CHAPTER - II

REVIEW

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The review of relevant literature for the present study have been discussed.

2.1 History

The pioneer of longitudinal studies of child development was Bird T. Baldwin (1921) in U.S.A. In fact right upto 1952 the majority of growth studies came from the U.S.A. Baldwin had a long line of distinguished successors including Stuart, who as Director of the Harvard Child Health Study was the first to incorporate in his data, systemic records of social circumstances and clinical events. In longitudinal studies each child is observed for part of his development period. This had been exemplified by the longitudinal studies at the Bruch and Harvard School of Public Health (Jena, 1997).

The Oxford survey as designed by Ryle, Russel and Kemp had the limited objective of examining 500 local children at regular intervals between birth and 5 years of age and assessing their home background. The children were examined, weighed and measured at regular intervals and the records were standardized. Since development and disease would depend to some extent on income and locality, the children represent different economic levels and from different parts of the city, growth pattern also depends on inheritance, but it was not at first realised that comparisons of parents and children and unrelated children offer good opportunities to recognize the genetic components of normal growth.
Like Oxford, the London survey was also based on local samples following the American pattern.

2.2 Growth and Development

Growth and development of children is a continuous and orderly process. Sequence or pattern of growth in children is comparable but the rate is not always uniform (Ghai, 1996). Assessment of growth and development is the most powerful epidemiological tool for early identification of children, who may not look apparently sick but who still have sub-optimal health and nutrition or are suffering from dormant illness remedial interventions tried at this point of time are much more effective for prevention of disease and promotion of health.

2.3 Anthropometric measurements

The term anthropometry was first coined by Lambert Adolphe Faqyes Quetlet in 1836 and subsequently has been used by several workers to assess growth and development. Guillot in 1852, probably was the first scientist, who used serial weight and height records as the basis of the health status and adequately of the breast milk feeding (Jena, 1997)

In 1933, Bigwood suggested standard procedures like height and weight records to differentiate the healthy from the unhealthy group. W.H.O. also recommended the use of anthropometric criteria in conjunction with clinical methods as the basis of assessing the prevalence of malnutrition and its geographic distribution.
It has been obvious that while anthropometry can provide a sound assessment of growth stunting and wasting it is not equally sensitive to all forms of sub clinical PEM, and this is why nutritionists have become interested in additional ways of assessing nutritional status (PEM) too. Several workers (Gupta et al., 1974; Kumar et al., 1975, Bakshi and Bhandari, 1977; Sen et al., 1980, Agarwal et al., 1980, Geetha et al, 2002; Agarwal et al., 1983; Sood et al., 1984; Gupta et al., 1985; Kumar et al., 1985; Kapil et al., 1988; Sharma et al., 1989; Seth et al., 1990), Math, 1995, Vijayaraghavan et al., 1998 have used nutritional anthropology for the assessment of nutritional status of the children.

Anthropometry predominates over other methods of nutritional assessment. Weight for age is used quite often for nutritional assessment. Weight reflects a complex summation of many processes, but height/length is a measure, only of linear growth.

The concept of "Nutritional dwarf" for impaired growth in both weight and height was introduced by Jelliffe in 1959. He also considered the stand radiation of measurement techniques of primary importance.

Some workers reported that velocity of weight is not altered even till the end of six months and that there is no differences in growth between solely breast feed and partially breast fed infants (Chandra, 1981).

Height-for-age and weight-for-height are often more useful tools for defining an individuals nutritional status than is weight for age, which does not take into consideration, the height deficit caused by chronic malnutrition, of all
the anthropometrical measurements used in nutritional studies, weight is usually as the most meaningful if regular sequential weighing is to be carried out (King et al., 1972),

2.4 Classification of PEM (protein – energy – malnutrition)

Several classification have been proposed for grading malnutrition but the one suggested by Waterlow (WHO) has been accepted by the Indian Academy of Pediatrics with minor modifications. The WHO (1978) has recognized the need for a growth chart which could be used internationally particularly by primary health care workers. Reference values of these charts examined by the WHO group where derived from data collected in Mexico, Netherlands, Sweden, Switzerland, U.K. and USA (Gomez, 1956, Waterlow et al., 1977, Karlberg 1976) in consultation with experts from various parts of the world and field tested in 10 centres of different countries in 1974.

2.4.1 Weight-for-age

Jelliffe (1959) classified PEM in four groups on quantitative basis.

<table>
<thead>
<tr>
<th>Group</th>
<th>Weight Range</th>
</tr>
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<tbody>
<tr>
<td>I</td>
<td>81 – 90 % of standard weight</td>
</tr>
<tr>
<td>II</td>
<td>71 – 80 % of standard weight</td>
</tr>
<tr>
<td>III</td>
<td>61 – 70 % of standard weight</td>
</tr>
<tr>
<td>IV</td>
<td>60 % or below 60 % of standard weight</td>
</tr>
</tbody>
</table>

In 1972, the nutrition sub-committee of the Indian Academy of Pediatrics (IAP) proposed the popular IAP classification of malnutrition again on
the basis of the Harvard reference of population (80 % as the cut off point between normal and malnourished).

<table>
<thead>
<tr>
<th>Group</th>
<th>Weight Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>80 % of standard weight for age</td>
</tr>
<tr>
<td>Group – I</td>
<td>71 – 80 % of standard weight-for-age</td>
</tr>
<tr>
<td>Group – II</td>
<td>61 – 70 % of standard weight-for-age</td>
</tr>
<tr>
<td>Group – III</td>
<td>51 – 60 % of standard weight-for-age</td>
</tr>
<tr>
<td>Group – IV</td>
<td>50 % or below 50 % of standard weight-for-age</td>
</tr>
</tbody>
</table>

2.4.2 Height/Length-for-age

It reflects achieved linear growth and its deficits indicate long term length and stature are also used.

I. Morley’s classification

- Dwarf : 80 %
- Short : 80 – 93 %
- Normal : 93 – 105 %

II. Vishveshwar Rao’s classification

- 80 % of the standard : Poor
- 80 – 90 % of the standard : Mild retardation
- 91 – 100 % of the standard : Normal
III. Waterlow's classification

85 % expected height-for-age : Severe malnutrition
85 - 90 % expected height-for-age : Moderate malnutrition
90 - 95 % expected height-for-age : Marginal malnutrition
95 % expected height-for-age : Normal

2.4.3 Weight-for-height

I. Waterlow's classification

75 % weight-for-height : Severe malnutrition
75 - 84 % weight-for-height : Moderate malnutrition
85 - 90 % weight-for-height : Marginal malnutrition
90 % weight-for-height : Normal

The importance of distinguishing between deficit in weight-for-height and in height-for-age is being increasingly realized. The term “wasting” is used for deficit in weight for height and “stunting” for deficit in height for age. Under weight is a composite measure of “stunting and wasting” cut off points for defining under nutrition are 80 % for weight-for-height and weight-for-age and 90 % for height-for-age.

2.5 Prevalence of Protein-Energy-Malnutrition(PEM)

The prevalence of PEM varied from line to line, country to country as well as region to region within the country according to the methods used for its detection.
Kumar et al. (1975) in Chandigarh used weight-for-age criteria for overall prevalence of PEM in infants as 64.3% in nutrition for monitoring of preschool children. On the other hand, Agarwal et al., (1980) reported PEM of 82% among rural pre-school children in Naila.

Sen et al., (1980) in their study of weight-for-height rated in assessment of protein calorie malnutrition found that 50% infant were malnourished.

A study conducted by Tondon et al., (1981) in rural area revealed that significant positive changes in the nutritional status of pre-schoolers on account of shift in severe malnutrition from 22% to 4% where ICDS projects was prevailing.

According to Grant, 1982-83, severe PEM, is most significant factor associated with high infant and child mortality in two thirds of the world.

Mishra (1984) found the overall prevalence of PEM as 67.3% in infants among horijon and tribal pre-school children in Manikpur block, Banda district of U.P.

Raj et al., (1985) in their study of protein-energy malnutrition in children below six years of age in rural area of Allahabad, found that the incidence of PEM of infants was 73.2%.

Gupta (1986) observed 95.29% of infants in his study an assessment of nutritional status of pre-school children in rural areas of Varanasi.
Bharadwaj et al., (1987) reported a prevalence of 35.82% in first year of life in their study of tribal undefined children of Himachal Pradesh.

Nanda (1991) using jelliffe classification reported 29.6% PEM in infants in their study of prolonged breast feeding practice among tribals of Takapal block in Baster district of M.P. and its impact on child and maternal health.

A study conducted by Kapil and Bali (1989) reported a prevalence of PEM as 64.35% in infants in a urban slum community of Delhi.

According to Jayalaxmi et al., (1992), higher percentage of children were found in I and II degree malnutrition in control group in ICDS block (55% and 19% respectively).

Vanitha et al.,(1990) reported that 53% of non-beneficiaries and 38% of the beneficiaries belonged to grade I and II malnutrition only 7.0% of the beneficiaries belonged to the Grade – III malnutrition.

According to Geetha et al. (2002) about 7.20 per cent of sample belonged to the category of severe degree of malnutrition. Similarly, high incidence of severe degree of malnutrition was reported (10.5) in the ICDS areas of Bihar (NIN, 1992).

### 2.6 Milestones of development

Most of the reports on studies in child development utilise a few selected “Milestones” to study the development of special group like parameters,
Low socio-economic group, malnourished etc. None of them can be considered as a serious attempt to establish norms (standard) for the development of Indian babies (Udani, 1998).

According to Ghai (1996) as age advances, the child acquires better co-ordination of mature activity and reacts to his/her environment in a willful manner, until he blends into a fully integrated and autonomous individual. Children accomplish maturation of different biological functions (Levels of development or milestones) as an anticipated age, with a margin of a few months on either side. The following milestones of development are performed at different months.

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Milestone Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>At 4 – 12 weeks</td>
<td>Head raising (control his head in horizontal planes, then above horizontal plane).</td>
</tr>
<tr>
<td>At 2 months of age</td>
<td>Social smile (child smiles when the examiner tries to speak two line without touching).</td>
</tr>
<tr>
<td>At 5 months</td>
<td>Head and chest lifting</td>
</tr>
<tr>
<td>At 5 – 6 months</td>
<td>Sitting with slight support</td>
</tr>
<tr>
<td>At 8 months</td>
<td>Sitting without support</td>
</tr>
<tr>
<td>At 8 – 9 months</td>
<td>Stands with support</td>
</tr>
<tr>
<td>At 10 months</td>
<td>Stands without support</td>
</tr>
<tr>
<td>At 12 – 13 months</td>
<td>Walking</td>
</tr>
</tbody>
</table>
A developmental delay should be suspected if a child is not able to perform the given tasks by the indicated ages (Ghai, 1996).

2.7 Feeding practices

2.7.1 Colostrum

Colostrum is the first phase of breast milk produced after delivery. In traditional Indian societies, majority of the mothers reject the colostrum and do not feed their children with colostrum considering it, dirty, indigestible and harmful. However, recent scientific researches in immunobiology have show that colostrum is the best food for the new born. Besides its nutritive value the colostrum is now known to promote the immune system of the child providing adequate general immunity for the whole life (Singh, 1983).

Rajammal et al (1999) observed that, ninety five per cent of the middle income group and 80 per cent of the high income group respectively seemed to have started feeding colostrums to their newborns soon after delivery while only 35 and 24 per cent respectively of the economically weaker section as well as low income group had advocated colostrums to their infants.

Breast milk has anti-infective properties against many organisms including E.Coli, Salmonella, Staphylococci, Polio virus etc. This may be due to presence of antibodies, particularly in the colostrums, phagocytic cells which can engulf bacterial substances such as lysazyme, unsaturated lactoferrin and complement as well as lactobacillus factors which promotes the growth of
lactobacilli and hinder the growth of *E. Coli*. Hence infections are less in infants fed on breast milk (Pittard, 1979, Narayanan *et al.*, 1979, Curringham, 1979).

According to Uma *et al.* (1990) greater percentage of urban infants were put to the breast immediately after their birth compared to rural infants. While in Sambalpur district of Orissa Mishra (1992) indicated that the use of breast milk as the first fed was less common. Mishra (1992) also was in confirmation with the findings that, in Sambalpur district of Orissa the use of breast milk as the first feed was less common.

A study conducted by Gayatri *et al.* (1997), 80.4% of the mothers started breast feeding on the 3rd day onwards, only 3.5% on 1st day and 16.1% on the second day after birth. Similar findings was reported by Kalra *et al.* (1982). Prelacteal feed (first feed) was prevalent in Orissa state mostly between 6–8 hours of birth in urban areas (Sunita *et al.*, 1997).

### 2.7.2 Weaning/Supplementary feeding

Prolonged breast feeding and delayed weaning in rural and urban slum children have been reported by several workers (Ghosh, 1966, Bhandari and Patel, 1973, Katiyar *et al.* 1981, Agarwal *et al.*, 1982).

Gupta *et al.* (1992) found that only one in five practiced exclusive breast-feeding till 4 to 6 months.

Breast milk is an ideal source of protein energy requirements for the proper growth of infants upto 3–4 months (Anna and Maclean, 1980,
Hitcheck et al., 1981) and maximum up to 6 month after which breast milk gradually diminishes and become insufficient.

According to National Family Health in Tamil Nadu (1993), 56 per cent of the infants of age 0 to 3 months received exclusive breast feeding. The percentage of extensively breast fed infants dropped off rapidly to 22 per cent after five months and to less than four per cent at age 6 to 7 months.

Kalra et al. (1982) reported that all mothers preferred to breast feed their babies at birth. By 6 months, 28.8 % urban and 7.6 % rural mothers respectively stopped breast feeding.

Kaur et al., (1983) found that the milk was introduced before six months of age by Brahmin(86.6 %) and Khatriya (85.7%) mothers than by backward and scheduled caste (64.7 %) and Hat Sikh (22.9 %).

Singh (1983) reported that, breast feeding was almost universal and was attempted by 99.4 % mothers. Bottle feeding for supplementation was introduced within first 6 months by 25.8 % mothers. Weaning was often delayed and insufficient as only 48.9 % mothers introduced cereal foods during 6 months and 26.7 % denied weaning upto 1 year.

Awasthi et al., (1983) found that prolonged breast feeding as a tradition which influenced by education and semisolids as well as solids were introduced late.
Kumar et al. (1989) reported that more than half of the children received their 1st breast feed on 3rd day of delivery. Among children under 3 months of age, 1/3rd were already received top milk and 68.4 % of the mothers felt that the child should be breast feed for as long as possible.

Weaning is a difficult period in the infants' life because, if the food supplements are not adequate in quantity or quality, the child becomes malnourished. Unhygienic feeding practices may result in enteric infections and diarrhoea further compromising his nutrition. Therefore, it is necessary to introduce more concentrated nutritional supplements at 4 months of age. (Ghai, 1990).

Ghosh et al. (1976) in their study on socio-cultural factors affecting breast feeding and other infant feeding practices in an urban community revealed the 100 % of the mothers in Delhi are practising breast feeding for the 1st few months, only.

Walia et al. (1987) found that 75 % of the upper class mothers had made an attempt to wean their infants off breast by the age of 9 months while 85 % of those among the lower socio-economic status had not attempted weaning till that time.

According to Srivastava et al. (1979) high prevalence of PEM was observed in those children in whom the weaning was delayed beyond 9 months of age.
Bahl (1979) reported that majority of the mothers breast feed their children up to the age of 36 months, 13% of the mothers breast feed their children even after the age of 3 years and 29% of children received semisolids at the age of 13-24 months in tribal belt of Himachal Pradesh.

Madhavi et al. (1972) in Fathepur, Hyderabad reported that prolonged breast feeding was the rule. Infants were well nursed for 1st 36-48 hours after birth. No solids supplements were given before one year.

Seth et al. (1990) stated that solid foods were introduced before 9 months in 24.50% of the Urban, 15.30% of the semi Urban and 13.60% of the rural children. By the age of one year proportion of the children receiving solid foods was equal for all the three groups.

Rajammal et al. (1999) stated that prevalence of exclusive breast feeding dropped off to 41.33, 35 and 39 per cent respectively for the four income groups after three months. However, only 10 per cent of the high income group had continued to breast feed their infants exclusively after three months.

According to Jimenez (1994) studied in hospital based mother, frequency of mixed feeding was higher in 1st 3 months and 50% were weaned gradually over recommended period.

Lindskogu et al (1994) noted breast feeding with prelacteal and top feeding was prevalent in his study, but diarrhoea become the problem from the age of 5-6 months when suitable supplementary feeding were lacking.
2.8 Factors influencing growth and development

2.8.1 Morbidity Pattern

In most of the tropical and sub-tropical developing regions, the commonness of health problems among children is shrinking. These are diarrhoeal diseases, infectious diseases, helminthic infestations, under nutrition and malnutrition, anemic and deficiency diseases. The prevalence of diseases may cause the pattern of sickness. The charge in morbidity pattern is not as striking as in other developed countries.

In India, the sickness load has been shown by many surveys, most of which are cross sectional in nature. A few longitudinal surveys of morbidity pattern of pre-school children have been done by Malhotra et al. (1966), Gupta et al. (1980), Prasad (1991), Hemangine (1998), Sharma et al. (1979) and Pandey et al. (1996).

Chabra et al. (1993) showed that 87.5 % of the ARI episodes were due to upper respiratory infection and about 12 % of them were of lower respiratory tract infection. Zaman K et al. (1997) showed that 96 % of the episodes were of upper respiratory infection.

In a longitudinal study at Singur block of Hoogly district, Mitra (2001) observed that, significantly higher frequency of ARI episodes among children belonging to low socio-economic status and those exposed to indoor air pollution. The incidence was also high among low birth weight babies, malnourished and those not fully immunized.
Dutta *et al* (1969) had observed the duration of episodes of sickness by specific diseases and incidence rate of sickness for 1000 children per month in different age during follow-up. The morbidity rate was respiratory diseases (453.8), GI disorder (406.9), skin diseases (971.1), conjunctivitis (64.1), obits media (22.9), chicken pox (2.3), neonatal tetanus (0.8), congenital malformation (3.0). The respiratory and gastrointestinal diseases together accounted for 76.9% of total episodes of diseases.

It was seen that incidence rate of sickness due to infectious disease was lower in (0-6) months age group. This is probably due to fact that, they are fairly protected against these diseases, by immunity derived from maternal sources through breast feeding.

Sen and Das (1973) observed that incidence of disease was more among younger age group (1 year) as also similar finding has been reported Jena (1997).

The cumulative stress of inadequate diet, infections, psychological trauma etc., coincide with higher nutritional needs during the transitional period of childhood which is most marked in the 2nd year of life (Jelliffe, 1973).

Idris *et al* (1981) observed lowest incidence (36.5%) of diarrhoea in 0-3 months of age group and 45.9% in 4-6 month of age group.

In the developing countries, diarrhoeal disease is one of the leading causes of morbidity and mortality. Cumulative mortality of 25.04%
among children up to the age of five years are common in developing nations, 40% of these deaths which are caused by dehydration of malnutrition are associated with diarrhoea (Jena, 1989).

A longitudinal study at Lahore, on morbidity of children in the age group of 2 years revealed that infection was responsible for 84% of all morbidity in first 2 years of life. 77% Diarrhoeal diseases, 30.3%, URTI and IRTI 22.4%, skin and eye infection, 6.7% skin rash, 0.5% of the total anemia and rickets were rare (2%). (Zaman, S (1993).

As per the reports of UNICEF (1984) diarrhoea disease is the major killer of the children. It is estimated that about 4.4% of deaths in the first year of life and 30.5% in 1-4 years, are due to gastro enteritis. About 1.5 million children die each year of diarrhoea, 60% of children who die of diarrhoea due to dehydration.

According to Rohde et al. (1988), the sick incidence of growth faltering occurring simultaneously with the highest incidence of diarrhoea, in late infancy, gives dramatic proof of the vicious cycle of diarrhoea and malnutrition. Diarrhoea is predominantly a problem of infancy, the same time period as growth faltering. This is no more a coincidence.

Khan et al. (1981) studied under five morbidity by questionnaire method and found respiratory infections (39.4%), GI infection (40.9%), skin infection (22.7%), anemia (24.2%), malnutrition (7.6%), warm infestation (17.7%) and malaria (19.7%).
2.8.2 Feeding practices affecting growth

The editorial of Indian Paediatrics (1980) XVIII stated that the period of weaning is a critical stage, which often resulted in malnutrition and diseases, if the child did not have a diet that was adequate in quantity and quality.

Prolonged breast feeding and delayed weaning in rural and urban slum children has been reported by several workers (Ghosh, 1966, Bhandari et al. 1973, Dutta 1975, Sharma et al. 1977 and Agrawal et al., 1982).

Weaning is a difficult period in the infant's life, if the food supplements are not adequate in quality and quantity, the child becomes malnourished. Unhygienic feeding practices may result in enteric infections and diarrhoea further compromising his nutrition. Therefore, it is necessary to introduce more concentrated nutritional supplements by 4 months of age (Ghai, 1990).

According to Srivastava et al. (1979) high prevalence of PEM was observed in those children in whom the weaning was delayed beyond 9 months of age.

2.8.3 Family size

Jaspal (1978) studied overcrowding to be one of the important causes of malnutrition and infection.

Mukherjee (1997) reported that the respiratory infection is directly proportional to the size of the family.
Kumar et al. (1980) have also observed similar findings of respiratory infection and gastroenteritis high in larger family.

Gupta et al. (1976) showed that skin infection is associated with family size.

Young et al. (1995) studied respiratory illness in a longitudinal follow-up study of infants and observed that there was no difference in family size but Khan et al. (1981) reported direct relationship between incidence of gastrointestinal and respiratory infection, skin infection and malnutrition with family size, ratio being 2:1 in large and small size families.

2.8.4 Socio-economic status

According to Gopalan (1970), the two major factors which contribute to poor health and undernutrition in children resulting from inadequate diet and infection from in-sanitary environment.

Dutta et al. (1969) demonstrated socio-economic environment has a great effect of morbidity in early childhood. Morbidity increased from higher to lower socio-economic status of families.

Walia et al. (1987) stated that the act of weaning was highly correlated with the socio-economic status where it was found that, 75% of the upper class mothers had made an attempt to wean their infants by the age of 9 months, while 85% of those among the lower socio-economic status had not attempted weaning till that time.
Studied on socio-cultural factors affecting breast feeding and other infant feeding practices in an urban community conducted by Ghosh et al. (1976) indicated that 100% of the mothers in Delhi are practicing breast feeding for the first few months only.

Idris (1981) observed significantly high prevalence of diarrhoea among the children of low socio-economic status similar to observations of Mukherjee (1979) and Gour (1982).

Kalra et al. (1982) reported that all mothers preferred to breast fed their babies at birth. By 6 months, 28.8% urban and 7.6% rural mothers respectively, stopped breast feeding. Mothers who had education above graduate level and those belonging to higher socio-economic status were the major defaulters.

Ganjoo et al. (1988) reported that breast feeding was mainly terminated by high income group of mothers of Srinagar.

According to Kumar et al. (1989), the mothers from higher socio-economic status indicated breast feeding earlier. More mothers from higher socio-economic status and those with better education thought that supplementation was needed before the child was 4 months old and felt breast feeding was needed for less than two years. They also reported that prevalence of breast feeding was higher among illiterate mothers and mothers from lower socio-economic status.
Studies carried out by Uma et al. (1990) regarding influence of maternal employment on weaning practices revealed that in spite of their employment, mothers breast fed their children till 11-18 months but interval of feeding in a day was less as compared to unemployed mothers. Further employment of mothers did not affect the weaning practices in infants in comparison with the unemployed mothers.

Young (1995) studied illness in a longitudinal study and reported that there is no difference of illness in different socio-economic status.

2.8.5 Maternal literacy

Idris et al. (1981) reported that educational status of mothers had significant association with diarrhoeal episodes among infants with increasing maternal education. The incidence of diarrhoea showed significant declining trend. The incidence of diarrhoea was higher 57.1 % and 50.6 % respectively for infants of illiterate and primary educational status of the mother, 39.4 % and 31.8 %, respectively for higher school and graduate and above educational standards of mother.

Educational qualification had a detrimental effect on breast feeding. Illiterate mothers were generally ignorant quantity or frequency of feeding semi-solids to their infants/children (Ganjoo et al. (1988)).

Research in many countries have shown a clear correlation between the level of female literacy and infant and child mortality rate (Coldwell, 1979; UNICEF, 1985).
According to Deva Das et al (1991), the educational status of the mothers has a direct bearing upon size of the family, birth rate and infant mortality rate. They also reported that, the percentage of healthy children was greater among those of high literate mothers as compared to those whose mothers were medium literate or illiterate.

Mother’s educational status influenced greatly their child care practice (Christian et al. 1988).

Chatterjee (1989) reported that both education of the mothers and weaning are believed to give greater “autonomy” which is reflected in better child care practices, including the use of health services.

2.8.6 Occupation

Brush (1993) observed housewives have less illness than mother with jobs.

2.8.7 Birth Order

Rajammal et al. (1991) found that, in case of children with birth order, below three, the occurrence of various infections was lower as against the children with birth order above three.

According to Rao (1969) in their longitudinal study of morbidity and mortality pattern of children under the age of five years in an urban community revealed that the incidence of morbidity as well as mortality increases with the increase in birth order.
Gopalan (1970) observed that, 17% of pre-school children, belonging to the birth order up to three, had various signs of malnutrition and increased to 32% in case of children belonging to birth order 4 or above. Similar findings were also reported by Mathur et al. (1974).

Srivastava et al. (1979) reported that, prevalence of PEM increased significantly with increasing birth order of the children. It was highest in children having birth order 5 or above and lowest with birth order 1 and 2.

Luwang and Singh (1980) reported that lowest prevalence of PEM in the first born rural children around Imphal and then an increase in the prevalence of PEM with the increase in the number of siblings. However, there was no significant association of PEM in the birth order of children. Similar results were also reported by Sharma (1972).

Ahmad et al., (1982) in their study of morbidity pattern in relation to birth interval and birth order in children observed an inverse relationship between birth interval and prevalence of malnutrition. Further a positive correlation was observed between morbidity and increasing birth order more so after 3rd birth order.

Devdas et al., (1991) reported that children in the birth order below three had lower incidence of morbidity as against the children in the birth order above three.
2.8.8 Age of child

Rao *et al.* (1969) in his classical study of rural pre-school children near Hyderabad reported the peak prevalence of kwashiorkor and marasmus at 2-3 years, respectively. However, the incidence of PEM was relatively lower in the infancy period.

Dutta *et al.*, (1959) reported that morbidity rate decreased as the age of the child increased. Prevalence of 34.5 % in second year of life of rural children of Haryana was observed by Ghai *et al.*, (1968). The peak prevalence before 18-19 months of age.

Rao and Singh (1979) observed higher prevalence of PEM in 1-3 years age group than in the 3-5 years age group.

Sen and Das (1973) observed incidence of disease was more among younger age group (1 year).

The cumulative stress of inadequate diet, infections, psychological trauma etc., coincide with high nutritional needs during the transitional period of childhood which is most marked in the second year of life (Jelliffe, 1973).

Srivastava *et al.*, (1979) reported the prevalence of PEM to increase with age up to 3 years of life with maximum prevalence between 2-3 years and up to 5 years of life with peak prevalence between 4-5 years (Sen *et al.*, 1980).
Idris (1981) observed lowest incidence (36.5 %) of diarrhoea in 0-3 month age group and 45.9 % in 4-6 month age group.

Singh (1978) reported that increase in the prevalence of PEM up to 4 years of age in pre-school tribal children of Manikpur block.

Zaman et al., (1993) stated diarrhoea, tetanus, ARI infection of eye and skin were more in early ages.

2.8.9 Sex

No difference was observed by Dutta B. (1978) in morbidity rate, between both sex of children. Rao et al., (1969) as well as Rao and Singh (1970) reported high prevalence of PEM in boys of rural pre-school children.

Sen et al. (1973) observed the same difference, incidence was higher (167.4/100) in female as compared to 121.3/100 for males, Rao et al., (1971) have stated that the number of days of sickness per year due to cute episodes for male and female infants were 50.8 % and 37.4 %, respectively.

Higher prevalence of mild malnutrition in girls and severe malnutrition in boys were observed by Gupta and Bhandari (1974) while severe malnutrition in male children was reported by Prasad et al., (1975).

Bhargav et al., (1984) in their longitudinal study of physical growth from birth to 6 years in children with birth weight 2501 g or more revealed that the boys had better growth pattern in general.
Behera et al., (1982) observed higher weight, height, head circumference, chest circumference measurement in boys than the girls up to 72 months of tribal Orissa on 4010 pre-school children having low socio-economic status.

Nutritional status of pre-school children of urban slum communities in Delhi studied by Kapil and Bali (1989) observed that, the prevalence of PEM was significantly higher among female children than the male children. On the other hands, Srivastava et al., (1979) could not found any such relationship between PEM and sex of the children.

Luwang and Singh (1980) reported a prevalence of 45.86 % in the female children using IAP classification, which was more than in the male (40.12 %) in rural pre-school children of Manipur. However, no statistical significant association of PEM with sex of the children. Similar findings were also observed by Srivastava et al. (1979), Singh (1983) and Gupta et al. (1985).

2.8.10 Birth weight

Birth weight is considered to be one of the important and reliable parameters in the evaluation of fetal and neonatal well being. Birth weight below 2.5 kg has been found to be very closely associated with poor growth, not just in infancy but through out childhood (WHO, 1977).
Gupta et al., (1975) had stated that morbidity (24.4 %) due to diarrhoea was higher in low birth weight babies. Hence birth weight of a neonate is very important and it is inversely proportional to infant morbidity.

Gattani et al. (1998) and WHO (1995) reported that the malnourished mothers during infancy, childhood, adolescence and pregnancy produced malnourished infants in the world. Low birth weight babies are 5-6 times more likely to die during prenatal period (WHO, 1984) and 3 times more likely to die during infancy compared to normal birth weight babies (Vijayaraghavan et al., 1998).

Revinder et al. (1995) had studied that early introduction of bottle adversely affected the morbidity profile of the infants than exclusively breast fed. Among all the illnesses suffered, the incidence of diarrhoea was associated significantly with the type of feeding.

Ketsela (1990) observed 12 % of diarrhoeal incidence among exclusively breast feed as compared to 49 % in partially breast feed infants. The difference is statistically significant.

MacGowna (1991) have studied women 6 months postpartum 24 % were initially breast feed. Only 6 % continued for 6 month or longer, initiation of breast feeding was associated with greater maternal education.

Reedman (1992) observed in his study, 66 % of infants were exclusively breast feed, 34 % were partially breast feed.
Sheard et al., (1993) reported that exclusive breast feeding practices decreases infant morbidity and mortality. Exclusively breast feeding for at least 4 months, decreases the incidence of otitis media.

Lindskogu (1994) reported that incidence of diarrhoea was infrequent during earlier months, inspite of prevalence of non-exclusive breast feeding practice. But respiratory diseases and episodes of fever were the most common symptom during the same period. They also reported that breast feeding was universal during first 3 months. But prelacteal and top feeding practices were prevalent to a greater extent.

Deway (1995) studied morbidity in relatively affluent population. Incidence of diarrhoeal illness among breast feed infants was half that of formula feed infants. The percentage with otitis media was 19 % lower with prolonged episode (more that 10 days) and was 80 % lower in breast feed infants compared with formulated infants. There was no significant difference in rates of respiratory illness, all cases were mild upper respiratory tract infection and also same was the findings of Young (1995).

2.8.11 Immunization

In India, deaths due to the six vaccine preventable diseases account for 1/3rd of all the childhood deaths(M.H.F.W,1977).

Ghose et al (1980) in their study on DPT immunization and malnutrition reported that, the antitoxin levels obtained in the malnourished
and normal children did not show any significant difference. The three doses schedule is recommended because it provides immunity to almost all the children.

Still less than 50% of the infants in many parts of the country are being protected against these vaccines preventable diseases, resulting in high incidence of cases and deaths (H.I.I,1989).

A meager 27.14% of the children were fully immunized. In the neighbouring district of Chitradurga (Sivaram, 1990), Raichur (T.M.I, 1987) and Dharwar (Govila, 1986) also immunization coverage was low (17.4%, 14.8% and 20.0% respectively).

Tambe (1990) observed that 26.88% children were fully immunized while 19.81% were partially immunized.

While two million children deaths are prevented by vaccines where three million children are still dying due to vaccine preventable diseases (UNICEF, 1995).

2.8.12 ICDS for growth and development

Integrated Child Development Scheme (I.C.D.S) was initiated in 2nd Oct, 1975 and was implemented by the Government of India selectively all across India to provide adequate services to young children and their mothers, both before and after birth and through the period of growth until the sixth year of age. The purpose of the programme is to ensure the child’s full physical, mental and social development. Services include immunization, supplementary nutrition, health check ups, treatment of minor illness, referral
services and non-formal pre-school education to children with the age group of 3-6 years. In addition, ICDS offers nutrition and health education, supportive services such as safe drinking water supply, sanitation and functional literacy for adult women. The ICDS scheme is intended specifically for the economically disadvantaged sectors of the community. Both are paid a small honorarium. An Anganwadi Worker (AWW) is the liaison between public health center and the area. The AWW is responsible for implementing services and the health and immunization status of all children under six years of age.

The ICDS scheme in the state of Orissa was launched in 1976 and today functions with a total number of 16,000 Anganwadi Centers starting at village level (UNICEF, 1994).

Study conducted by Agarwal et al. (1994), reported that the overall growth pattern of infants in the ICDS block remained unsatisfactory, particularly in the later part of infancy.

The overall coverage of ICDS services was good according to Singh et al. (1993).

Marginal impact of ICDS on the nutritional status of infants was observed (Kumar et al., 1997).

A study conducted by Tondon et al. (1981) in rural area revealed significant positive changes in the nutritional status of pre-schoolers an
account of shift in severe malnutrition from 22 % to 4 %, where ICDS project was prevailing.

Ghosh et al. (1976) in their study an socio cultural factors affecting breast feeding and other infant feeding practices in an urban community revealed the 100 % of the mothers in Delhi are practicing breast feeding for the 1st few months only.

Walia et al. (1987) found that 75 % of the upper class mothers had made an attempt to wean their infants off breast by the age of 9 months while 85 % of those among the lower socio-economic status had not attempted weaning till that time.

According to Srivastava et al. (1979) high prevalence of PEM was observed in those children in whom the weaning was delayed beyond 9 months of age.

Bahl (1979) reported that, majority of the mothers breast feed their children up to the age of 36 months 13 % of the mothers breast feed their children even after the age of 3 years, 29 % of children received semisolids at the age of 13-24 months in tribal belt of Himachal Pradesh.

Seth et al.; (1971) stated that solid foods were introduced before 9 months in 24.50 % of the Urban, 15.30 % of the semi Urban and 13.6 % of the rural children. By the age of one year proportion of the children receiving solid foods equal to all three groups.
About 7.20 per cent of sample belonged to the category of severe degree of malnutrition observed by Geetha et al. (2002). Similarly high incidence of severe degree of malnutrition was reported (10 %) in the ICDS areas of Bihar (NIN, 1991-92).

On the contrary, Math (1995) revealed that none of the children were in severe degree of malnutrition in Dharwad which was attributed to the beneficial effect of supplementary feeding programme in crèches.