Chapter - III

REVIEW OF RELATED LITERATURE
As a field of scientific research, nutrition education has received attention only after 1960 in India. It was initially due to the work of Devadas (1965) that the situation began to change.

In the present chapter, an effort has been made to review the studies related to the present investigation in chronological order. These studies have been presented under the following heads:

1. Nutrition and Development
3. Malnutrition and its causes
4. Impact of Nutrition Education on knowledge, attitudes and practices.

1. **NUTRITION AND DEVELOPMENT**

   - Physical Dev.
   - Mental Dev.
   - Psychosocial Dev.
   - Dev. of Infection
     - Cognitive Dev.
     - Educational Achievement
(i) **Nutrition and Physical Development**

Physical development refers to increase in height, weight, length of limbs, body part proportion, his development of strength, coordination, speed and precision in the use of arms, legs and other body muscles. Physical development influences behaviour directly or indirectly. It determines what the child can do. If he is well developed for his age, he will be able to compete on equal terms with his peers in games and sports. If not, he will be handicapped in competition with them, feels tired the whole day and all this has a direct effect on the way he reacts to people and situations. Indirectly, physical development influences attitude towards self and others. These in turn are reflected in the kind of adjustments one makes.

Vijay lakshmi et al. (1975) conducted a study on 'Anthropometric measurements of infants under one year of age' and concluded that a higher mean weight and height was observed in the case of infants who had the benefits of breast feeding and supplementary food. Devadas et al. (1977) and (1979) reported statistically significant differences in increase in height and weight of experimental and control children. The maximum increment with supplementation observed in height was 3.8 cms and in weight was 1.5 kg during six months period. Paramjit and Bhatt (1979) in their study reported increase in arm circumference as a result of food supplementation.

Soothhil et al. (1980) assessed a project in which young children were fed with food supplement of millet and buffalo milk. The supplement was in such large quantity that children took most of it home where it was shared by other family members. So, instead of becoming a supplement it ended up as a replacement and hence no impact
was observed in the anthropometric measurements of experimental group of children.

Gopaldas et al. (1983) conducted a study where the growth of the child receiving food by take home and spot feeding methods was compared with controls. Significant improvement was observed only in those fed on the spot. Mittal and Gupta (1980) reported similar results.

Puri et al. (1983) conducted a study in Chandigarh to see the impact of ongoing supplementary feeding programme on the anthropometric measurements of preschool children. The results indicated that the supplemented children gained significantly more on all somatic measurements right from six months onwards till the end of the study. Similar results were reported by Chawla et al. (1983).

Sharma et al. (1986) conducted a study in Himachal Pradesh to evaluate the food supplementation in Nutrition Programmes. It was observed that little improvement occurred in anthropometric measurements of pre-school children. The reason for this were monotonous menus and that personnel were not interested in such programmes. Nutrition education was the neglected aspect which needs attention.

Schelp et al. (1990) undertook a nutritional intervention project in north east Thailand. Various activities such as supplementary feeding, teaching nutrition and home visits were carried out in intervention villages. An obvious increase in the nutritional status of children was observed only after two years and nine months.

Thaker (1990) concluded that the nutritional status of the beneficiaries of the ICDS programme was relatively better than that of the non-beneficiaries evidently due
to the impact of the package services provided to them. She expressed her view that the components of education, specially nutrition and health education and community participation need to be strengthened and recommended that repeated nutrition education programme should be conducted to bring about a permanent adoption of new concepts. CTC (1990) study also support the claim of positive impact of nutrition in bringing changes in anthropometric measurements of children.

Jaya lakshmi et al. (1992) evaluated the impact of ICDS on pre-school children who were beneficiaries in Karnatka. The results indicated the beneficial effect on its subjects due to its integrated approach of nutrition intervention and education. But the quantity of supplements given to children seems to be inadequate to substantiate the normal growth pattern. It was suggested that more emphasis should be laid on the Health and Nutrition education of mothers who are responsible to feed the child the whole day.

Friet et al. (1993) and Sazawal et al. (1996) in their studies concluded that supplementation of Zinc in diet of children showed positive impact in improvement of motor development. Keith et al. (1997) in a study on "Effect of vitamin A supplementation on growth of vitamins A deficient children" in Nepal indicated no impact on weight gain or linear growth. However arm circumference and muscular growth showed positive effect.

Abel et al. (1997) evaluated a nutrition rehabilitation programme in Tamil Nadu in which food supplement was given to children suffering from third degree malnutrition. It was concluded that the nutritional status of children who were given the foodmix as supplementary diet was better than children who were given as main diet. However, the
mothers were aware of the benefits of food supplementation but they had no knowledge on the method of food mix preparation. Similar results were reported in the earlier study (Sunder Lal and Madan, 1979)

Wasantwisut (1997) recently indicated that other micro nutrients (nutrients) other than proteins and calories) also play a role in young child development. Severe as well as marginal Vitamin A deficiency was shown to lead to an increased risk of morbidity and mortality in children. Delayed growth, especially stunting was reported in children with clinical signs of vitamins A deficiency. Deficiency of zinc leads to growth failure and delayed secondary sexual maturation in man. Supplementing of infants and older children revealed that those who manifested overt zinc deficiency showed improvement in linear growth and weight gain.

Gutierrez et al. (1988) conducted a study in Brazil to evaluate the impact of supplementary nutrition programme on the growth of undernourished children who were below 5 years. To assess the impact , reference curves for the anthropometric profile was constructed based on expected variations in population percentiles. The changes observed in each group were analysed statistically. The study reported that the feeding supplementation programme temporarily minimized severe nutritional deficiencies but not sufficient to recover and maintain normal growth pattern.

Leonberg et al. (1988) conducted a study in U.S.A on nine children aged 2 to 6 years who had previously received long term Parental Nutrition (PN). PN had been discontinued in all subjects for at least 6 months and they were receiving oral feeding only. One or more abnormalities were present in all nine subjects. These findings suggest
that children who require prolonged PN in early life are at risk for abnormalities in growth and nutritional status in later childhood. They require long term dietary growth and nutritional monitoring.

(ii) **Nutrition and Mental Development**

Mental or Intellectual development includes the abilities in memory, imagination, language, percepts, concepts and problem solving abilities. Individuals differ in the consistency of mental growth through out the period of childhood - depending upon environmental, social and psychological factors. Any improvement in a child’s physical health makes it easier for him to work up to his full mental capacity.

Nutritional deficiency whether dietary or metabolic in origin have long been known to cause learning disability and cognitive disorder and a number of studies have shown the benefits of food supplements on mental functions in underfed children.

Cabak and Najdanvic (1965) tested a group of 36 sarbian children who suffered from malnutrition in their pre school years. They found that about half of them scored below the accepted limits of normal intelligence. Similar results were reported by Cravioto et al. (1966) and Stoch and Symthe (1967).

Champakam et al. (1968) proved that children who had suffered from an attack of Kwashiorkor, performed only half as well as those who did not have this attack. The widest differences were seen in a study by Devadas (1971). Devadas et al. (1972) and Devadas et al. (1973) in different studies concluded that children with higher protein intakes had greater I.Q. than children with lower protein intake. The well nourished children scored above average mental scores as many as twice than the malnourished children.
The co-relation between I.Q. and height, weight, Head circumference and birth order were positive but not statistically significant. The results were in consistent with the earlier study by Padmavathy et al. (1970)

Bhatt et al. (1973) studied preschool children with varying degrees of growth failure due to severe protein calorie malnutrition and revealed that there was a close relation between I.Q. and height and weight. Greater the deficit in height and weight, lower was the I.Q.. The study suggested that growth failure which was predominantly nutritional in children of low socioeconomic group has an effect on physical growth, brain growth and mental development.

Lloydstill et al. (1974) studied the effect of severe malnutrition on intellectual development in infancy. The results were consistent with the hypothesis that malnutrition in infancy can affect intellectual development in first five years of life. Similar results were reported in a study conducted by Udanti et al. (1971).

Singh et al. (1976) study indicates that both malnutrition and socio economic status contribute to intellectual impairment. Due to low socio economic status, the child does not get quality food which leads to malnutrition that ultimately impairs the mental growth.

Jesudasan et al. (1979) concluded that both mental and motor development are affected by nutrition. Kalra et al. (1980) reached similar results in his study.

Puri et al. (1983) conducted a study in Chandigarh on impact of food supplementation given to pre-school children in creches on mental growth. The results indicated that mental abilities of experimental children improved significantly in both SES. Bhardwaj et al. (1983), Chawla et al. (1983) and Choudhary et al. (1984) in different
supplementation studies concluded that I.Q. of the children was directly related to the diet consumed.

Lozoff and Brittenham (1986) study in children clearly documented that severe iron depletion resulting in iron deficiency anaemia results in poor attention span, poor performance, low intelligence score, some degree of perceptual disturbance and altered affective behaviour.

Sandstead et al. (1986) highlighted essential functions of trace elements such as zinc, copper, iodine and magnesium in mental development. Toxic elements that have profound effects in brain functions are lead and mercury.

Stanburg (1994) in a study proved that iodine deficiency causes cretinism with severe mental retardation. In iodine deficient children, an early supply can prevent neural damage of the infant. Studies by Beard et al. (1993); Pollit (1993); Sheard (1994); Kretchmer et al. (1996) and Saza Wal et al. (1996) also indicated similar results showing the role of trace elements in mental development.

Mental development proved to be a wide area to study the impact of nutrition, therefore specific areas of mental development were reviewed i.e. cognitive development and educational achievement.

(a) Nutrition and Cognitive Development

The Portage Guide to Early Education by Shearer et al. (1972) provides the following definition that concerns the present investigation:
Cognition or thinking is the ability to remember, see or hear likenesses and differences and to discover relationships between ideas and things. This area also includes basic skills needed before school entry, such as counting, colours, and drawing.

Many studies have been conducted in which the relationship between Nutrition and Cognitive development has been established. A few of them are cited below:

Ghosh (1979) in a study concluded that cognitive development of the children (0-6 years) was seen to be directly related to the socio economic status and nutritional status of the children. Similar results were documented by Dutta and Das (1981) in his study "Non cognitive co-relates of malnutrition."

Shrivastava and Shrivastava (1985) conducted a study in Madras to evaluate the impact of Child Development Service Scheme on the problem solving ability of children. The results showed that nutritional intake of child has direct co-relation with cognitive development of the child. Kaur et al. (1985) too viewed the similar results.

Pollit et al. (1985) showed that neurochemistry of brain and associated cognitive processes can be affected by nutritional deficiencies. He also showed the effect of iron supplementation on cognitive performance. Seshadri et al. (1987) and Simon et al. (1990) studies also reported improved scores in cognitive functions with iron supplement in anaemic children.

Sahni and Agarwal (1986) in a study in rural ICDS block, Hissar demonstrated that children attending Balwadis had better cognitive development due to food supplementation and stimulating environment that they get in Balwadis.
Cravioto and Cravioto (1996) recently documented that severe general malnutrition in infancy or early childhood characterized by combined deficiency of energy, protein and other elements is associated with a marked reduction in cognitive ability. Kretchmer et al. (1996) study supports the above study.

(b) **Nutrition and Educational Achievement**

Recently a new concept of the relationship between the nutritional status of children and their academic performance has emerged. Few studies have been conducted to know the role of nutrition in school performance and academic achievement.

Somenantri et al. (1985) investigated the effect of iron supplementation on measures of school performance among iron deficient children in Indonesia. The results revealed that iron supplementation among iron deficient children benefit learning processes measured by school achievement.

Pollit et al. (1985) in a study indicated that the average absenteeism is higher among the malnourished children. The results support the findings in this area that an association exist between the nutritional status of children and their educational performance. A malnourished child is generally mentally and physically fatigued. He is less attentive in class and perform less well than his well nourished counterparts. It was also seen that a malnourished child is attacked by bouts of illnesses which may be an additional cause for poorer performance of the malnourished children.

Nelson et al. (1990) conducted a study on British children and it was evidenced that learning ability in them was limited by the quality of their diet.
Rezaul Karim et al. (1991) conducted a study in government primary school, Dhaka. Nutritional status of the children was assessed on the basis of weight for age and weight for height measures. The results indicated that nutritionally normal children scored higher marks in school examinations compared to malnourished children.

Nidhi (1991) in a study found that nutritionally normal children had better grasping ability, more intelligence, better academic and extra curricular performance than undernourished children. A significant high co-relation has been found between nutrient intake and physical fitness.

Novello et al. (1992) in their report write 'The Healthy Children Ready to Learn'. The initiative starts with the underlying concept that health is a critical partner to optimum education. All children have a right to be healthy. At a minimum this right assumes providing good nutrition, promoting optimum use of available and effective preventive measures such as ensuring compliance with immunization, promoting measures to prevent injuries, ensuring opportunities to identify diseases and disabilities early; and providing prompt treatment when needed.

Ivanovic et al. (1996) in Chile studied the relationship between the scholastic achievement and nutritional status. Percentages of weight/age, height/age and weight/height were compared to WHO Tables and head circumference/age to the Tanner Tables. School achievement was measured by means of language and mathematics test. Results show that head circumference/age was the anthropometric parameter with greatest explanatory power in school achievement variance.

Hutchinson et al. (1997) conducted study on Jamaican primary school children to determine the relationship between nutritional status, anaemia and infections to school
achievement and attendance. The results indicated that children who were malnourished had low achievement scores. Children who were infected had lower achievement levels than uninfected children in spelling and reading. Anaemia predicted poorer school achievement. It suggested that efforts to increase school achievement levels in developing countries should include strategies to improve the health and nutritional status of children.

Andreou et al. (1997) study in Cyprus indicated that children of 11 years age with better eating habits had higher self esteem and achievement in school work than children whose quantity and quality of dietary intake was poor. They remarked "Children who eat well feel good".

(iii) Nutrition and Psychosocial Development:

As the child grow in size, he makes more complex movements and learns to coordinate his perceptions, the infant develops a more active social life. Initially social relations are self centred and aimed at fulfilling basic needs. Cooperation, participation and organization of activities appear as a result of his social group. Emotional development in general from infancy through emotional maturity is characterised by an increasing variety and richness of emotional experience, and improved ability to control the emotions and expressing them in socially approved ways. A child is emotionally mature if he shows capacity for emotional behaviour that is true to his level of development. There are certain environmental factors that help in social and emotional development of the child and nutrition is one of them.
Saraswati Munshal et al. (1979) in a study assessed the daily protein and caloric intake of children. Those who were well nourished were socially mature than those who were under nourished. Chatterjee (1979) reached similar results.

Chattopadhyay (1981) studied the role of malnutrition in the development of social maturity. He concluded that a malnourished child does not have the desire to attend social gatherings and develops poor social relationships.

Bhattacharya's (1981) study shows that emotional development is also related to what the child has taken in his meals. The well nourished children are emotionally mature than the undernourished children.

Vazir et al. (1988) highlighted the importance of identifying the culturally relevant micro environmental factors which influence growth and development of children. Some of these factors include family size, mother awareness, child phobias, paternal occupation, weaning food, economic conditions, dwelling etc.

Gortmarker et al. (1990) in a study proved that children with chronic health conditions have long been considered at excess risk of psychological morbidity.

Upadhay et al. (1992) in a study reached results that children having Grade II and III malnutrition showed poor development in all areas of behaviour i.e. motor, adaptive and personal social aspects.

Engle et al. (1995) in his study suggested that culturally relevant micro environment factors which are identified for growth and development of children can be addressed effectively in the existing intervention programmes such as Integrated Child Development Services for better impact.
Vazir et al. (1998) study in Hydrabad indicated that children who were better nourished attained milestones at the earlier age as compared to the poorly nourished children. Similar results were obtained at other two centres at Jabalpur and Chandigarh (WHO Report, 1991). The difference between the better nourished and under nourished was especially noticed in the 'vision and fine motor', learning language and conceptual development and personal social areas. These results are supported by earlier studies (Cravioto, 1965, Yatkin, 1970) on several malnourished children. The difference in the age of attainment of psycho social skills between under nourished and better nourished children was seen to increase with age. This finding is in line with results reported in earlier studies (Dasen, 1984; Sigmah et al.; 1984). Grantham et al. (1983) and Grantham et al. (1991) research work support the study by Vazir et al. (1998).

(iv) Nutrition and Infection

The association between nutrient deficiencies and susceptibility to infection has been appreciated since the time of Hypocrates. Many of the infections develop in people with Protein Calorie Malnutrition such as pneumonia and measles. These pathogens suggesting that the cellular immune system is particularly affected by nutritional status (Keurch, 1993). Nutrients derived from dietary proteins, carbohydrates and fats as well as micronutrients, vitamins and minerals interact with immune cells systematically in the circulating blood and leads to the development of tolerance.

Anne et al. (1985) study reveals the incidence of anaemia and parasitic infections in pre school undernourished children.
Schelp et al. (1990) conducted a study in seven villages of north east Thailand. The health of pre-school children was assessed every alternate week by questioning the mothers. More than 80% of all the illness episodes could be accounted to ill defined infections such as fever and cough with only 5.2 percent accountable to diarrhoea. It was also concluded that weight for height is better indicator for determining children at risk of falling ill than weight for age and height for age.

Lanting et al. (1996) conducted a study in Netherlands and concluded that a relationship exists between the diet consumed during childhood and morbidity in adulthood, such as athrosclerosis and insulin dependent diabetes mellitus.

Edward et al. (1996) conducted a study in Hongkong on 'Do variations in normal nutrition play a role in the development of myopia'? The results showed that the children who developed myopia had generally lower intake of many of the food components than children who did not become myopic. The differences were statistically significant for energy intake, protein, fat, vitamin B₁, B₂ and C, phosphorus, iron and cholesterol.

From May 4 to 7 (1997) 'Nutrition and Immunity' was the fourth conference held in biennial International Conference Series on Nutrition and Health Promotion. It was concluded in the conference that Nutrition and Immunity are closely related and this fact can be used to re-evaluate the dietary requirements of a diverse population.

2. NUTRIENT INTAKE AND NUTRITIONAL STATUS OF PRE-SCHOOL CHILDREN

Vijayalakshmi et al. (1975) observed that no special food was given to pre-school children in Coimbatore in Tamil Nadu. The diets were deficient with respect to all
the nutrients. Similar results were reported by Gopalan et al. (1971). Devadas et al. (1977) found that none of the pre-schoolers consumed an adequate diet in terms of ICMR recommendations although more than 60% of income was spent on food mainly cereals neglecting other essential food groups.

Vijayadingamba (1979) study in Hyderabad found that in view of low intake of vegetables and fruits, the vitamins intake was much less than the requirements. Devadas et al. (1983) in a study found that inadequate intake of food resulted in inadequate intake of nutrients and subsequently the deficiency signs were more prevalent in nutritionally affected children.

Choudhary et al. (1983) studied pre-school children of Rajasthan and found that urban children tended to be better in nutritional status than rural children.

Sister Lina and Philomina Reddy (1984) conducted a study in Trichur in Kerala and found that at the age of 18 to 24 months the mean daily protein intake was marginal, where as energy deficit was around 200 to 300 K.calories. Parvathi and Devadas (1984) in a study found positive co-relation between height, weight measurement and intake of energy, proteins, calcium and beta carotene.

Rao (1987) in a study Vital statistics and nutritional status of Indians found that perceptual availability of food stuffs, calories, vitamins and minerals in India have been more or less steady and below requirements. Socio economic status and Literacy status of parents were found to be influential on variations in health and nutritional status.
Ragimol et al. (1988) study in Trivendrum demonstrated that anthropometric data on Pre-school children reveal the extensive malnutrition. The prevalence of malnutrition increases as age advances.

Vijaylakshmi and Chittemma Rao (1988) study on nutritional status of tribal and non tribal children of Andhra Pradesh found that later were more malnourished. Thimmayamma et al. (1988) study revealed that the total calorie intake decreases with decrease in income. Meal frequency and socio economic status were also found to be significantly co-related to energy and protein adequacy in pre-school children.

Devi et al. (1990) conducted a study on the diets of malnourished Marathwada pre-school children. It was concluded that diets of children with PEM was deficient in calories, calcium, riboflavin and vitamins C.

Sharma and Kalia (1990) conducted a study in the Ghumarwin Block of Himachal Pradesh to assess the effect of nutrition on anthropometric measurement of pre-school children. The analysis revealed a positive co-relation.

Poh Siang Choo (1990) conducted a study on Indian pre-school children in Malaysia. The results showed that nutritional status of the estate preschool children in Malaysia is low. Most of the children were under weight, stunted and wasted. The prevalence of malnutrition among children indicated that foods consumed by these children may be of poor quality or inadequate to meet their growing needs.

Dahiya and Kapoor (1992) conducted a study in rural Haryana on children of 4 to 36 months age. The results of anthropometric indices revealed that the infants and
children were comparable to their peers on all India basis. The nutrient intake indicated deficit in energy, protein and iron when compared to allowances recommended by ICMR.

Rajasree and Soman (1994) studied nutritional status of children in two poor communities. The prevalence of various forms of growth retardation was determined in two communities. Inspite of better food intake, the rural coastal children exhibited poorer nutritional status mainly because of environmental deprivation.

Hanumantha Rao et al. (1994) in a study conducted in Madhya Pradesh in three districts found that varying degree of stunting and wasting was common in all the three districts where there was low dietary intake over a long period of time.

Choudhary (1995) undertook a comparative study on the basis of linguistic groups of children-Assamese, Bengalis and Hindi speakers. The study revealed that the Assamese children are the least sufferers of malnutrition.

Shrivastava and Kumar (1995) in a study in Pantnagar assessed the anthropometric measurements of young rural children belonging to low income group. When these measurements were compared with national and international standards, it was found that the measurements were lower than those reported for children belonging to higher socio economic status. Morbidity and lesser nutrition were the main contributing causes for the undergrowth of these children. Similar results were reported by Aminul Haque et al. (1997) in a study conducted in Bangladesh.

Kumar et al. (1996) study shows that 48.8% children are stunted, 49.6% are under weight and 9.1% are wasted. Undernutrition showed a significant rise after 12 months of age. Stunting and under weight was significantly more among girls compared to boys. It was concluded that every second child was under nourished.
Yadav and Singh (1999) conducted a study in Bihar to assess the dietary intake and nutritional status of tribal children. The results showed that the intake of protein was broadly in line with the recommended dietary allowances in all age groups among the children. However, the average intake of energy and other nutrients was lower in all age groups. Similar findings were documented from Bihar in the National Family Health Survey (1995).

3. MALNUTRITION AND ITS CAUSES

Nutrition is of major importance in the attainment of proper growth and development and the maintenance of health throughout life. Adequate nutrition has direct and indirect effects on health. Direct effects of poor nutrition are protein energy malnutrition, vitamin deficiency, anaemia and goitre. Indirect effects are poor growth, high mortality and increased still birth rates etc.

Poverty, large population, poor production and unequal distribution of income distribution and food are few of the reasons of malnutrition in India. Ignorance of mothers is one such major reason of malnutrition among children. Several studies have been conducted in India and other countries to indicate that malnutrition in children is caused due to certain reasons.

(i) Faulty Infant Feeding Practices and Food Beliefs

Thimmayamma et al. (1980) conducted a study on educated working mothers residing in urban areas and found that breast feeding was continued just for 4 months. Supplementary foods were given to children but they were not nutritious. 61% mothers used commercial baby foods.
Rao et al. (1981) in a study stated that breast feeding was more common in rural areas than in urban areas. In rural areas most children were weaned on to solids without intervening supplementary foods with fresh or artificial milk. Beyond six months, weight gain in urban children was more than in rural children, probably due to early introduction of solids. Many of the mothers failed in lactation because of taboos in their food habits, which prevented them from taking an adequate balanced diet.

Nalwa (1981) in a study found that mean age of introduction of semi solids is inversely related to literacy and socioeconomic status. An enquiry into common food items, at the stage of weaning and post weaning revealed that cereals, pulses and fruits were administered in 82.6%, 55.6% and 22% of the weaned children. Cheap nutritious food items like vegetables hardly ever appeared (7.5%) in the list of the child's food. Egg and meat preparations were rarely mentioned.

Kesaree et al. (1981) studied feeding pattern of 3 to 24 months old children in Devanagere. Semi solids were introduced in only half the children between 6 to 12 months. Rice was commonly introduced first. They highlighted improper food preparation methods, taboos and irrational beliefs as cause of malnutrition. Gurudeva et al. (1982) supported the above study.

Bhandari et al. (1983); Meharban et al. (1983) and Satapathy et al. (1984) have stressed on delayed weaning and prolonged breast feeding as cause of malnutrition among infants. Victoria et al. (1984) study found that nutritional status appeared to be worse in those breast fed for longer than seven months.

Choudhary et al. (1986) studied the relationship between the working and non-working mothers of joint and nuclear families to the nutritional status of children. It was
concluded that working status does not affect the nutritional status but depends upon the type of substitute taking care of the child in the absence of mother.

Ahuja (1986) listed the multiplicity of factors that affect feeding methods i.e. socioeconomic status, maternal education, availability of foods, family structure, locality, working and non-working status of mother etc. Early weaning of the urban infants with proprietary preparations and juices is more conducive to the better overall growth of infants.

Sehgal et al. (1989) study in Bhiwani District (Haryana) and Uma and Chanderasekhar (1990) study in Coimbatore highlighted the beliefs and taboos of mothers during lactation and pregnancy. Introduction of supplementary foods in the form of juices and commercial formulas were common among urban mothers.

Kaur et al. (1990) study in Hissar reported that urban mothers were aware of the advantages of breast feeding but were ignorant about the nutritive values of the colostrum. Thus the mothers need to be educated regarding the importance of vitamins and iron rich foods in infant feeding and to maintain good nutritional status of infants.

Punia et al. (1997) in a study on Infant feeding and weaning practices in selected cultural zones of Haryana concluded that most of the mothers were unaware of the nutritive value of colostrum. The new born was fed on variety of prelacteal foods using unhygienic methods. Supplementary foods were started late which increases the chances of malnutrition and leads to high mortality rate among infants. Results show that there is need for nutrition education of mothers.
(ii) Family Income, Socio Economic Status and Maternal Literacy

Socio economic status is the non nutritional casual factor which greatly influences the nutritional status of a community. The per capita income, family size, educational status of the housewife and social status of the family play a role in the consumption of food stuffs which in turn contribute to the well being of an individual. Various studies have been done to elucidate the relationship between per capita consumption of different foods and nutrient intake.

Devadas et al. (1980) in a study 'Influence of family income and parent education on the nutritional status of pre-school children stressed that family income and mother’s education has direct impact on the dietary intake and nutritional status of pre school children. Children of high income group are physically better than children of low income group as low income families cannot afford to provide balanced food to their children. Although 60% of the income was spent on food which included large quality of cereals and relatively negligible quantity of pulses.

Chaudhary and Rao (1983) study revealed that in addition to socio economic status and maternal education, the size of the family effects nutritional status of pre-school children. In large families, the child gets inadequate and insufficient food which results in malnourishment in children.

Aujla et al. (1983) studied the nutrient intake among different income, occupation and family size categories in rural areas of Punjab and concluded that the calories consumed were below the body requirements in low income, large family and labour class categories. The protein intake was much higher than the recommended allowances in all income, occupation and family size groups.
Leonard (1989) conducted a study in Nunoa. Food consumption data and selected anthropometric measures were obtained from a sample of 33 households. With in the present sample, it was found that upper income individuals had sufficiently higher caloric intakes than those of the lower income groups. Anthropometric data show that children of High SES group were significantly taller and heavier than the low SES group children. Parvathi (1984) and Thimmayamma (1988) revealed similar results.

Arya and Devi (1991) studied the influence of maternal literacy on the nutritional status of pre-school children in Parbhani and concluded that children of literate mothers had better anthropometric measurements than children of illiterate mothers. Nutrients deficiency signs especially of protein calorie malnutrition were predominant among the children of illiterate mothers. Food consumption pattern was better in children with literate mothers. The consumption of milk and milk products, fruits, sugar and jaggery was significantly greater in children with literate mothers. Similar results were reported by Abbi (1988).

Gupta et al. (1991) study shows that mothers general education level was a strong determinant of nutritional status of children. The educational score of mothers was significantly lower in the malnourished group. It was interesting to note that there was no relation between children's nutritional status and father's education.

Jayalakshmi and Neel Kantan (1995) conducted study in Coimbatore and reported that the intake of pulses, milk, oils and fats was significantly influenced by per capita income, educational status and social status and it was negatively influenced by family size. The caloric intake was significantly influenced by income. This is due to the consumption of quality food such as pulses, milk etc. by high income families.
Arya and Devi (1997) demonstrated that nutritional deficiencies were most in low income, less in middle income and least in high income groups.

(iii) Mother's Knowledge about Nutrition

Mother's nutritional knowledge has equal impact on the nutritional status of children as socioeconomic status of the family. Bower has pointed out "The way to child's stomach is through the mind of her mother and the mind of the mother is often blocked by grand mother". General lack of nutritional knowledge is common even in educated mothers.

Mittal et al. (1981) studied the nutritional knowledge of rural mothers in four areas of child feeding. It was found that a majority of the rural mothers had moderate level of knowledge in all cases. Mother's level of nutritional knowledge was related to their educational level, age and income of the family. They consulted their mother in-laws regarding child feeding.

Kumar et al. (1989) study in Hissar found the 48.4% mothers were adequately informed and 26.2 percent mothers were inadequately informed. 65% mothers had favourable attitude towards nutrition while none had unfavourable attitude, 74% mothers showed good nutrition practices and 26% were under poor category. A positive and significant co-relation existed between nutritional knowledge and practice but nonsignificant co-relation was found between attitude and practices.

Kaur (1990) studied the nutritional knowledge of working women in different professions. The results showed that nutritional knowledge of officer subjects was higher as compared to clerks regarding role of vitamins, minerals, various cooking methods,
infant feeding practices, hygiene and sanitation and balanced diet due to many possible reasons like education, age, socioeconomics status, source of information and finally their professional status that effects the level of their knowledge.

Gupta et al. (1991) study proved that proper knowledge, attitudes and practices of the mother in relation to certain nutritional concepts are strongly associated with the nutritional status of the child. It was also found that level of education did not significantly affect the nutritional KAP of mothers. This concept is of tremendous importance in the Indian context where the vast majority of Indian women, particularly in rural areas are illiterate. The study further emphasized that mother’s education and mothers nutritional KAP independently and significantly affected the nutritional status of the child. The content areas of nutrition education identified in the study were nutritional requirements of children, nutritional value of foods, oral rehydration, diarrhoea, immunisation, deficiency diseases and hygiene.

(4) IMPACT OF NUTRITION EDUCATION ON KNOWLEDGE, ATTITUDES AND PRACTICES

In Indian society where food is scarce and poverty is overwhelming, the necessity to develop consciousness about the food selection needs adequate emphasis. Nutrition education is needed to remove ignorance and for best use of what is available locally. It offers great opportunity to individuals to learn about the essentials of nutrition for health and take steps to improve the quality of their diets and well being. Many studies have been done to show the impact of nutrition education on different groups.

Devadas (1965) reported that nutrition education imparted through Applied Nutrition Programme (ANP) had positive effect on the children as well as mothers. In
ANP nutrition education is imparted through the use of practical demonstration, exhibition, home visits and group contacts. In some areas beneficial effects of songs, skills, discussions, and demonstrations have been shown while in others, individual contact has been found to be useful.

Devadas et al. (1966) conducted a study on elementary school children. They selected thirty children who were participating in school lunch programme. Nutrition education was also given to them through posters, charts, story telling, and school garden. The results showed that children who participated in school lunch programme had acquired higher level of nutritional knowledge than the other children of the control group.

Rao et al. (1969) study proved that knowledge and attitudes of rural mothers improve as a result of nutrition education.

Kamalanthan (1970) in a study imparted nutrition education to the children (receiving supplementary food) and their mothers. The results indicated that mothers were convinced of the nutritive value of the supplements made of ragi and cholam. They had started including these and vegetables in their diets at home.

Shah (1971) reported that mothers of 16 children suffering from kwashiorkor in Palaghar village were advised on diet modification. Weekly visits were made by the nurse and nutrition and health education was given to mothers through person to person talk. After one year it was observed that not a single child died and all improved. 68 percent of mothers attributed the recuperation to the diet and 16 percent to medicines only.
Devadas et al. (1972) and Devadas et al. (1973) reported that school lunch programme in itself is an effective medium for imparting nutrition and health education. When along with school lunch, nutrition education is imparted to children, results are encouraging in term of knowledge gains.

Mukundan (1973) organised nutrition education through women's camps. The study revealed that there was an increase in the home garden and poultry rearing. The number of families using green leafy vegetables also increased considerably and they adopted better methods of cooking after nutrition education.

Devadas et al. (1974) studied scope of nutrition education through integrated curriculum of school. Nutritional themes were incorporated in the subjects included in the syllabus such as English, Mathematics, Tamil, General Studies and Social Studies. This showed better results than teaching of nutrition as an isolated activity. Devadas and Sarojini (1978) in another study emphasized the importance of introducing nutrition education through integrated curriculum.

Murthy (1975) in a study on effect of nutrition education given to mothers of children who were given food to carry back home found that mean intake of calories, proteins minerals and vitamins had increased due to food distribution and nutrition education imparted to mothers. Similar results were obtained in a study by Gopal Das et al (1975) where nutritional knowledge of mothers increased and practices improved a lot by complementing nutrition education with supplementary food for children.

Chandrashekhar and Amarithwani (1976) analysed that school lunch programme improved health habits and nutritional practices both in school and at home. Improvement in dietary habits after introduction of nutrition education was also reported by Devadas et al. (1972) and White Head et al. (1973).
Choudhary et al. (1977) reported that with food as a catalyst, inputs of nutrition and health education with basic health care can be effectively integrated into an easily acceptable package by mothers and children.

Shah et al. (1977) in another study in Kasa provided health and nutrition education to mothers by part-time social and health workers. They made weekly and monthly visits. The results were encouraging after one year of implementation. Shah et al. (1978) further supported this result by recommending domiciliary nutrition education.

Gopaldas et al. (1978) stressed on the need of relevant and simple health and nutrition messages in local languages so that nutrition education reaches at grass root level.

Devadas et al. (1979) conducted a study on dissemination of nutrition information through parent teacher associations in primary schools. The results showed that these associations had a significantly beneficial impact on the nutritional knowledge and practices in the families.

Menon et al. (1980) reported that nutrition education should form an essential part of all feeding programmes. In this study it was found that even after stopping supplementary diet of children, the mothers became enough aware to buy these items from local market.

Puri and Malhotra (1982) conducted a study on the impact of formal nutrition education on the knowledge, beliefs and practices of Home Science students. A
significant impact on the nutritional knowledge was observed but the practices and beliefs were not influenced much.

Puri et al. (1984) evaluated nutrition and health education of Balsevikas through in-service training. After four weeks of training, there was greater change in the knowledge level than practice. The decline in the knowledge was reported more than in practice when a retention test was conducted. Thus it was suggested that for greater retention, knowledge must be imparted at intervals of 3 months at least.

Ruel et al. (1992) conducted a study in Lesotho and found that mothers who attended the clinic (where knowledge was imparted on weaning practices and diarrhoea) were better informed than those who did not attend the clinic.

Sur et al. (1997) in a comparative study in urban slum areas concluded that the mothers who were imparted nutrition education delivered babies of average weight where as mothers who were not imparted nutrition education delivered babies of below average weight.

A close analysis of review of related and relevant literature show that the diets of pre-schoolers in India are still deficient with respect to all the nutrients. That is why they have a low nutritional status. The mothers are not well informed about health and nutrition facts especially in rural areas and low socioeconomic groups. Many supplementary feeding programmes are being organised in India where food supplement is given to children once a day. No doubt, the supplement enhances their physical and mental development but if the child gets all the meals at home which are balanced and nutritious, it will definitely influence their development. At home, mothers
are directly responsible for feeding the child and taking care of his health. Good quality and proper quantity of food can be given to the child if the mothers have proper knowledge of nutrition.

In many studies conducted in different parts of India and abroad, impact of Health and Nutrition Education of mothers is measured in terms of Knowledge and Practice gains. In no study impact has been measured in terms of physical and mental growth of their children. So, the investigator thought of measuring the impact of Health and Nutrition Education of mothers in terms of Physical, Mental and Skill gains of their pre school children.