil et al. (1992) showed that a large majority of mothers delivering at All India Institute of Medical Sciences, New Delhi, initiated breastfeeding within 24 hours inspite of a CS delivery. Though not explicitly stated, it is presumed that these mothers would have been motivated by the concerned health staff to initiate breastfeeding.

According to Anand (1994) few health professionals are adequately trained to give support to the mothers for breastfeeding. An effort at influencing hospital practices was the Baby Friendly Hospital Initiative (BFHI). It is a global effort at influencing hospitals to provide support to the mother before, during and after delivery to have a joyful breastfeeding experience. A code termed ‘Ten successful steps to promote breastfeeding’ has been evolved and hospitals which implement this code successfully, are termed Baby Friendly Hospitals (Anand, ibid). While appropriate hospital practices are essential for establishing breastfeeding, it is important that counselling be continued afterwards and extended to other family members so that the mother gets the support of family members to breastfeed. The role of professionals is pivotal since mothers and families trust and follow the advice of doctors.

Most authors attribute reasons for the delay in the initiation of breastfeeding as well as the introduction of prelacteal feeds (feeds given to the infant before initiation of breastfeeding) to inadequate or false knowledge, tradition or physical inability. While tradition plays a positive role in ensuring breastfeeding, it might actually hinder where other recommended practices are concerned (Lingam and Mankad, 2001).
According to Gathwala and Narayanan (1992) prelacteal feeds are commonly given when there is a delivery by CS causing separation of mother and child sometime for over a day, delaying initiation. This however does not rule out the role of traditions and beliefs, since amongst mothers who had a normal vaginal delivery only 38% did not give prelacteal feeds. Gopujkar et al. (1984) found that the longer it takes to initiate breastfeeding the greater is the use of prelacteal infant foods. Age, parity, education, income as well as urban rural differences were not correlated to the practice of administering prelacteal feeds as observed by Banapurmath and Selvamuthukumarasamy (1995). They are administered in the belief that they clear the bowels and milk is inadequate in the first few days after birth.

Regarding rejection of colostrum, data compiled by NFHS 1 and 2 give a high incidence of discarding colostrum in both rural and urban areas in India. According to Lingam and Mankad (2001) though there is high incidence of rejection of colostrum, research does not support the view that Indian mothers universally discard colostrum. There is no clarity on how much milk and for what period needs to be expressed and discarded to conclude that colostrum has been discarded. The authors advocate a clear cut definition of colostrum.

UNICEF (2000) has disputed the claim of 55% of exclusive breastfeeding in India by NFHS 2 data, since the Multiple Indicator Cluster Survey (MICS II) carried out by UNICEF places the percentage at 15.6%. According to UNICEF, the MICS II findings have clearly shown the difference between the two ways of asking the question about exclusive breastfeeding from the respondents. When asked whether they had provided any solid or liquid within the past twenty-four hours, 36.8% of them said that they did not. However when asked about exclusive breastfeeding since birth, the number was merely 15 percent.
According to MICS II data, the proportion of children receiving both breast milk and supplements increases from 10 percent in the first month of life to 49.4% percent after six months and 81% at twelve months. Thus care in phrasing the question can make a big difference to the results.

There is prolonged duration of breastfeeding with more than 80% of the mothers feeding upto one year of age (Narayanan, 1997). Breastfeeding often continues into the second year. The NFHS 1 and 2 data have computed the duration of median length of breastfeeding (point above which 50% of the mothers have stopped breastfeeding) to be a little over two years. According to the NFHS I data, the highest continued breastfeeding rate for children aged 20 – 23 months occurs in West Bengal (84%) and the lowest rate occurs in Tamil Nadu (36%). The report notes that more ‘modernised’ mothers (urban or educated mothers and those exposed to mass media) breastfeed for a shorter duration.

With regard to complementary feeding already discussed in the earlier section the following highlights emerge from the review:

♦ In India, there is tremendous disparity with regard to introduction of semi-solids according to states, ranging from delayed introduction, beyond 12 months to early introduction (NFHS 1)
♦ Foods available or prepared in the home are usually used for complementary feeding (Gillespie, 1997). However the use of commercial infant foods is on the increase even among poorer sections of the society and is often over - diluted.
♦ Use of feeding bottles is sparse, except in Goa where 67% use bottles (NFHS 2)
♦ In general very little is known about the quantity and quality of complementary foods especially with regard to micronutrients or how infants make the transition from mother’s milk to liquids, semi-solids and family foods.
Though studies on the microbial quality of complementary foods are few, they point to the high prevalence of E.coli. organisms, in poor households (Ghuliani and Kaul, 1995).

For all aspects studied there is wide inter – state variability and rural - urban differences pointing to the diversity of these practices (Lingam and Mankad, 2001)

Practice is conditioned by constraints related to work status and time availability of mothers and availability of secondary caregiver (Narayanan, 1997).

2.4 Nutritional status of Infants

While the importance of the period between birth to two years was always known the need to have desegregated data about this age group is being increasingly recognised. Except for a few research studies on infancy especially in the last two decades (NFI, 1989) the references to infancy per se in literature are comparatively less and much go under the broad categories of under- five and under- threes (NFHS 1). Longitudinal studies on infancy are few compared to cross-sectional ones. Hence very few studies have analysed the pattern of growth over a time period, while most have studied nutritional status at a given point of time.

Intra-uterine life is the starting point for growth. Any impediment to growth during this period gets reflected as low birth weight in the new born. Low birth weight children suffer from a higher incidence of morbidity and mortality than their counterparts born with adequate weight irrespective of feeding practices, Bhargava et al.. (1984). The relative irreversibility of the negative impact of low birth weight was borne out in studies conducted on orphaned Indian children adopted and brought up in affluent Swedish homes (Sachdev and Choudhury, 1995). Children who were stunted on arrival in Sweden with values for height/age below –3 SD continued to exhibit lower height for age than those who were not stunted on arrival. Onset of puberty occurred earlier
by one year in the adopted Indian children than in their native Swedish counterparts. The tragedy of LBW is that, childhood in children gets shortened due to early puberty, which cannot be offset by optimal conditions later in life.

Other developing nations, especially Bangladesh, show similar trends as far as birth weight and subsequent growth are concerned. In a study on infant growth patterns in the slums of Dhaka, Arifeen et al. (2000) reported that while the mean birthweight was less than 2.5 kg, 46% of the children had a birthweight lower than that. Seventy percent of them were small for gestational age (SGA). Upon measuring the growth pattern it was noticed that the mean weights of the infants closely tracked that of – 2SD of the WHO pooled breast-fed sample. Weight differences by birth weight, SGA or preterm categories were retained throughout infancy. Catch- up growth was limited and weight at 12 months was largely a function of birth weight.

Ghosh (1999) points out that these small babies grow up to be small adults and in the case of girls, mothers with a small stature who, in turn, give birth to LBW babies - the intergenerational cycle of growth failure. Maternal determinants of low birth weight have been identified to be age at marriage, parity, and quality of antenatal care, Nair et al. (2000). Amin et al. (1993) found that social factors influencing low birth weight could be countered with intervention strategies.

According to NFHS 2 data, of the undernourished children in India under three years of age, 46% are stunted, 47% are underweight and 16% are wasted. In Tamil Nadu, the prevalence rates for stunting, underweight and wasting are 29%, 37% and 20% respectively. On an average twenty eight percent of infants in India who reach the age of one year are wasted and 63% are stunted but this declines slightly thereafter. In three year old children, stunting reaches a peak of 67% (Ghosh, 1999).
Micro-level cross-sectional studies also reflect a similar pattern of origin of wasting in infancy followed by stunting peaking at the second and third year of age. In an urban slum of Calcutta, Sen (1994) found that 24% of infants between 0 – 11 months were suffering from Grade 1 malnutrition while nearly 5% and 4% respectively suffered from grade II and III malnutrition. Steinhoff et al. (1986) surveyed pre-school age children in rural Tamil Nadu for the nature and type of malnutrition. Fifty percent of the 12 to 60 month old children were underweight. The nature of malnutrition varied with age. At 12 – 23 months of age both stunting (in 43%) and wasting (in 36%) were common. In contrast at 48 – 60 months, 60% were stunted but only 14% wasted.

Abel and Sampathkumar (1998) carried out a similar survey of pre-school children in the same region more than a decade later. The prevalence of stunting and wasting had decreased considerably at 27% and 19% respectively with combined stunting and wasting at 10%, attributed partly to the WHO ‘Health for All’ campaign. Though severe wasting was absent, the sample children suffered from severe stunting and underweight.

Though not explicitly stated, implicit in the findings is a definite pattern leading to the prevalence of malnutrition in infants. Deprivation in infancy leads to frank undernutrition by the end of the first year, manifested as wasting. Since wasting is defined as inadequate weight for height, the adaptation of the body to a reduced nutrient intake starts taking place by one year of age. Probably the gap between what is needed by the body and what is obtained keeps increasing, such that the potential to grow gets curtailed, manifested after two years of age as stunting.

The causal factors for growth faltering are several. Socio-economic conditions were cited by several researchers as the causal factors for growth faltering. In Stockholm socio-economic differences
amongst Swedish children were observed over a period of time. Till the 1950s, children from upper socio-economic class were significantly taller and heavier than those of their less privileged counterparts, Lindgren et al. (1994). This trend disappeared amongst children born in 1954, only to reappear in children born in 1964. This pattern of appearing and disappearing was interpreted as mirroring the socio-economic conditions in Swedish society. In a study of risk factors for under-five children in Brazil, family income and father’s education showed the strongest association with nutritional status, Victoria et al. (1988).

Researchers found that even in underprivileged environments, where both food supply and health care are chronically short, there were well-nourished individuals (Pivoz and Viteri, 1985). Even in disadvantaged situations, there were women who could cope and manage to rear healthy children (Greaves, 1979). Termed as ‘positive deviants’, these children showed better growth than their peers living in the same environment and exhibiting ill health and growth retardation.

In 1991, Shekar et al. provided an important conceptual enhancement to the understanding of negative and positive deviants. The concept of positive deviants was further refined and suggested that there were negative deviants as well as median growers. The mechanisms producing positive and negative deviants are not always opposites or mirror images of each other. They could operate simultaneously and the comparatively dominant one could be the ultimate determinant of the child’s nutritional status.

Shekar et al. (ibid) outlined the hypothesis that negative and positive deviance be viewed as two different conditions, rather than as two ends of a continuum. In a study in which data was collected from 3122 children from 42 villages in Tamil Nadu, of the fifty-two variables studied, twenty-three differentiated the positive deviants from the median
growers and 12 differentiated the negative deviants from the median growers. The authors explain the occurrence of deviants as due to gender preferences of mothers. Mothers of the median growers had the greatest desire for female children and least desire for sons. While opposite in their desires were the mothers of both positive and negative deviants who showed overt preference for male children. The overt gender preference for male children was outweighed by other factors such as greater family wealth, which promotes positive deviance. The gender preference of mothers did not become a significant factor for the growth of the child.

On the other hand, a study of positive deviants, median growers and negative deviants in 150 children from six to thirty six months in the urban slums of Mumbai showed that, the ability of the mother to use available resources wisely was the main determinant of whether a child was a positive or negative deviant (Merchant and Udipi, 1997). Mothers of negative deviants often used their resources to purchase luxury items such as television sets or gold jewelry, whereas the mothers of positive deviants made more intelligent choices by spending their available income on nutritious foods such as green leafy vegetables and fruits for feeding their children, or by seeking timely medical help. The mothers of negative deviants also failed to perceive that their children were growing poorly and could not prioritize health problems.

The authors noted that the power of the mothers to make decisions has also influenced whether the child became a negative or positive deviant. Mothers of undernourished children had less freedom to take their children to a doctor in major illness due to the following reasons. A very young age, lack of family support, inability to attend social functions thereby losing the opportunity of interacting with other women and the presence of a mistress which drained the family resources as well as causing psychological stress to the mother, were found to be the associated with negative deviants.
The effect of malnutrition in increasing the risk of morbidity in young children has also been recorded. In a study of children less than 2 years of age in the Phillipines, Yoon et al. (1997) observed that nutritional status as measured by weight-for-age was a significant risk factor for both acute respiratory tract infection (ALRI) and diarrhoeal mortality in the first two years of life. For ALRI mortality a one-unit decrease in weight-for-age z score resulted in a 1.7 fold increase in risk and for mortality combining ALRI and diarrhoea the relative risk was 2.

Becker et al. (1991) put forth the rationale that interventions aimed at improving dietary intake of children may be as important a factor as control of infections in poor environments. In a prospective study of seventy children 5-15 months old in two villages in Bangladesh, monthly weight gain was to be inversely related to the number of days of diarrhoea and positively related to energy intake per kilogram of body weight.

The concept of growth monitoring was promoted in India through the ICDS and regular monitoring of growth is necessary for identification of growth faltering. A growth chart for every child from birth to six years was expected to be maintained by the local balwadi teacher who was supposed to use it as a tool for educating mothers to understand and see how their children grew. If any faltering of growth was identified the mothers were to be given ‘nutrition education’ and the child was to be enrolled in the supplementary feeding programme.

Efforts were undertaken to study the effectiveness of growth monitoring in 12 villages in Tamil Nadu by George et al. (1993). Of these 6 villages served as ‘control’ villages wherein the investigators gave health and nutrition advice to mothers without the growth chart. In the rest of the 6 experimental villages, the same advice was given with the growth chart. After an evaluation exercise at the end of the programme, in which no significant improvement in the growth status of children was
visible in the experimental group, the authors question the effectiveness of the tool.

However the authors have not considered the possibility that it takes time for a behavioural change to occur and even more so for its effect to appear in a tangible measure. Other constraints to mothers by way of lack of time and decision-making power might have operated. Further it is important for mothers to have the correct scientific information on aspects of health and nutrition that concerns their childrens’ welfare, irrespective of whether they appear to use it or not.

The NCHS/WHO standards have been recommended for use in growth and surveillance studies for international comparability. Of late, concern has been expressed that the NCHS/WHO curves are inappropriate for healthy breastfed infants (Onis and Habicht, 1997) since the standards have been evolved based on the growth pattern of formula fed babies. In reviewing the growth of breastfed infants who live under favourable environmental conditions in different parts of the world, a WHO working group found significant differences between the growth patterns of these infants and that reflected in the NCHS/WHO references (WHO, 1995). They grew less rapidly and deviated significantly from the reference group.

Considering the clinical and public health significance of these differences, and the risks associated with too early and too late introduction of complementary foods it was concluded that the current growth reference has limited value as a tool for the optimal nutritional management of infants. However till such time as other standards are available, the current standards have to cautiously used for exclusively breastfed infants upto six months of age. Hautvast et al. (2000) collected cross-sectional data for 518 breastfed infants in rural Zambia to evaluate the effect of applying two different data sets as reference (ie) WHO pooled data set and NCHS reference set. Prevalence of malnutrition in terms of
stunting, underweight and wasting was estimated. Anthropometric z scores calculated by using the breastfed data set were lower during the first 6-7 months of life compared with those calculated by applying the NCHS growth reference. This resulted in a higher proportion of infants aged 0-6 months being classified as stunted and underweight when using the breastfed data set versus NCHS growth reference set. Similar prevalence for stunting and underweight with little wasting was observed after 7 months. The development of a new growth reference is recommended.

Sheard (1994) shares a similar observation while reviewing the work done by Dewey et al. (1992), who examined the growth pattern of infants who were fed either breast milk or formula as their sole source of milk during the first year of life. About 40–50 infants in each group were studied. The two cohorts were matched for infant birth weight, gender, as well as parental socioeconomic status, education level and ethnicity. Introduction of solid food occurred no later than four months of age in either group. Home visits were made monthly from one to 18 months of age and height, weight and head circumference data were collected.

Formula fed infants weighed more than those who were breastfed at each monthly time-point between seven and 18 months in males and between six and 18 months in females. There were no significant differences in length. The weight of both groups was above the 50th percentile during the first six months of life. The weights of breastfed males fell below the 50th percentile after eight months of age. The study does not address the issue of whether growth in breastfed infants is delayed or whether growth in formula fed infants is accelerated. Infants were from a single ethnic and geographic entity with higher birth weight and so a generalized conclusion cannot be arrived at. Sheard (opcit) concludes that exclusively breastfed infants are not nutritionally at risk and more data is required on the differences in growth, energy expenditure and
food intake of breastfed and formula fed infants. Use of feeding practices as a dependent variable in generating national reference data is necessary.

Feeding practices of mothers or caregivers chiefly influence the nutritional status of infants. A nutritional surveillance survey was carried out in 25 villages in China covering about 3564 children (Chen and Taren, 1995). More than 90% of the infants under 6 months of age were breastfed as against 75% and 26% at twelve and twenty four months respectively. As against 15% of infants who ate solids at six months and 58% at twelve months in 1984, 23% and 78% were given solids respectively in 1988. The infants showed comparable growth as per international standards for the first few months of life, after which weight-for-age and height–for-age z scores deviated significantly. Prevalence of micro nutrient deficiencies was also observed. The study records that though breastfeeding was maintained complementary foods were introduced at an early age due to expanded health care availability and economic changes.

Rao and Rajpathak (1992) investigated the role of breastfeeding and complementary feeding on the nutritional status of 150 infants from low socio economic class (LSE) and 75 from high socio economic class (HSE). Height and weight were measured. Almost all artificially fed infants in LSE class were malnourished while this was not so in HSE class. This indicated the better adherence to hygienic practices by mothers in the latter group. However among the underprivileged, the prevalence of malnourished children given breastfeeding along with complementary foods, was comparable to that of exclusive breastfed children and was significantly lower than that of the artificially fed group, indicating protective effect of partial breastfeeding. The authors conclude that the real problem appears to be lack of knowledge in handling and giving weaning foods in adequate quantities. They offer education of mothers as the solution.
However Merchant (1993) puts forth quite another view on the relationship between feeding practices and nutritional status. The type of feeding and other constraints faced by the mothers have a role in determining positive and negative deviants and median growers. While studying 6 – 36 month old infants, three type of feeding situations were observed which made the children significantly different from each other with regard to nutritional status. Thirty six percent of negative deviants fed themselves without any supervision and encouragement from their parents as against 2% of median growers and 16.3% of positive deviants. A similar trend was observed with regard to the percentage of children who shared food with their siblings and who were left in the care of older siblings or neighbours. Mothers of positive deviants took a more active interest in feeding. Many expressed being overburdened with other responsibilities with little time for childcare especially feeding. The problem with mothers of negative deviants was inability to utilize time wisely.

According to Golden and Golden (1991) in Jamaica, dietary intake of infants in poor households is reduced by anorexia caused by monotony of the diet. This is further accompanied by infections as well as by the deficiency of specific essential nutrients in the diet, such as essential amino- acids. Food supplementation studies reported little improvement in weight or height gain, in spite of being offered large amounts of dietary energy due to anorexia caused by infection, specific nutrient deficiencies and imbalanced diets.

Powell et al. (1995) studied the effect of supplementation in 127 stunted children in Jamaica between the ages of 9 – 24 months. There was no consistent change in weight-for-height or head circumference. However height gains in the first year predicted change in mental age and hearing and speech in the second year. Supplementation had an effect on development independent of growth. The benefits of supplementation on
development and the extent to which they were shared with growth varied among the subscales.

In Jamaica Walker et al. (1992) studied the effect of supplementation on the morbidity profile of 9 – 24 month old children. Weight gain was measured in two monthly intervals and increment in weight showed significant reduction in coughing, apathy, anorexia and diarrhoea. In non-supplemented children, there was reduced linear growth with increased lower respiratory tract infection. However effects of morbidity on growth were transient and morbidity was unlikely to be a major cause of malnutrition in the long run.

According to Myers (1990) it is not only the food but feeding which also determines the nutritional status of children. Feeding is not only a nutritional activity but is also a social activity with psycho-social development purposes. The quality of this interaction will determine the amount of food the child is able to demand and ingest. Interactions during breastfeeding and bottle-feeding as well as during meal times can encourage or discourage proper feeding while helping to satisfy important developmental needs. Neuman et al. (1992) studied infants’ nutritional status and supplementary food calories in relation to infant behaviour and abilities at six months of age in Kenya. Larger infants were found to smile and vocalise more than shorter infants. A relationship was observed between Bayley mental score and infant length and supplementary calories. Chavez and Martinez (1982) opine that growth faltering or stagnation in weight gain is only a later sign of malnutrition. The behavioural differences between a hungry child and a satisfied one appears much earlier. With continued assault, behaviour adaptation starts taking place with decreased activity level and ultimately leads to growth faltering.
2.5 Conclusions

A review of existing material has highlighted the fact that lactation and breastfeeding are two distinct issues. The former is the ability of mothers to respond to the infants’ demand for milk and the latter is the act of giving the child the breast. Some authors argue that the ability of mothers to lactate is not affected by their nutritional status, since there is no discernible decrease in their nutritional status. Further no threshold level has been identified for maternal characteristics, below which one may say that lactation and breastfeeding are affected. Even poor maternal diets have not affected output.

However the pioneering global study by WHO (1985) which compared the lactating performance of mothers from various socio economic and ethnic groups, showed that the issue of lactation and breastfeeding is an interplay between infant demand and the maternal ability to cope with it. Poor nutritional status affects milk production but may not lead to crisis so long as the infant’s needs are met. An argument has even been put forth (Gopalan and Puri, 1992) that since infants born to malnourished mothers are themselves undernourished there might be a lower demand and hence no threat to the mothers’ potential to lactate.

However the study by NFI (1988) in the three cities of Chennai, Mumbai and Calcutta has shown, that the demand and supply mechanism is a finely balanced one and can disintegrate at any time and even have a negative effect on the mother. The study showed that mothers with a body weight below 38 kg could not maintain exclusive breastfeeding and had to resort to complementary feeding. Further they lost 4 kilograms of body weight.

While the above studies have focused on maternal nutritional status, some have looked at the adequacy of lactation from the perspective
of infants’ nutritional status. Growth faltering has been used as the major criterion for deciding adequacy of need. In affluent populations there is no difference in the growth of fully breastfed infants and those given complementary food and hence complementation is unnecessary. In disadvantaged population groups a similar situation prevails in the period between four and six months. However there is an increased risk of infection warranting exclusive breastfeeding. While the concern to health due to lack of hygiene and contamination is genuine, Chavez and Martinez (1982) argue that even before growth faltering, there is behaviour faltering. Infants of undernourished mothers while facing inadequacy or on the pathway to being malnourished reportedly show less active behavior.

If lactation is a complex issue, the practice of breastfeeding is not simple either and is influenced by several factors. These factors do not operate uniformly in all environments with the result that even mothers with the potential to lactate may not be able to do so for (eg) the question of whether paid work affects breastfeeding or not is dependent on what support mothers get for maternity leave and how far they are empowered to combine work with feeding.

In general studies have focused more on the well being of infants rather than on the mothers. Thus the argument of Lingam and Mankad (2001) about the lack of focus on the mother and her environment appears justified. The WHO norms, though considering the lack of information on mothers’ nutritional status nevertheless recommend six months of exclusive breastfeeding keeping in mind the dangers of infection through complementation. It cannot be denied that the ideological basis of this recommendation is child centric.

When compared to breastfeeding, complementary feeding has comparatively attracted less attention. The focuses of most studies has been on the foods given, devices used and the timing rather than on the process
of feeding, the choices and options available to the mother and how the infant gets initiated into the process. Gillespie (1997) points out that the problems associated with breastfeeding are equally true for complementary feeding and unlike breastfeeding are more complex, since the adequacy, suitability and hygienic nature of the food has to be externally managed.

Studies which explore the constraints and opportunities that mothers face for infant feeding, and the options available to them are very few. Further most of the studies have focused either on the mother or on the infant, with very few looking at it as a dyad. Those that have linked feeding practices and growth are even fewer. When early complementary feeding was always considered to be detrimental to the growth of infants, the observations of Anandiah and Choe (2000) that in fact it might prove beneficial to infants is a challenge that needs more exploration.