CHAPTER – II
REVIEW OF LITERATURE

2.1 Theoretical Review of Related Literature
2.2 Review of Related Literature
CHAPTER II

REVIEW OF LITERATURE

This chapter is a review of related literature and is broadly divided into two sections- theoretical review and research review, which are further divided into a number of subsections.

The first section deals with theoretical review, which includes meaning, history, principal, types, characteristics etc.

The second section includes the note of researches done in India as well as in western country. Both the sections are discussed below one by one.

2.1 THEORETICAL REVIEW OF RELATED LITERATURE

2.1.1 Health:

The word health refers to the condition of the body; good health not only implies freedom from disease, but physical, mental and emotional fitness as well.

The ‘WHO’ has defined health as the “State the complete physical, mental and social well being and not only merely the absence of disease or infirmity”.

Health is important because it is better living and not because it is an instrument for better living better health can have interpersonal benefits. There are many extremities of morbidity and mal nutrition. In instrumental sense ‘good health’ has an economic rationale. While good health leads to reduced medical costs of the government and households, ill health leads to loss of income for poor familiar subsisting on daily income, pushing them to hunger and malnutrition. Improving child health and nutrition is not only a moral imperative but also a rational long term investment. In reality, health care is one of the inputs that go into the generation and maintenance of health. The ‘health production function’ is symbolically represented as Good Health = f (Nutritious Food, Pollution free environment, safe drinking water, mental peace, opportunity for work and recreation, genetic endowment and use of health services.)

2.1.2 Determinants of Child Health:

At the household level, income and wealth are linked to child well being through the effects that purchased goods and services have on the proximate determinants of child health. Greater household income and assets directly raise the
ability to purchase sufficient quantities of nutritious foods, clean water, clothing, and adequately-ventilated housing, fuel for proper cooking, safe storage of food, personal hygiene items, and health services. In Cambodia, more educated mothers do, on average, live in wealthier households. Among households in the lowest wealth quintile, only 5 percent of mothers had at least some secondary schooling, compared to 52 percent of mothers in the wealthiest quintile. Fuji and Ear (2002) showed that in Cambodia, mother’s total years of education more strongly predict total household expenditures than do head of household’s total years of education. The results imply that educated mothers are able to contribute to household income, which allows for greater household expenditures.

At the individual level, greater education for mothers contributes to new skills, beliefs, and choices about sound health and nutritional practices that directly influence the proximate determinants of child health. For instance, knowledge obtained during a mother’s education can affect choices about antenatal care and about children’s nutrition, hygiene, and health care. To the extent that more-educated mothers make healthier choices for themselves during pregnancy, education will have a direct effect on the health of the child at birth. For example, in Cambodia, women with secondary schooling and above were twice to take iron pills while pregnant as those with no education. The proportion of Cambodian children who have all their basic vaccinations is 60 percent higher among children of mothers with secondary schooling and above than among those of mothers with no education.

Improved socioeconomic status also involves changes in norms and attitudes that influence the economic decisions and nutrient related behaviors of mothers and fathers. Stronger bargaining power for women within the household can facilitate decision making that improves child health outcomes. Central to the social context in which mothers and fathers operate is bargaining power, and an important change that comes with more education for women in developing countries is increased empowerment and autonomy.

While substantial knowledge has been gained over the past several decades, much has yet to be learned about how intervening in children's health can modify trajectories to adult health. The precise effect and interaction of a variety of influences that begin in childhood and continue to adulthood are of particular interest. Understanding the differences between transient and enduring health conditions requires comprehensive longitudinal surveys, ideally with multiple cohorts, and
sufficient sample sizes to capture prevalent health conditions as well as rare disorders. Improved measures of functioning and health potential are also needed to achieve a comprehensive, positive vision of children's health. Topics of particular interest include the biopsychosocial pathways of development, the role of genetic biomarkers, the effect of environmental toxins and other environmental health hazards, and the unique susceptibilities of children to a variety of chemical and other exposures. Improved understanding of the reasons and remedies for health disparities among ethnic, racial, and socioeconomic groups is another priority area for future research. Finally, development of profiles and integrative measures of children's health that incorporate each of the three domains of health will improve the quality of children's health measurement.

In summary, strengthening the nation's ability to nurture and develop our children with all their inherent richness and potential requires new strategies and new partnerships to improve the comprehensive assessment of children's health.

2.1.3 Nutritional Status:

“Nutritional Status the condition of health of the individual as influenced by the utilization of the nutrients (B.Shri laxmi, 2012) Nutritional status centre good, Fair or poor. General good health is evident by stamina for work, regular mal times, sound regular sleep, normal elimination and resistance to disease.

Nutrients are the constituents in food that must be supplied to the body in suitable amounts. Food main Physiological function is to provide energy. The body needs energy to sustain the involuntary process for continuance of life, to carry out professional, household and recreational activities to convert food ingested into usable nutrients in the body, to grow and keep warm. The energy is supplied by oxidation of the foods consumed. The second important function of food building body, The third function is to regulate activities and last one is satisfying physical and social needs.

2.1.4 Assessment of Health Status

Assessment of Health Status can be done in terms of Assessment of Nutritional status as well as Physical status along with absence of morbidity. There are five methods assessing Health and Nutritional status –
1. Anthropometric Measurement

Anthropometry refers to the comparative measurements of the body. The measurements include estimation of body fat, muscle tissue and bone. It also includes height, weight, head; arm and chest circumference and skin fold thickness. Hence, it is a useful tool for assessing nutritional status. Other factors such as repeated infection or any of the chronic disease may also affect the nutritional status of the body.

Common Anthropometric Measurements

a. Body Weight: Body weight is the simplest and most used anthropometric measurement for evaluating nutritional status.

b. Length: Under the age of 2 years, length is measured horizontally on a specifically designed board or table.

c. Height: Height is genetically predetermined. However, certain factors, such as poverty can lead to nutrient deprivation during growth can prevent an individual to reach his genetic potential.

d. Mid-upper arm circumference (MUAC): Mid are circumference is usually measured with a flexible, non-stretchable tape at a point midway between the top of the acromion and the ulner process with arm hanging relaxed.

e. Triceps skid fold thickness: Body stores 50 percent of total adipose tissue in the subcutaneous layer. Thus, skin fold thickness can be an important indicator of fat stores in the body.

2. Clinical Findings

Physical examination includes a complete head-to-toe examination. This is the most common method to see clinical signs of nutritional deficiency. Detectable clinical signs of nutritional deficiency start with an inadequate supply of one or more nutrients, the reason for which could be either through an inadequate diet or a failure of utilization; gradual tissue depletion and finally altered biochemical parameters leads to characteristics symptoms.

3. Biochemical and other laboratory tests

A wide range of biochemical tests may be conducted to detect deficiency or toxicity before the symptoms appear. On the basis of the results of the tests, the nutritional corrections are done in early stages.
Normally, blood plasma, blood serum, urine, feces and hair are used for biochemical studies.

4. Dietary history (24 level method)

Dietary assessment is the essential part of nutritional assessment but it is not the sole method of diagnosing nutritional deficiencies. It helps in the interpretation of anthropometric, clinical and laboratory data and provides a base for dietary counseling.

Methods of Dietary Assessment:

a. Twenty four hour recall method: This is the most widely used method in which the subject is interviewed. Most of the dietary counselling is based on this method.

b. Food Frequency: In this method the interviewer asks the individual how often – daily, weekly, monthly specific foods are eaten. A food frequency checklist is designed which may include a few broad categories of foods or all the foods commonly used.

c. Food diary: The individual may be asked to maintain a food dairy for several days. In this method the subject keeps recording whatever he/she eats such as the kind of food and the amount of food or beverages for several days. If this record is kept carefully, some valuable information about food habits is made available.

d. Diet history: In this method a record is maintained of dietary practices of the individual over a period of time. Diet history can be taken through 24 hour recall, food frequency or diary. Information on the socioeconomic environment and medical history should also be included.

5. Radiological and Bio Physical Measurements.

Radiological examinations are not on routine bases unless otherwise indicated. It is advisable to carry-out radiological tests if the clinical signs are suggestive of any bone deformities such as rickets, osteomalacia, fluorosis, infantile survey and protein-energy malnutrition.

In the present study Assessment of Health Status has been done in terms of evaluation of Nutritional status as well as Physical status along with absence of morbidity seen in selected primary school going children by using Anthropometric Measurement, Clinical Findings, Food Frequency and Twenty four hour recall method.
2.2 REVIEW OF RELATED LITERATURE:

The review of literature leads the researcher to conclude the finding with references to past studies. The comprehensive review of literature is an essential part of any scientific investigation. It is also necessary in developing conceptual framework and selection of appropriate design for the study. Further, literature having direct bearing on different aspect of the present study is limited. Hence, references having indirect bearing are also reviewed. A brief account of such literature reviewed has been presented under the following head.

2.2.1 Health and Nutritional status of children

2.2.2 Dietary pattern of children

2.2.3 Association between selected personal, social, economical, communicational and lifestyle characteristics of children and their Health and Nutritional status

2.2.4 Health programmes of children

2.2.1 Health and Nutritional Status:

Pai and Naik (1989) studied the Nutritional status of selected rural school children aged 6.5 to 10.5 years old from villages in Dharwad district, Karnataka. They observed that in the group 9.5 to 10.5 years old, girls (23.5 kg) weighed significantly more than boys (20.3 kg). They also reported that the all the children were significantly below the standard of the Indian Council of Medical Research in height and weight. Out of 254 children, 124 were classified as normal, 30 were currently underfed with past history of malnutrition, 60 normally fed with past history of malnutrition.

Ng-andu (1992) had studied the parasitic infections, anemia and nutritional status of adolescents in primary school of rural area. They showed that the mean values for weight-for-age, a measure of under nutrition, decreased sharply with increasing. Anemia was significantly associated with weight-for-age percentage, weight-for-height percentage, and weight, anthropometric measurements which are susceptible to short-term fluctuations. Hookworm infection was associated with weight-for-age percentage only. Multiple regression analysis showed that the presence of anemia was by far the most important variable of those studied explaining variations in nutritional state of the school children in this area. It is concluded that parasitic infections may be contributing to the poor growth of the children.
Taylor (1993) assessed that some 85% of women used antenatal services, 45% of children under six who had fever were treated with an antimalarial drug, 19%-22% of children aged 12-23 months had been vaccinated against measles, and virtually no children who had had diarrhea were treated with oral rehydration therapy.

Hadju et al. (1995) studied the urban slum school children for assessment of prevalence and intensity of helminthes infections and nutritional status. They pointed out that the prevalence of Ascaris lumbricoides, Trichuris trichiura and hookworm were 92, 98, and 1.4%, respectively. They also reported that the stunting was seen in 55% of the children, and wasting was observed in 10%. Boys had lower nutritional status than girls, based on weight-for-age (WA) and height-for-age (HA) Z-scores. Age had an inverse relationship with WA and HA Z-scores.

Pegelow et al.(1997) investigated the prevalence of helminthes infections and nutritional status of children aged between 8 and 10 years in the rural area of Indonesia. They observed that the Hookworm and Enterobius vermicularis were in 9 and 3% of the children, respectively.

Al-Isa and Moussa (1998) measured the nutritional status of pre-school children aged 0-5 years and compared with the NCHS/CDC reference population. Obesity was defined as weight-for-height (W/H) 2.00-5.00 standard deviation (s.d.) scores of the NCHS/CDC reference population. Underweight and short stature were defined as W/H and height-for-age (H/A) -4.00 to -2.00 SD scores, respectively. Obesity among Kuwaiti pre-school children was 8.2% (7.5% in boys and 9.0% in girls). Underweight was almost similarly distributed among both genders (4.2% in boys and 4.1% in girls). Short stature was 5.8% (6.1% in boys and 5.6% in girls).

Ansari (1998) examined the nutritional status of school girls aged 7-10 years in Ahwaz City in Iran and compared the growth rate with the proposed standards of NCHS. They estimated the mean +or-1 SD for age, weight and height were 8.5+or-1.2 years, 24.5+or-3.5 kg and 128+or-7.9 cm, respectively. They also showed that weight and height were under the 5th percentile of the NCHS standards in 14.6 and 14% of the total investigated cases, respectively. The deviation from the 5th percentile of the proposed NCHS standards were 17, 15.5, 17 and 9% for weight, and 20, 12.6, 12.6 and 11% for height observed at ages 7,8,9 and 10 years, respectively. The calculated average weight and height for age in this study were significantly lower than the NCHS standard (P<0.001 and P<0.003). The average weight for school girls aged 7,
8, 9 and 10 years were 20, 23, 26 and 28 kg, respectively, and the average height were 117, 124, 128 and 136 cm, respectively.

Balgir et al. (1998) studied the Health and nutritional status of tribal children studying in Ashram schools aged six through 15 years of Orissa. They revealed that mild to moderate anemia (68 to 75%) has been observed in Ashram school children. In both boys and girls, the age specific values for mean body weight and height are lower in Ashram school children than the well-to-do group from Hyderabad and NCHS standards.

Dutta (1998) examined the nutritional state of children, and contrast it with the nutritional state of adults. It is noted that 82.9% of the children were undernourished. Children aged seven to 18 years are the most nutritionally vulnerable, and in general people in this area have comparatively inferior health to their counterparts elsewhere in the country.

Nwaorgu et al. (1998) investigated the knowledge of schistosomiasis transmission and the acceptability of a school-based control programme in Enugu State, Nigeria. The study collected data from children, teachers, health staff and household heads. The children had high prevalences of hookworm (32.4%), Ascaris (22.9%) and Trichuris (2.5%), micro-haematuria (17%) and proteinuria (47.3%). Visible haematuria was present in 17.9% of children indicating a high prevalence of Schistosoma haematobium.

Abidoye and Soroh (1999) worked out the effects of urbanization on the nutritional status of primary school children aged 5-10 years. They resulted that the prevalence (37.9%) of protein energy malnutrition (PEM) among the children. The 38.2% of them had weight-for-height <-2SD (standard deviation) signifying wasting, while another 40.5% had a height-for-age <-2SD, indicating the level of stunting among the children. The 60.7% of the malnourished children belonged to mothers with a maximum of primary school education and 52.5% were from mothers who were skilled workers.

Chang et al. (1999) examined the nutritional status of rural primary school children of grades 2 to 5 and all-age schools in central Jamaica using the WHO/NCHS references. They observed that the 69% of the total children were of normal weight-for-age, 2% were moderately undernourished (weight-for-age>-3 Z-score, <less or =>-2 Z-score), and a further 24% mildly undernourished (weight-for-age>-2 Z-score, <less or =>-1 Z-score). Few children were overweight. The frequency distribution of
weight-for-age was similar in girls and boys. In the subsample of children in whom heights were measured, 25.8% were ≤1 Z-score height-for-age, and of these 4.9% were ≤-2 Z-score.

Zulkifli et al. (1999) evaluated the nutritional status of children aged 1-10 years in Malaysia. They found that the nutritional status of the Orang Asli children was poor, with a prevalence of 33.7-65.3% underweight, 55.3-74.4% stunting and 4.4-29.7% wasting based on the NCHS reference values. The prevalence of malnutrition among the Malay children was lower, underweight - 7.3-34.1%, stunting - 9.8-34.1% and wasting - 1.7-17.1%.

Abate et al. (2000) conducted a cross-sectional study during March to May 1997 in which examined nutritional status of 758 children aged 6 to 36 months of four selected slum kebeles (villages) of Addis Ababa. The study established six variables to predict childhood malnutrition: (1) presence of child waste inside house (Odds Ratio =7.44; p<0.0001), (2) diarrhea treatment at the hospital (OR=0.47; p<0.05), (3) prolonged storage of cooked foods (OR=2.86; p<0.05), (4) feeding with washed hands (OR=0.44; p<0.01), and (5) poor handling of drinking water (OR=3.18; p<0.01) and (6) foods (OR=3.52; p<0.01). They suggested for changing the behaviours of households towards good personal and household hygiene practices for success of public health programmes.

Abidoye and Akande (2000) compared the nutritional status of public primary school children in upland and a riverine of Nigeria, using the National Centre for Health Statistics (NCHS/WHO) reference values. They found that the malnutrition prevalence of 20.8 and 30.81% for the upland and riverine populations respectively. There was a stunting in 15.8% of upland and 30.0% of riverine children; 3.3% and 1.7% of them were wasted, and 14.2% in the upland and 18.3% in the rural area were underweight. They reported that the Anaemia occurred among 25.0% and 29.2% of the upland riverine groups respectively. Intestinal helminth infection was found to be significantly associated with malnutrition. Ascaris had a prevalence of 46.7% in the upland and 63.3% in the riverine area.

Aggarwal et al. (2000) conducted a study in eight government primary schools of rural Haryana, India, for assessment of the morbidity pattern and nutritional status among the children. They found most commonly morbidity was pallor (23.8%), followed by signs of xerophthalmia (21.6%), dental caries (16.8%), worm infestation (8.3%), respiratory infections (7.3%), refractive error (16.3%), skin
infections (8%) and ear infections (3.7%). Moderate malnutrition (underweight Z score < -2 SD) was higher among males than in females whereas moderate and severe stunting (Z< -2 SD, Z< -3 SD) was marginally higher among females than in males.

**Fernando et al. (2000)** studied the health and nutritional status of school children in two rural communities in Sri Lanka. The height and weight of children were measured and anthropometric indices calculated. Stool and blood samples were examined for evidence of intestinal helminthiasis, malaria and anaemia. A greater proportion of boys than girls were underweight, wasted and stunted. Over 80% of the children were anemic but did not apparently have iron deficiency anaemia according to their blood picture. The prevalence of parasitic infections such as hookworm and Plasmodium spp. that may contribute to anaemia was low.

**Kossmann et al. (2000)** examined the relationships between nutritional status and diarrhoea and respiratory infections in pre-school children between 6 months and 6 years old. They pointed out that H/A, W/H and W/A were significantly and inversely associated with subsequent diarrhoea and febrile diarrhoea (P for trend <0.001) with risks being 2.00 times higher (95% confidence interval, CI (1.64, 2.43)) among children with W/A Z-scores below -4 Z, and 1.75 times higher (95% CI (1.56, 1.96)) among those with a W/A Z-score between -4 and -3 Z compared with children having a W/A Z-score <more or => 1. The febrile cough was inversely associated with W/A and W/H (P<0.03), with risks ranging from 1.41 times higher (95% CI (1.02, 1.97)) to 1.21 times higher (95% CI (1.04, 1.41)) in the group of underweight children with W/A Z-scores below -4 and between -2 and -1 Z, all compared with normally nourished children (<more or => -1 Z).

**Lwambo et al. (2000)** observed the nutritional status of schoolchildren (aged 7-18 years old) from a rural area of Tanzania. They estimated that the overall, 52.5% of children were stunted and 43.0% were underweight, with significantly more boys stunted and underweight than girls. Z-scores of height-for-age for both boys and girls decreased progressively between 7 and 12 years. After 12 years the height-for-age z-scores of girls show a marked upturn, whilst z-score for boys continue to decrease throughout the school-aged years until 16 years when a slight upturn was observed. Anaemia (Hb<120 g/litre) was present in 62.6% of children, with the prevalence decreasing with age. Anaemia improved throughout the school years for boys, but did not for girls. Age, sex and hookworm infection were significant predictors of anaemia.
Masley et al. (2000) studied that the health problems of children and pointed out that the most commonly health problems among the children were a history of bronchitis, asthma, skin allergies, pneumonia, and hay fever. Compared to farming households, more members of non-farming households reported a history of respiratory problems, particularly bronchitis among the women and children. They also observed the important differences in the smoking history, the occupational use of pesticides and fertilizers, and the general health status between the farming and non-farming households and individuals in this rural population.

Ojo et al. (2000) conducted a study for assessment of nutritional status and health risks of three to five-year-old children, using weight-for-age (WFA), weight-for-height (WFH) and height-for-age (HFA) z-scores. They showed that MUAC z-scores (-1.91 SD+or-0.74) gave the highest percentage prevalence of malnutrition of 45.2% in this population, followed by the WFA (-1.22 SD+or-1.07) and HFA (-0.84 SD+or-1.42) z-scores with a percentage prevalence of 23.3% and 20.6% respectively. The WFH z-score (-0.89 SD+or-1.06) was the least sensitive in detecting malnutrition (14.7% prevalence).

Panda et al. (2000) studied the 776 students of both sexes, 462 boys and 314 girls in the age group 5-16 years, of a secondary school in Ludhiana city. They observed that the girls of all ages except the 14 years old had lower mean weight for age in comparison to mean height, as compared to expected weight for age as per ICMR standards. The expected height for age as per ICMR standards was also less in both boys and girls of all ages except the 15 and 16 year old. The prevalence of wasting and stunting in these children was high (52.2% wasted and 26.3% stunted), with boys and girls suffering almost equally. The 11-15 years old were affected most. 72.4% children were found to be suffering from some sickness, with girls suffering more (30.5%) than the boys (22.9%). They also found that the 47.8% of children were normal as per their weight for age, 52.2% were malnourished and 6.8% were in severe degree of wasting. The 11-15 years old children, the age group in which the growth spurt takes place, were observed to be at highest risk of wasting. The 20.7% children were in mild degree of stunting and 5.5% were in moderate/severe degrees of stunting. The 11-15 years old children were the most affected. A total number of 562(72.4%) children were suffering from one or more illness. 26% had anaemia, 23.1% had dental caries, 14.4% had tonsillitis and 5.6% suffered from refractive
errors. The prevalence of anaemia was significantly higher in girls (30.5%) than in boys (22.9%). 1.1% of the children were found to be suffering from skin diseases.

**Shubair et al. (2000)** investigated the prevalence of intestinal parasites and their relationship to anaemia and nutritional status among school children aged 6-11 years in the Gaza strip. Anemia was assessed by Hemoglobin level (Hb) and nutritional status by anthropometric measurements including weight for age (WA), weight for height (WH) and height for age (HA). The overall prevalence of intestinal parasites was 24.5% (n=556). Overall prevalence tended to decline with age in both sexes. Anaemia was common (prevalence 29.9%; n=274, chosen to include 136 infected and 138 non-infected children), as was malnutrition. Anemia was more common in the younger children, and in the youngest age group it was significantly more common in infected children (P<0.01). Infected children in the 8-to-9-year-old age group showed a higher incidence of low WA than non-infected ones. The prevalence of stunting and wasting among infected children of the youngest group was greater than that observed for controls. The prevalence of anemia did not differ between the sexes, but malnutrition was more prevalent among girls than boys.

**Thakor et al. (2000)** analyzed the 2250 children (1092 boys and 1158 girls), aged 10 years and above of 12 primary schools run by Surat Municipal Corporation. They observed that the height correlated positively with the age and increased with its increase. In boys, mean height from its minimum (133.7±6.3 cms) in 10 years age rose to the maximum (153.6±11.1 cms) in 15 years age. Similarly, in girls, mean height increased from 132.8±10.9 cms in 10 years to 150±20.6 cms in 15 years age. Body weight also increased in boys as well as girls with the increase in age. In boys, mean weight increased from 25.0±4.3 kg (10 years) to 36.2±7.4 kg (15 years). In girls also, the weight increased from 26.1±4.8 kg at 10 years to 38.0±7.1 at 15 years. Mean as well as median weight was higher for girls (than boys) at all ages. The appraisal of the nutritional status, adjudged by the weight, height and BMI, revealed that the median parameters of the population were comparable to the ICMR standards but are far below the 50th percentiles of NCHS standards. Girls exhibited the better nutritional status in terms of "weight for age" than boys. Height and BMI showed maximum influence on weight and could explain 48.4 to 10.8 percent and 69.5 to 21.7 percent of weight variations respectively.

**Yusuf (2000)** determined the nutritional status of pre-school children(n=376) of the farmers and examined the factors associated with malnutrition of Dera Woreda,
north west Ethiopia. The nutritional status of the pre-school children was assessed by using the indicators weight for age (W/A), weight for height (W/H), and height for age (HA) and 2SD as a cut-off point of the NCHS reference standard. The overall malnutrition rate was found to be very high, 51.9%, 12.5% and 55.9% W/A, W/H and H/A, respectively. The mean land size per household was 2.4ha; and the mean annual income was 673 Ethiopia Birr. Income was the most important factor in determining nutritional status.

Agrawal et al. (2001) determined the nutrient intake of children in different urban and rural areas in India. A total of 480 children were randomly selected from 50 different wards of Jabalpur city and 10 villages in Madhya Pradesh. The nutritional status of urban children was better than that of rural children. The mean values of nutrient intake of rural children were higher. However, malnutrition was more prevalent in rural children in comparison to urban children.

Anupama et al. (2001) studied the 862 children (457 boys and 405 girls) studying in the 4th standard from different categories of schools in Kozhikode district of Kerala were studied. The NCHS/WHO reference standards were used to define underweight and stunting. The cut-off used to define anemia was 11.5 gm as recommended by WHO in 1998. They observed that the actual deficits in height and weight of children in these schools range from 3.5 to 7.0 cms and 3.5 to 6.0 kg respectively. Stunting was still a problem in the backward area schools affecting 12.9% of students. Underweight was more widespread affecting 46.3% and 65.5% respectively in ordinary and backward area schools. Overweight was an emerging problem in the unaided schools affecting 10.6% of students. Prevalence of severe malnutrition was very low. The mean hemoglobin was 11.8 g/dl. But 44.2% of children were anemic. Anemia was more prevalent in urban ordinary schools and the coastal area. The deficit in hemoglobin in these schools compared to the unaided schools, ranges from 1.8 to 2.0 g/dl. Gender difference in mean hemoglobin was not significant in the sample as a whole though there was a small but significant difference in the ordinary schools in favor of girls.

Ayaya and Esamai (2001) conducted the study on Health problems of street children aged 5 to 21 years. They investigated that the most common symptom was cough (28.9%) while frequent diagnosis was upper respiratory tract infection (URTI) (12.1%) followed by skin disease (50.9%) as the leading disease category. The common drug of addiction was cigarette (37.6%), but none of the school children was
taking any drug of addiction. The prevalence of disease was 467 per 1000 children. Type 2 street children had the highest prevalence of disease (833 per 1000 children). Shelter children had the least disease prevalence (474 per 1000). Factors determining prevalence of disease were the same as in normal children. The malnutrition rate was high with 31.1 and 41.9% of the children being stunted and underweight, respectively. Type 3 children had the highest rate of malnutrition with 51.8 and 64.3% being stunted and underweight, respectively. They also pointed out that the street children have a high incidence of childhood diseases. Respiratory and skin diseases were the leading causes of morbidity. Drug abuse was rampant among the street children but none of the school children abused any drug.

**Magnussen et al. (2001)** evaluated the school health programme in Mwera Division, Pangani District, Tanzania included treatment of malaria attacks occurring in children during school time. Malarriometric surveys on children aged 7-15 years (mean age: 10 years) were conducted once a year. Plasmodium falciparum accounted for 100% of infections and the parasite prevalence varied between 32.7 and 35.3%. Children in grades 1-4 (age 7-13) accounted for 64.6% of cases. Symptoms and oral temperature were recorded for 1258 children. Of these, 992 (78.9%) complained of fever and at least one other symptom when presenting to teachers, 98 (7.8%) had fever as their only complaint and 168 (13.5%) presented without a perception of fever, but with other symptoms. Of these children, 36 (21.4%) had a temperature ≤ 37.5 degrees C. Blood slides were prepared from 55.3 and 37.2% of children diagnosed by teachers during 1995 and 1996, respectively, and 71.4% were found positive. With little training and regular supervision, it was feasible for school teachers to make a presumptive diagnosis of malaria.

**Moosa et al. (2001)** surveyed of primary school children in Bahrain was conducted to estimate the prevalence of goitre and iodine deficiency according to age, sex and area of residence of all government schools. Only 26 children (1.7%) had goitre. Although median urinary iodine was above 100 micro g/litre, 121 of 749 children (16.2%) had low urinary iodine levels. Although iodine deficiency does not pose a significant public health problem in Bahrain, education about the nutritional value of iodized salts in the prevention of this disorder could increase public awareness.

**Shanthi et al. (2001)** determined the important morbidities and their aetiology, and evaluate the extent and pattern of health status of school age children
in Kedar, Tamil Nadu, India. They revealed that according to the 160 respondents, fever (95% of the respondents), respiratory infections (85%), headache (80%) and abdominal pain (53%) were the common morbidities. On specific questioning, 79.3%, 78.1% and 61.3% of the respondents expressed that worm infestation, angular stomatitis and anaemia also affect school age children, respectively. More than 40% of the respondents did not know what caused these morbidities; however, some believed that change of water or getting wet, intake of food that did not agree with the body, excessive heat in the body, fear, eye problems or poor hygiene was the cause. Quantitative data revealed that mean heights and weights, overall intake of calories, iron, riboflavin, niacin and vitamin A in children was less than the reference standards. Most common morbidities include anemia, worm infestation, under nutrition, riboflavin deficiency and dental caries for the cross sectional survey, and fever, respiratory infection, headache, abdominal pain and diarrhea for the longitudinal survey. It is concluded that what the community perceives as morbidity among school age children is different from what was observed on clinical examination.

Ahmed et al. (2002) studied that women’s knowledge, expenditure on food, and price of nutrients are important determinants of nutrient intakes. The analysis of the factors affecting the health status revealed that women’s practice and knowledge, and age of the mother and female headship are important determinants of the weight-for-age and weight for height scores. Also, participation in village level health programmes has a significant effect (at 10% level) on the weight for height.

Anonymous (2002) studied and found that as per Gomez classification for nutritional status using NCHS reference values, majority of the preschool children (93.5%) have been found undernourished. Moderate to severe under-nutrition has been seen in 59.5% children. Severe under nutrition was observed in 15% children. Prevalence of under-nutrition has been found to be almost similar in both the sexes. Prevalence of under-nutrition in preschool children in terms of under-weight, stunting, and wasting (weight for age, height for age and weight for height below –2SD respectively) was observed at 74.3%, 75.4%, and 20% respectively. Very few children were found above NCHS median values i.e. weight for age 2.4%, height for age 5.6%, and weight for height 12.3%. No difference in under-nutrition was found according to sex. Forty-four percent of the surveyed population had signs of anaemia.
**Balgir et al. (2002)** assessed the clinical health and nutritional status of 224 school children (aged 6-14 years, 153 boys and 71 girls) belonging to the Gond tribe from 4 Ashram schools in Kalahandi, Orissa, India. Of the 224 children examined, 34.4% had visible conjunctival pallor, 15% had vitamin B complex deficiency (angular stomatitis, glossitis, cheilosis), 15.2% had vitamin A deficiency (Bitot's spot, conjunctival xerosis), 17.4% had iodine deficiency in the form of goitre, 20% had dental caries, 27.2% had scabies, 3.6% had mycoses and 88% had different grades of anemia.

**Danielzik et al. (2002)** investigated the impact of parental BMI on the manifestation of overweight in 5 to 7 year old children (3306 children). They found that the BMI of the children was significantly correlated with parental BMI (r=0.272, P<0.01). Children's BMI showed closer associations with maternal than with paternal BMI (r=0.254 vs. 0.159, P<0.01). A multivariate regression analysis showed that parental BMI explained 7.6% of the variance in children's BMI. Children with one obese parent were more frequently overweight than children with one overweight parent. Parental BMI showed only a weak correlation with the BMI of their children. However, children's risk of becoming overweight increased with parental overweight and obesity.

**Florentino et al. (2002)** worked out the nutritional status of urban schoolchildren from all public and private schools in Manila for weight and height measurements. The Nutritional status was assessed by weight-for-age and height-for-age Z scores and body mass index (BMI) percentile cutoff points. They estimated that on an average, private schoolchildren were taller and heavier and had higher BMI values than public schoolchildren, resulting in a much lower prevalence of undernutrition and a much higher prevalence of overnutrition.

**Giampietro et al. (2002)** assessed the anthropometric indices of school children and familiar risk factors. They carried out a primary school health programme and assessed children's growth and body composition(n= 869). They observed that the average age was 118+or-5 months, BMI 18+or-3 kg/m2. Offspring BMI was correlated with birth weight (P<0.05), parental BMI and scholarship level (P<0.001), children blood pressure (P<0.001), and hours per day spent in television viewing (P<0.01). Three of 869 children had BMI>30 kg/m2 (2 boys and 1 girl), 33 had BMI>25 kg/m2 (17 boys and 16 girls). The percentages of children who could be
considered overweight (BMI $\geq$ 95th percentile of age- and sex-specific reference data) were boys, 10.0%, and girls, 9.3%.

**Gillett and Tobias (2002)** studied the nutritional status of school children aged 7 to 13 years. They reported that after ages 6 and 7, height-for-age and weight-for-age $Z$-scores of boys decline steadily towards -2.0 SD throughout the 12th year, whereas mean $Z$-scores of girls decline markedly from 8 years on. Mean HAZ (Height-for-age-$Z$-score) of girls falls below -2.0 SD by 11 years and approaches -3.0 SD by 13 years. Thirty-nine percent of males and 47% of females in the baseline sample showed effects of moderate or severe protein energy malnutrition at the time of relocation.

**Mian et al. (2002)** assessed the nutritional status of school aged children (5-10 years) living in an urban squatter settlement in Islamabad, Pakistan. They reported that the measurement of height and body weight revealed a high prevalence of malnutrition among these children. The prevalence of underweight (<2 standard deviations (SD) below the NCHS (National Centre for Health Statistics) standard for weight-for-age) was 29.5%, wasting (<2 SD below standard weight-for-height) 13% and stunting (<2 SD below standard weight-for-height) 35%. Overall, 44% of the children had one or more of underweight, wasting or stunting. Severe malnutrition (<3 SD below the standard value) was present in 15.4% of the children. The prevalence of malnutrition was significantly higher among older children and those from larger, poorer households.

**Singh (2002)** studied a total of 504 households of 16 villages of Sheopur and Shivpuri district of M.P. They observed that as per Gomez classification for nutritional status using NCHS reference values, majority of the preschool children (93.5%) have been found undernourished. Moderate to severe under-nutrition has been seen in 59.5% children. Severe under nutrition was observed in 15% children. Prevalence of under-nutrition has been found to be almost similar in both the sexes. Prevalence of under-nutrition in preschool children in terms of under-weight, stunting, and wasting (weight for age, height for age and weight for height below –2SD respectively) was observed at 74.3%, 75.4%, and 20% respectively. Very few children were found above NCHS median values i.e. weight for age 2.4%, height for age 5.6%, and weight for height 12.3%. No difference in under-nutrition was found according to sex. Forty-four percent of the surveyed population had signs of anemia. Vit.- A deficiency was observed in 8.2% children. The prevalence of Vit.- B complex
deficiency was observed in 2.6% and Vit.-D deficiency in 7.8% children. Though overall prevalence of chronic energy deficiency in adults was found to be 55.2%, only 14% adults had severe CED. Anemia status has been categorized as per WHO recommended classification. Very high prevalence of anemia (87.6%) has been observed in the tribe. Prevalence of moderate to severe anemia has been found to be very high at 47.1%. Though overall prevalence of anemia has been found more or less similar in both the sexes, moderate to severe anemia have been found higher in females than in males. Analysis further revealed that in addition to anemia, other morbidities observed were acute respiratory infection, cervical lymphadenopathy, suspected cases of pulmonary tuberculosis, skin infections including scabies with secondary infection, Vit.- A deficiency and eye infections including conjunctivitis.

Wake et al. (2002) studied the health status of Australian primary school children aged 5-13 y (50.5% male), of whom 17% were overweight and 5.7% obese. Using logistic regression analyses with 'normal weight' as the referent category, obese boys were at greater risk of poor health (i.e. <15th centile) on 7 of the 12 CHQ scales: Physical Functioning (odds ratio (OR) 2.8), Bodily Pain (OR 1.8), General Health (OR 3.5), Mental Health (OR 2.8), Self Esteem (OR 1.8), Parent Impact - Emotional (OR 1.7) and Parent Impact - Time (OR 1.9). Obese girls were at greater risk of poor health on only two scales: General Health (OR 2.1) and Self Esteem (OR 1.8). Forty-two percent of parents with obese children and 81% with overweight children did not report concern about their child's weight. Parents were more likely to report concern if the child was obese (OR 21.3), overweight (OR 3.5) or underweight (OR 5.4) than normal weight (P<0.05). Concern was not related to child gender, parental BMI or parental education after controlling for child BMI. Perceived health and well-being of overweight/obese children varied little by weight category of the reporting parent (overweight vs non-overweight).

Agudelo et al. (2003) evaluated the nutritional status of 6 to 18 years old students by means of anthropometric measurements; and consumption of iron and vitamin C. They found the prevalence of iron deficiency was 4.9%, and the prevalence of iron-deficiency anaemia was 0.6%. The prevalence of both was higher among adolescent women (P<0.05) than in the rest of the sample studied. The anthropometric parameter that showed the greatest association with the presence of anaemia was height for age.
Friedman et al. (2003) evaluated the impact of ITNs on growth, nutritional status, and body composition of primary schoolchildren less than 13 years of age living in an area of intense perennial malaria transmission in western Kenya. The ITNs did not have a significant impact on linear growth or summary measures of protein-energy malnutrition in this age group. This lack of efficacy most likely relates to the reduced burden of malaria in this age group in a setting of stable transmission pressure. Use of ITNs was associated with a change in body composition with an increase in percent lean body mass (1.2%; P=0.04).

Jimenez et al. (2003) survey the third and fifth grade students for assessment of anthropometric status and their perception of hunger experience and dietary intake by 24-h recall method. They observed that the overall prevalence of overweight and obesity was 38%. Abdominal obesity was found in 26% of subjects, while 43% had both obesity and abdominal obesity. The prevalence of under nutrition according to weight-for-age was 1.2%, and by height-for-age it was 4.8%. The prevalence of hunger was 2.5%, and at risk of hunger was 44%. Daily intake of food groups in servings was: 8.7 grains, 1.2 fruit, 1.0 vegetable, 2.1 milk and 2.6 meat.

Jinabhai et al. (2003) investigated the relationship between stunting and levels of overweight/obesity among school children aged between 8 and 11 years, using two definitions of overweight and obesity, based on the WHO/NCHS standard based on the 85th and 95th centiles and International Obesity Task Force (IOTF) criteria. Stunting was measured according to the WHO definition of -2 Z scores height-for-age. They reported that the moderate stunting ranged from 2.9 to 40.2%, and mild stunting ranged from 31.4 to 75%. The prevalence of overweight ranged from 0.4 to 13.3% (WHO criteria) and from 0.4 to 11.9% using the IOTF criteria; while obesity ranged from 0.1 to 3.7% (WHO) and from 0.1 to 1.5% (IOTF criteria). The prevalence of overweight and obesity was observed to be higher using the WHO definition than that of IOTF (0.05<P<0.10).

Kwena et al. (2003) determined the nutritional status of children less than five years of age in an area in rural western Kenya. They observed the prevalence of stunting (Z-scores for height-for-age [HAZ]<-2), wasting (Z-scores for weight-for-height [WHZ]<-2) and being underweight (Z-scores for weight-for-age [WAZ]<-2) was 30%, 4%, and 20%, respectively. This was severe (Z-score <-3) in 12% (stunting), 1% (wasting), and 5% (underweight) of the children. Few children less than three months of age were malnourished (<2%), but height-for-age and weight-
for-age deficits increased rapidly in children 3-18 months of age, and were greatest in children 18-23 months old (44% stunted and 34% underweight).

**Neumann et al. (2003)** found significant positive associations between intake of animal source foods (ASF) and growth, cognitive development and physical activity in Kenyan primary school children. They observed that the baseline data revealed stunting and underweight in 30% of children and widespread inadequate intakes and/or biochemical evidence of micronutrient deficiencies, particularly of iron, zinc, vitamins A and B-12, riboflavin and calcium. Little or no ASF were eaten and fat intake was low. Malaria was present in 31% of children, and hookworm, amoebiasis and giardia were widely prevalent.

**Nigam et al. (2003)** assessed malnutrition, classifications like Gomez and Indian Association of Pediatricians (IAP) used to analyzed data. The prevalence of moderate and severe levels of malnutrition was defined as the proportion of children below −2 SD of the median value of the NCHS reference population. Malnutrition could be monitored using both height – for – age and weight – for – height indicators. The average cut-off points for σ, 2σ and 3σ limits, both for boys and girls, are 96%, 92% and 88% of median respectively for height - for - age, and 91%, 81% and 72% for weight – for – height. In India, at the national level, ICDS also uses IAP classification for growth monitoring and identifying severely malnourished children below 6 years for supplementary food. However, international organizations and even National Family Health Surveys uniformly use NCHS standards and standard deviation classifications. A drawback of IAP classification is that it is not only arbitrary, but also underestimates severely malnourished children. The study showed that it should be 67% of median weight based upon standard deviation classification.

**Prista et al. (2003)** tested the relevance of the anthropometric criteria for health and well-being, particularly in developing countries of 2316 subjects (n=1094 males, 1222 females) aged 6-18 y from Mozambique. The subjects were classified in 5 nutritional groups labeled normal, low height-for-age (stunted), low weight-for-height (wasted), low height-for-age and low weight-for-height (stunted and wasted), and overweight, according to cutoffs set by a World Health Organization expert committee. Socioeconomic status was classified according to region of residence. They found the prevalence rates for males and females, respectively, in the nutritional groups were 3.0% and 2.3% (stunted group), 21.9% and 10.0% (wasted group), 3.0%
and 0.8% (stunted and wasted group), and 4.8% and 7.7% (overweight group). With control for age, socioeconomic status, and maturity stage, the overweight group performed significantly worse than did the other groups on most of the fitness tests. Compared with the normal group, the 3 undernourished groups performed significantly worse in absolute strength tasks, better in endurance tasks, and equally in flexibility and agility.

Renzaho and Renzaho (2003) reported that Malnutrition was found to be most prevalent in children aged 6-29 months old (W/H <-2 Z-score and/or oedema, 6.2%; 95% confidence interval (CI), 3.4-10.6%), among whom the malnutrition rate was almost double the overall malnutrition prevalence (W/H <-2 Z-score and/or oedema, 3.5%; 95% CI, 1.5-7.2%).

Shrestha and Khattri (2003) assessed the health and nutritional status of school children, 4-15 years of age, in 6 government primary schools of the Pokhara valley. A total of 750 students of both sexes (368 boys and 382 girls) were examined. The prevalence of wasting and stunting in these children were low (10.3 and 15.7%, respectively). The 6-10 years old children were affected most. The Pediculosis, dental caries and worm infestation were the three most common diseases suffered by students.

Silva et al. (2003) conducted the study to assess the impact on geohelminth infections of introducing albendazole in the national filariasis control programme in Sri Lanka for the children aged 8-9 years in six schools They found that infections with Ascaris lumbricoides, Trichuris trichiura, hookworm and Enterobius vermicularis were detected but always at prevalences of <5%. The cumulative prevalence of geohelminth infection was 4.5% at baseline and 2.0% at follow-up. The prevalences of infections were all lower after mass drug administration than before, but none of the reductions was statistically significant.

Siyambalagoda et al. (2003) assessed and compared the nutritional status of primary school children of the Polonnaruwa district (Sri Lanka). The nutritional status of the primary school children of the new settlement was poorer than those in the old settlement in all three anthropometric indicators, namely stunting, wasting and underweight. The prevalence of stunting among children from the new settlement (36.2% and 31.2% in males and females respectively) was significantly higher than those of children in the old settlement (29.0% and 28.6% in males and females respectively). The prevalences of wasting among children from the new settlement
(51.8% and 48.2% in males and females respectively) were significantly higher than that of children in the old settlement (27.3% and 23.2% in males and females respectively). The prevalence of underweight was 65.4% and 62.4% in the new settlement and 47.2% and 38.3% in the old settlement, in male and female children, respectively. More than 85% of the children were anemic with the prevalence being significantly higher among children from the new settlement (91.5%) as compared to those from the old settlement (72.3%).

Hughes et al. (2004) determined, Federated the prevalence of Ascaris lumbricoides, Trichuris trichiura and hookworm infections and nutritional status school children aged 5-12 years attending 27 primary schools in 14 Pacific Island countries. They reported that the total prevalence of helminthiasis was 32.8%. Anaemia prevalence was 12.4%. Children with helminthiasis and anaemia were found to be 8.7 times more likely to be stunted and 4.3 times more likely to be underweight than non-anemic and non-infected children. Helminthiasis was found to be strongly associated with anemia, stunting and underweight and environmental influences identified.

Eroshina et al. (2004) assessed the relationship between area of residence and respiratory function in junior schoolchildren aged 6-12 years. They observed that the children from the lower pollutant districts were generally younger, had higher parental income, and were less frequently exposed to cigarette smoke at home. They were also less likely to report heavy lorry traffic in the streets outside their homes. After adjustment for age, gender and height the FVC was 7.6% (3.6-11.5%) lower in children from the medium pollution district and 9.9 per cent (95% confidence interval (CI) 5.6-14.0%) lower in children from the high pollution district compared with those in the least polluted district (P<0.001 for trend). The frequency of reported allergy was also lower in the high pollution district. FVC increased, and the probability of a low FER decreased, with household income. Children from areas of high environmental pollution had lower lung capacity but also smaller risk of a low FER compared with those from cleaner areas.

Janssen et al. (2004) studied the overweight and obesity prevalence rates for 11-16-year-old Canadian youth (n=5890) and to examined the associations between overweight and obesity with dietary habits and leisure-time physical activities. They observed fifteen percent of 11-16-year-old Canadian youth were overweight (pre-obese) and 4.6% were obese in 2002. These prevalence rates were greater in boys than
girls (p<.001), but did not vary according to age. There were no clear associations observed between dietary habits and measures of overweight and obesity. However, physical activity levels were lower (p<=.05) and television viewing times were higher (p<.01) in overweight and obese boys and girls than normal-weight youth.

Lissau et al. (2004) compared the body mass index (BMI) and the prevalence of BMI at or above the 85th centile and 95th centile (overweight) in 29242 boys and girls, aged 13 and 15 years (adolescents). They observed that the highest prevalence of overweight was in the USA and the lowest in Lithuania. On the basis of the reference standard, the prevalence of overweight (percentage) in the USA was 12.6% in 13-year-old boys, 10.8% in 13-year-old girls, 13.9% in 15-year-old boys, and 15.1% in 15-year-old girls, all significantly increased. Prevalence of overweight in Lithuania was significantly below the expected 5%, with 1.8% in 13-year-old boys, 2.6% in 13-year-old girls, 0.8% in 15-year-old boys, and 2.1% in 15-year-old girls. Relative rankings among countries were similar for BMI at or above the 85th centile.

Moy et al. (2004) studied the nutritional status of school children and adolescents in Malaysia. They observed BMI status using the cut-off of BMI-for-age >=95th percentile and <5th percentile for overweight and underweight respectively, there were a total of 7.3% of overweight students and 14.8% of underweight students. When analysed by gender; 7.5% of boys and 7.1% girls were overweight, while 16.2% of the boys and 13.3% of the girls were underweight. The youngest age group (11 years old) had the highest prevalence of underweight as well as overweight. With increasing age, the prevalence of underweight and overweight decreased and more children were in the normal weight range. The overall prevalence of overweight among the three ethnic groups was similar. However the prevalence of underweight was highest among the Indian students (24.9%), followed by Malays (18.9%) and Chinese (9.5%) (P<0.001).

Muzzo et al. (2004) analysed the nutritional and stature trends in prepubertal and pubertal boys and girls from 1986 to 1998. They detected significant increases in obesity risk (body mass index between the 85th and 95th percentiles): from 8.3% to 19.6% in prepubertal males, from 5.4% to 14.6% in pubertal males, from 10.2% to 16.2% in prepubertal females, and from 9.7% to 24.9% in pubertal females. Obesity (body mass index >95th percentile) increased significantly, from 4.3% to 29.5% in prepubertal males, from 1.6% to 14.6% in pubertal, from 4.7% to 24.0% in prepubertal females, and from 2.3% to 17.6% in pubertal females. During this same
period, the prevalences of short stature (height for age below the 10th percentile) decreased from 40.9% to 12.0% in prepubertal males, from 44.2% to 20.4% in pubertal males, from 29.8% to 12.7% in prepubertal females, and from 41.1% to 25.8% in pubertal females.

Patel and Bhavsar (2004) analyzed the data from National Family Health Survey (NFHS), Gujarat (n=3845) for to know the effects of selected demographic and socio-economic factors on three dimensions of malnutrition among children below age three years, as indicated by anthropometrics measurement viz., proportions stunted, wasted and underweight, by place of residence and sex of child. They found that the stunting increases with the increase in the age of child. A little over half of the children (53-55 percent) are found stunted in the age group 12-23 months. This decreases slightly to 48 percent in urban areas but increases to 63 percent in rural areas.

Ulukanligil and Seyrek (2004) evaluated the relationship between nutritional status and parasitic infections of schoolchildren and demographic, socioeconomic factors in Sanliurfa province, southern Turkey. Nine hundred and eight schoolchildren took part in the survey: 57.2% boys and 42.7% girls. The children's mean z scores were as follows: height for age - 0.8 (+or-1.0) and weight for age - 1.0 (+or-0.9). The mean Hemoglobin concentration was 123 g/litre (+or-2.1) and the prevalence of parasitic infections was 55.1%. In total, 50.2% of children were hungry when they arrived at school and 13.4% worked after school. Over 70% (70.4%) of mothers and 18.1% of fathers were illiterate, 16.1% of fathers were unemployed and 46.3% of fathers were engaged in low-income labour. The mean number of children in each family was 5.4 (+or-2.5), and the mean number of children from each family who attended school was 2.1 (+or-1.1). The school-attendance ratio was 0.4 (+or-1.0). Data indicated that older children had significantly lower mean z scores of height (P<0.0001) and weight for age (P<0.0001) than younger children, and boys had significantly lower mean z scores of height for age than girls (P<0.0001). Children living in shantytown areas had significantly lower mean z scores of height for age (P<0.0001) and weight for age (P<0.0001), lower mean Hemoglobin concentrations (P=0.003) and a worse parasitic infection status (P<0.0001) than those living in apartment areas. Children who were hungry when they arrived at school had significantly lower mean Hemoglobin concentrations than those who had eaten (P=0.04).
Ulukanligil and Seyrek (2004) examined the relationship between nutritional status and parasitic infections of schoolchildren and demographic, socioeconomic factors of nine hundred and eight schoolchildren (57.2% boys and 42.7% girls). The children's mean z scores were as follows: height for age - 0.8 (+or-1.0) and weight for age - 1.0 (+or-0.9). The mean Hemoglobin concentration was 123 g/litre (+or-2.1) and the prevalence of parasitic infections was 55.1%. In total, 50.2% of children were hungry when they arrived at school and 13.4% worked after school. Over 70% (70.4%) of mothers and 18.1% of fathers were illiterate, 16.1% of fathers were unemployed and 46.3% of fathers were engaged in low-income labour. The mean number of children in each family was 5.4 (+or-2.5), and the mean number of children from each family who attended school was 2.1 (+or-1.1). The school-attendance ratio was 0.4 (+or-1.0).

Varenne et al. (2004) analysed the oral health status of children and adults in rural and urban areas of Burkina Faso. At age 6, 38 percent of children had caries, with prevalence higher in urban than rural areas. At age 12, the mean DMFT was 0.7 with prevalence significantly higher among urban than rural children.

Zhao (2004) estimated that the average malnutrition rate was 3.74%, showing an annual decreasing tendency. The average of obesity was 11.19%, showing an annual increasing tendency. The rate of obesity was higher in males than in females (17.32 vs. 9.17%, P<0.01). The peak of obesity occurred in senior middle school students.

Chandrasekara et al. (2005) surveyed the 305 children age 3 to <6 years in Kurunegala for determination the factors associated with nutritional status of preschool children living in urban and peri-urban areas. A two-day activity recall was used to assess mother time on childcare activities. Blood Hemoglobin level was measured from a sub sample of the cohort. They found that the boys had a significantly higher birth weight, current weight, height, and body mass index (BMI) than the girls. The prevalence of underweight, wasting and stunting in the study cohort was 18.7%, 27.7%, and 2.6% respectively.

Friedman et al. (2005) studied the relationship between malaria and Protein-energy malnutrition (PEM) was controversial. Three cross-sectional surveys were conducted using insecticide-treated bed nets (ITNs) among children aged 0-36 months living in an area with intense malaria transmission. In multivariate models, stunted children had more malaria parasitemia (odds ratio [OR] 1.98, P<0.0001), high-density
parasitemia (OR 1.84; P<0.0001), clinical malaria (OR 1.77; P<0.06), and severe malarial anemia (OR 2.65; P<0.0001) than nonstunted children. The association was evident in children with mild-to-moderate (-3<height-for-age Z-score [HAZ]<-2) and severe stunting (HAZ<-3).

Hublet et al. (2005) studied Perceived Social Capital (PSC) and self-rated health in Flemish adolescents (n=16,561). They estimated the mean age of adolescents was 14.5 years. Half of the young people were female (51.5%). Sixteen percent of the young people indicated to have a fair or poor health. The prevalence rates were 31.8% for low PSC, 30.6% for medium PSC and 37.7% for high PSC. Young people with poor self-rated health, were more likely to have a low or medium PSC. (low: 1.81 [1.63-2.02]; OR medium: 1.22 [1.08-1.36]). When PSC was adjusted for other socio-economical indicators and smoking and obesity, the OR's decreased slightly but stayed significant (low: 1.73 [1.53-1.95]; OR medium: 1.21 [1.07-1.38]).

Janssen et al. (2005) estimated the prevalence of overweight and obesity in school-aged 137,593 youth from 34 countries and examined the association between overweight and selected dietary and physical activity patterns. The prevalence of overweight and obesity was determined based on self-reported height and weight and the international child body mass index standards. Logistic regression was employed to examine associations between overweight status with selected dietary and physical activity patterns. They observed that the two countries with the highest prevalence of overweight (pre obese + obese) and obese youth were Malta (25.4% and 7.9%) and USA (25.1% and 6.8%), while the two countries with the lowest prevalence were Lithuania (5.1% and 0.4%) and Latvia (5.9% and 0.5%). Overweight and obesity prevalence was particularly high in countries located in North America, Great Britain, and south-western Europe. Within most countries, physical activity levels were lower and television viewing times were higher in overweight compared to normal weight youth. In 91% of the countries examined, the frequency of sweets intake was lower in overweight than normal weight youth. Overweight status was not associated with the intake of fruits, vegetables, and soft drinks or time spent on the computer.

Page et al. (2005) determined the levels and patterns of physical activity in a sample of obese (>=99th percentile body mass index (BMI)) and non-obese (<99th percentile BMI) children. A total of 133 children (mean age 10.5+or-0.8 years) were included. They observed that the obese children were significantly less physically active overall than their non-obese counterparts (P=0.001). Similarly, the obese
children spent less time in physical activity of moderate or greater intensity than the non-obese children (P=0.002). Hourly patterns of activity indicated a tendency in obese children to be less active than non-obese children at times when activity was more likely to be determined by free choice, particularly outside of school time.

**Rao et al. (2005)** examined a total of 1022 pre-school children (M 527, F 495) of tribal area. They observed that the boys were slightly taller and heavier than girls but the difference was not significant. Both the boys and girls were shorter and lighter compared to the NCHS reference data for their ages and sex. The distribution of pre-school children was classified according to Standard Deviation (SD). High prevalence of undernutrition (below 2SD) in terms of underweight (61.6%), stunting (51.6%) and wasting (32.9%) was observed among them. The severe degree (below -3SD) of underweight, stunting and wasting was found about 27.8, 30.3 and 6.5 per cent children, respectively. Anaemia prevalence rate of 86.7 per cent was observed among the children. Moderate and severe anaemia was observed in 71.1 per cent children. Prevalence of clinical protein energy malnutrition (PEM) was found in 6 (0.6%) children. Emaciation was seen in 35 (3.4%) children. Clinical signs of anaemia were present in 530 (51.9%) children. Vitamin A deficiency in the form of Bitot’s spots was recorded in 16 (1.6%) children. A total of 127 (12.4%) children were found suffering from upper respiratory tract infection. Vitamin B complex deficiency in the form of angular stomatitis and cheilosis was seen in 29 (2.8%) children.

**Sunita Kumari and Jain (2005)** assessed the 413 school children (260 boys and 153 girls, aged 6-12 years) from rural areas in Bihar, India for anthropometric parameters and clinical symptoms of deficiency diseases. The dietary intake of a subsample (n=60; 20 boys and 40 girls) of the surveyed children was recorded. A high incidence of malnutrition was observed. The mean height and weight of the children were below the standard values. However, increment in height and weight were higher in girls than in boys, although intake of foods and nutrients was not significantly different between boys and girls. Nutritional deficiency diseases such as iron deficiency anaemia, riboflavin deficiency, dental diseases, protein energy malnutrition and vitamin C deficiency were observed.

**Acharya et al. (2006)** estimated the Nutritional Status of adolescent Girls belonged to 10-14 years and 15-19 years age group, i.e., 128 and 122 respectively in an Urban Resettlement Colony of South Delhi. They found that the mean BMI was 16.8 (Range 7.5-30.2). It was seen that one fourth of the girls (n= 62) had normal
BMI. Majority (74%) were under nourished, out of which 96 (38.4%) had BMI less than 16, 61 (24.4%) had BMI between 16-17.4 and 28 (11.2%) had BMI between 17.5 to 18.4. Only 3 girls were overweight. None of the girls were obese. However, the level of malnutrition in the 10-14 year age group was 86.7% (111/128) compared to 60.7% (74/122) in 15-19 years age group and this difference was statistically significant (p=0.0001).

**Armstrong et al. (2006)** determined the prevalence of overweight and obesity in South African children aged 6-13 years (5611 male and 4584 female). Height and weight were measured and body mass index (BMI) \(\text{BMI} = \frac{\text{weight (kg)}}{\text{height (m)}^2}\) was calculated for each grouping (age x gender x ethnic group). They observed significant differences in height and mass between the different ethnic groups and genders. The prevalence of obesity within the sample was 3.2% for boys and 4.9% for girls, whereas overweight prevalence was 14.0% for boys and 17.9% for girls. The prevalence of obesity and overweight among boys was 2.4% and 10.9% respectively, while obese and overweight girls comprised 4.8% and 17.5%, respectively.

**Bulliyya et al. (2006)** carried out the study among the Dongria Kondhs primitive tribal group (PTG) and Domb scheduled caste populations in Rayagada district of Orissa. History of acute illness within two weeks prior to clinical examination was recorded among children aged up to 10 years. They observed that about 50% and 40% of children of 0-5 yrs and 6-10 yrs age respectively had some illness. Common cold, respiratory tract infection, febrile illnesses and diarrhoeal disorders were the common illness observed in order of frequency. Difference in frequency of illness observed to be minimal in Domb caste and Dongriatribe children. Recurrent respiratory tract infection was found to be the most common illness, where recurrent attacks of RTI/fever/ diarrhoeal diseases were found to be reduced as the age advanced (i.e. in 6-10 yrs. age group). History of exanthematos illnese in terms of fever and/or rash was seen in quite a few children (about 5%). Clinical pallor was observed in two third of the children examined and prevalence rate was 10% higher in the 6-10 yrs children when compared to younger (0-5 yrs) children. Signs of protein energy malnutrition in forms of edema and changes in skin or hair were evident in about 8% of children of both the groups. Splenomegally was observed in identical proportions (15%) in both the age groups from either groups and it was associated with hepatomegally in more than half of these cases. Auscultatory signs of lower respiratory tract infection or wheezy bronchitis syndrome detected in about 7% of
Dongria children, where it was observed to be higher (17%) in Domb children. Nutritional status. The proportion of Dongria children with underweight (<median–2SD) was 66.7%, of which 38.1% were severely underweight (<median–3SD). While 52.7% of Domb children were underweight and 20.2% of them were severely underweight. Nearly 63% and 52% of Dongria and Domb children respectively were stunted (<median-2SD), an index of linear growth retardation reflected chronic nutritional deficits. The prevalence of severe stunting (<median-3SD) was 21% in both the communities. The percentage of children with wasting was relatively higher among Dongria Kondh (34%) than Domb (27%). About 8% and 5% of children had severe grades of wasting.

Mesfin et al. (2006) assessed the nutritional status of school age children (n=1208, aged 6-18 years) in Addis Ababa. The NCHS reference data on height and body mass index were used to estimate age-specific prevalence of stunting, thinness, and overweight. Using the 5th percentile of the NCHS reference data, the prevalence of thinness was 28.4% for boys and 20.4% for girls; the average being 24%. The prevalence of stunting (<3rd centile) was 13.8% for boys and 6.2% for girls with an average of 9.8% for both sexes. The prevalence of overweight was 3.3%. Thinness and stunting were shown low prevalence in the study area, a level which was lower than the prevalence in some developing countries.

David et al. (2007) examined the 3066 school children and adolescents (aged 5–17 y). They estimated the mean BMI-for-age z score was 0.46, and 17% of the children were overweight; BMIs did not differ significantly between boys and girls. The mean waist-to-height ratio was 0.458, and measures of waist, height, waist-to-height ratio, and SBP were slightly but significantly higher among boys than among girls. In contrast, girls had slightly but significantly higher concentrations of total cholesterol: HDL cholesterol, triacylglycerols, LDL cholesterol, and fasting insulin than did boys. Age was associated with BMI (r=0.48), waist circumference (r=0.59), and height (r=0.90) but not with BMI-for-age (r=0.02) or waist-to-height ratio (r=0.01).

Gray et al. (2007) assessed the causes of overweight to predict weight status of elementary school-aged children (n=169). Anthropometric measurements were obtained from children to determine weight status and nested logistic regression models were used to determine relationships between children's weight status and family characteristics, parental control, and parental belief. They concluded that the
low household income was an important predictor of overweight. Parental control was not a significant predictor of overweight. Parental belief in the primary cause of overweight in children (diet vs physical activity) was significantly related to children's weight; however, it was not significant after controlling for income. Low household income relates strongly to increased childhood weight status.

Medhi et al. (2007) studied the nutritional status of 605 adolescent (boys- 265 and girls-314) among tea garden workers. They observed that the prevalence of stunting (3rd percentile height of NCSH reference) was slightly higher among girls (51.91 %) than boys (47.42 %) and the difference was not statistically significant (p>0.05). The prevalence of thinness (<5th percentile height of NCSH reference) was significantly higher (p<0.05) among boys (59.45 %) than girl (41.32 %) counterparts. Mean BMI value was equal in both sexes at 11 years age at all other ages mean BMI of girls was higher than boys. BMI values of both boys and girls were far below the NCSH median. Overweight was detected only in 2 adolescents (0.33%).

Ojanen et al. (2007) investigated the correlations between household building materials, amenities, and head-of-household education with vitamin A status, hematocrit and hemoglobin (Hb) values in Indonesian preschool children infected with Ascaris lumbricoides and/or Trichuris trichiura (children N=125, aged 3.3+or-1.2 year). Statistical analysis used multiple linear regression models for MRDR value, serum retinol concentration, hematocrit, and Hb with physical and socioeconomic factors as independent variables. Hb and hematocrit were negatively associated with the quality of walls (p=0.032 and p=0.0021, respectively) and floors (p=0.0046 and p=0.0032, respectively). Hb was positively associated with the quality of drinking water (p=0.030) and serum retinol was positively associated with a higher level of head-of-household education (p=0.035).

Perichart et al. (2007) studied the nutritional status of school-aged children (N=561) aged 6 to 13 years from an urban public school in Mexico City and assessed the influence of obesity on health status in a subgroup (n=88) of these children. They found that in the whole school, overweight and obesity prevalence was 27.1% and 21.4%, respectively. High systolic blood pressure was seen in 8.4% of children and 6.2% of children had prehypertension. Higher hypertension risk was seen in children with body mass index >=95th percentile and waist circumference >=90th percentile (88 cm). Significantly higher waist circumference, systolic blood pressure, insulin
resistance indexes, and triglyceride levels were found among the obese when compared with normal-weight children.

Zaborskis et al. (2007) studied the joint activities of parents and school-aged children of 17761 students (8,649 boys and 9,112 girls) aged 13 and 15 years from 6 European countries. They reported that the students from Spain and Ukraine spending the most time together with their families in almost all kinds of joint activities, whereas students from Greenland and Finland reported spending the least of this time. Boys were more likely than girls to be spending time together with family. Joint family activity goes into decline in age from 13 to 15 years. They also found that the distribution of joint family activities tends to be dispersed significantly by family structure (intact/restructured family) and family wealth.

Samir Radi (2009) studied the Nutritional Status of 102 Palestinian Children. They observed that the prevalence of anemia was 72.8% among children. Anthropometrical indices showed that the prevalence of wasting, stunting, underweight were 34.3%, 31.4%, 31.45% respectively. Palestinian children are at high risk of health problems related to malnutrition. The prevalence of anemia among them was 72%. Above the 33.3% of the children were suffered from moderate anemia, 24.5% from mild anemia and 21.6% had normal hemoglobin levels. The mean hemoglobin level among the studied children (10.2 g/dl) was significantly lower than the cut-off point proposed by WHO (<11g/dl) (T(One Sample t-test) =–0.65, p <0.001). The value of hemoglobin level ranged between 7.5-12.5g/dl. The frequency that anemia appeared among male children reaching to about 64%, where it was 78% among female children. The prevalence of anemia based on sex distribution was not statistically significant (c2=2.51, P= 0.11).

Shaaban et al. (2009) designed to study the nutritional knowledge and attitude of 1000 adolescent school girls aged 12 to 16 years from governmental and private schools in Cairo. They observed that the weight and skin fold thickness were higher in private school adolescents compared to governmental school (p <0.01). The height of girls from private schools was also greater than girls from governmental school (p <0.05). There was no significant both schools as regards to skull circumference and BMI (p>0.05). The results of the study also revealed that only 2.8% of the studied girls fell below the 3rd percentile (significant underweight) especially governmental schoolgirls. Obese girls (95th percentile) were 9.9%. Girls 85th and < 95th percentile (overweight girls) were 16 %. Obese and overweight girls were more from the
governmental schools compared to private schools. All the other girls (71.3%) fell within the 3rd to the 85th percentile.

2.2.2 Dietary Pattern:

**Abidoye and Randle (1991)** compared the nutritional status of children aged 7 to 14 in military and private schools. The nutritional status of the children showed that 48% in Command Children School and 74% in Fazil-I-Omar were malnourished. The prevalence of anaemia for all the children was 26% and there was no iron deficiency. Socio-economic factors played a great role in this state of malnutrition. Though all the children ate three square meals, family type and family size must have influenced the quantity of food eaten. The educational level of mothers and occupation of fathers had statistically significant association (P<0.05) with the state of nutrition of the children. Most children from Fazil-I-Omar School regularly ate high carbohydrate diet while those in Command School ate a fairly balanced diet.

**Arrigo et al. (1994)** studied the food and nutrient requirements of school children and criteria used for analysis of diet tables adopted by the school meals programmes in Italy. They analysed the data from the tables indicated that the feeding programme for elementary school children (up to 11 years old) was low in energy and fats and the main meal of the day was deficient in polyenoic fatty acids (PEFA), vitamins, especially riboflavin, folic acid, vitamin A and vitamin E, and minerals, especially calcium, iron, zinc, magnesium and iodine. The diet for middle school children (up to 14 years old) had adequate energy but was deficient in lipids, especially PEFA, vitamins (vitamin E, group B vitamins, vitamin A) and minerals (Ca, Fe, Mg and I). Carbohydrates and proteins in the diet were above recommended amounts.

**Ortega et al. (1996)** investigated schoolday and holiday breakfast habits of 9 to 13 years old children of medium and medium-high socioeconomic level. 53% ate dairy products and cereals for breakfast and 10% also ate fruit: breakfasts that could be considered adequate or satisfactory. However, also 17% of boys and 33% of girls took only dairy products at breakfast. In most cases (98%) this was limited to a glass of milk, an intake insufficient to start the day. 3% of boys and 5% of girls took no breakfast at all. Boys in general and younger children spent more time at breakfast than girls or older children. Breakfast made a contribution of 15.6±0.4% to the
recommended daily intake of energy. In 88% of cases, the contribution of breakfast was lower than 25% of total energy, the advisable level for this meal.

*Chen et al. (1997)* observed that average body weight of the children approximated that of the national standard. Protein intake was above the national standard of 0.75 g/kg body weight daily, but the majority of protein (80%) was derived mainly from plant sources. Ca intake was insufficient. Based on the diet and fluoride intake of the studied groups, the areas with a better nutritional status had a lower incidence of dental fluorosis. The incidence among milk-consuming children (7.2%) was lower than that of non-milk-consuming children (37.5%).

*Balgir et al. (1998)* examined the health and nutritional status of Ashram school children in two districts of Orissa (n= 1040, aged six through 15 years). They observed mild to moderate anaemia (68 to 75%) in Ashram school children. In both boys and girls, the age specific values for mean body weight and height were lower in Ashram school children than the well-to-do group from Hyderabad and NCHS standards. Similar findings were observed for Hemoglobin levels. This indicates that the health and nutritional status of Ashram school children is better than the urban school children of Orissa, low income group of Hyderabad, Andhra Pradesh and Indian average and lower than the well-to-do groups of Hyderabad, Andhra Pradesh and NCHS standards.

*Pratinidhi et al. (1998)* evaluated the ICDS project of Pune city. They studied the diet pattern of 165 children aged 1-6 years, receiving supplementary nutrition from anganwadis. They studied the variables: i.e. knowledge and perception of ICDS, protein and calorie intake of children, nutritive value of ICDS supplementary foods. They found that the protein and calorie intake was less than 50 percent of recommended daily allowance in 38.2 percent and 35.7 percent children respectively. Only 13.9 percent of children had a protein intake of > 90 percent of RDA while 12.7 percent had a calorie consumption of >90 percent of RDA. 71.6 percent of children aged 3-<6 years took the food to their homes and shared with other family members thus depriving them the total benefit of supplementary nutrition. 46.1 percent mothers perceived the supplementary nutrition to be a substitute. The supplement given at anganwadi had an average nutritive value of 213 calories and 5.1 gm protein as compared to recommended values of 300 calories & 10 gms protein.

*Toroitich (1998)* examined the nutritional status among 7-8 year old school going children. The anthropometry results revealed that 19.8% of the children in the
survey were stunted and a dietary food survey showed that 43% of the children had total energy, fat, protein, carbohydrate and Ca intake below the recommended values. Correlation analysis of anthropometry and dietary survey showed that 9.4% of the subjects were malnourished.

**Olivares et al. (1999)** investigated the influence of television publicity on school age children food preferences (n=786 aged 6 to 11 years. They observed that the ninety nine percent of school age children watch television during week days and 20% watches more the three hours daily. Snack commercials such as those about potato chips, chocolates, cookies and ice cream, are preferred by 35% of children. Soda commercials are preferred by 33% and yoghurt commercials by 12%. Eighty five percent of children had money to buy food. Of these, 66% bought snacks, 15% bought sodas and 7% yoghurt.

**Auld et al. (2000)** conducted the survey on demographic and attitudinal factors that were correlated with specific practices to reduce fat intake and increase fibre intake. Factors associated with adoption of specific behaviours were identified. More than 60% reported consuming whole grains; however, only 15% reported eating fruits and vegetables frequently. Among the sample, those more likely to practice a behaviour had the following characteristics: female, college educated, older than 60 years, white, higher income, no children younger than 18 years, perceived health status as excellent, and absence of chronic disease

**Pavlovic and Berenji (2000)** examined the dietary habits of school children aged 10 to 18 years. They determined that 23% of children frequently miss the breakfast, a great deal of them have inadequate rhythm of meal consumption, 47% have one or more meals a day away from home. Fresh fruits everyday consume only 44% of school children, vegetables 21%, two cups of milk or milk drinks 24%, while meat and meat products 33%. Nonalcoholic sweet beverages consume almost everyday 39% of children, snacks 28%, and 15% of children add salt in their meals very frequently. About 73% of children have a possibility to choose what they want to consume, but only 23% of children always think about health when they choose food, and 26% does it sometimes. Younger children think more about health in food selection. Only 37% of analysed children want to change their nutritional habits, the most frequently because of their health condition. They determined the unbalanced nutrition in school children, that has an influence on inadequate nutritional status and nutritive risk factors.
Nowak et al. (2001) conducted a telephone survey to characterize food-allergic reactions in children (aged 3-19 years) with known food allergies in schools and preschools. Of 132 children, 58% reported food-allergic reactions in the past 2 years. 18% experienced one or more reactions in school. The offending food was identified in 34 of 41 reactions, milk being the causative food in 11 (32%); peanut in 10 (29%); egg in 6 (18%); tree nuts in 2 (6%); and soy, wheat, celery, mango, or garlic in 1 (3%) each. In 24 reactions (59%), symptoms were limited to the skin; wheezing occurred in 13 (32%), vomiting and/or diarrhoea in 4 (10%), and hypotension in one (2%). Also, 15 (36%) of the 41 reactions involved 2 or more organ systems, and 6 (15%) were treated with epinephrine.

Serra et al. (2001) evaluated dietary habits and nutritional status of Spanish schoolchildren and adolescents (aged 2 to 24 years) using 24-hour recalls (a second 24-hour recall in 30% of the sample), a food-frequency, lifestyles, knowledge and food preferences. They estimated the mean daily energy consumption was 2189 kcal among males and 1781 kcal among females, and the percentage of energy from fat and saturated fat was 39.8% and 13.4%, respectively, without any differences by gender. Of females, 95% showed folic acid intakes below 200 micro g/day.

Sudesh et al. (2001) carried out supplementation study in 66 children of 10-12 years of age for a period of about 4 months. On the basis of blood analysis, 33 children were taken as deficient having low level of both Hb (<10 g/dl) and serum retinol (<20 micro g/dl). Similar number of children (33) were selected as control purposively who had Hb >10 g/dl and serum retinol >20 micro g/dl. Average daily consumption of cereals, pulses, vegetables, fruits, milk and milk products, fats and oils, and sugar and jaggery was below the recommended dietary intake in control as well as deficient subjects, however, control children consumed more when compared to deficient children. Among nutrients the daily mean intake of energy, protein, iron, beta-carotene and vitamin C were found lower than RDA in deficient subjects as compared to control subjects. Feeding of 100 g/day of cauliflower leaves powder supplements i.e. biscuits and shakarpara improved the Hb, serum retinol, height, weight and nutritional status in deficient subjects. The increase in Hb, serum retinol, weight and height in supplemented group was 14.61, 33.27, 4.48 and 7.06%, respectively. Initially, 27.27% children had normal nutritional status in deficient group, but after supplementation this value was increased to 42.42%.
Swami et al. (2001) assessed the Nutritional status of pre-school children in urban, rural and slum areas of Chandigarh, India, using weight for age criteria by making domiciliary visits. They revealed that the overall prevalence of protein energy malnutrition (PEM) was found to be 51.6% while 65.4%, 26.3%, 5.3% and 3% of children had grades I, II, III and IV PEM, respectively. The prevalence of malnutrition significantly increased with increase in age till 3rd year, then started declining (P<0.001). The prevalence of PEM was significantly higher among Integrated Child Development Service (ICDS) beneficiaries (53.8%) than non-ICDS beneficiaries (46.9%); P<0.05. More attention and better impetus are required to be given to improve the nutritional status of pre-school children in Chandigarh.

Anonymous (2002) studied a primitive tribe of Madhya Pradesh. Vit.- A deficiency was observed in 8.2% children. The prevalence of Vit.- B complex deficiency was observed in 2.6% and Vit. – D deficiency in 7.8% children. Though overall prevalence of chronic energy deficiency in adults was found to be 55.2%, only 14% adults had severe CED.

Guthrie et al. (2002) examined the changes in the quantity and quality of food Americans consumed that was prepared at home versus away from home. For comparability, they used "day 1" dietary data, which both surveys collected via 24-h recall. They categorized foods by preparation at home or at restaurants, fast-food establishments, schools/day care, and other non-home locations. They assessed percent calories from total fat and saturated fat, and the cholesterol, sodium, fibre, calcium, and iron densities of foods prepared at home versus those prepared away from home. They examined that between 1977-78 and 1994-96, consumption of food prepared away from home increased from 18% to 32% of total calories. Meals and snacks based on food prepared away from home contained more calories per eating occasion, and "away" food was higher in total fat and saturated fat on a per-calorie basis than at-home food. "Away" food contained less dietary fibre, calcium, and iron on a per-calorie basis. The food prepared away from home was more sodium and cholesterol dense. They suggested that the nutrition educators need to be aware of the increasing role of "away" food in diets.

Lu JieHua and Watson (2002) studied the food and nutrient intakes, activity levels and body composition of migrant children aged 7-10 years. They concluded that the overall average energy intake of children was close to the recommendations. The average protein intake of children was well above the UK RNI and USA RDA
values (69.3 g compared with RNI of 28.3 g and RDA of 28.0 g), and higher than that of their New Zealand counterparts. The mean percentage of food energy derived from fat was higher than that found in children from China (29.6 vs. 23.4-28.5), but lower than that in New Zealand.

Matheson et al. (2002) examined the relationship between household food insecurity and children's nutritional status (relations among household food insecurity, household food supplies, and school age children's dietary intakes and body mass indexes) of 124 fifth-grade children and their mothers (California, USA). Data on the children's weights and heights were collected and three 24-h dietary recalls were conducted. The mothers provided reports of household food insecurity and household food supplies. They observed that the food insecurity was negatively associated with the children's BMIs and household food supplies but not with the children's food intakes. However, a secondary analysis showed that as payday approached, children from the most food-insecure households had significant decreases in energy intakes and meat consumption. The ages and sex-adjusted BMIs of the food-insecure children were lower than those of the food-secure children but were still within the normal range. The lower BMIs in the food-insecure children may have been due to short-term, yet periodic food restrictions that resulted as household food supplies diminished before payday.

Duda et al. (2003) assessed the dietary intake and selected parameters of nutritional status of 600 children aged 11-14, of primary schools. The 24-h recall was taken to evaluate the total intake of basic nutrients, i.e. proteins, fats and carbohydrates. They found that the daily food rations did not cover the daily demand for basic nutrients according to the recommended norms. Daily food rations (DFR) oversupplied calories (112-125% of the recommended norms) and fats (120-130%), with concomitant insufficient supply of proteins (95% of the recommended intake). Cholesterol and saccharose intakes were higher from recommendations and amounted to 124-150% and 174-194%, respectively. Even more pronounced insufficient protein intake was reported in older children. The analysis of basic anthropometric parameters has, however, confirmed adequate physical development of most of the children.

Siqueira et al. (2003) investigated the effectiveness of multimixture (MM) supplement used concomitantly with other actions to improve children's health. Thirty-one students enrolled in a rural school were examined for anthropometric and hematologic measures before and after the consumption of diet supplemented with
MM. The results were compared with those from control group (n=26) who consumed the same diet without MM. They found the beneficial effect on the nutritional status of children, since it improved their blood parameters and reduced the anemia independently of MM supplementation. The average height/age was significantly higher only in the group that received MM. The supplementation of the deficient diets with MM contributed significantly to the improvement of the children's stature.

**Weker et al. (2003)** conducted the study on the nutrition manner of 508 children aged 1-3, living in various regions of Poland. Children nutrition manner was assessed by recording their daily (24 hours) menu. Frequency of meal consumption, kinds of meals and nutrition preferences were estimated. Most one year old children (465/508) were breastfed; only 43 children were fed in artificial way from the beginning. The nutrition manner of children older that 1 in most cases slightly changed: 25% mothers continued breast feeding, 20% children ate the same meal consumed by adults and approximately 40% of children was fed special diet prepared from the ready products assigned for infants and small children. Modified milk, ordinary milk and dairy products were the fundamental products used for 2-year-old children. 77% children ate meat every day and 88% took fruit and/or vegetable juices. Average energy value of particular meals was similar.

**Bowman et al. (2004)** investigated the effects of fast-food consumption on energy intake and diet quality among 6212 children and adolescents 4 to 19 years old. On a typical day, 30.3% of the total sample reported consuming fast food. Fast-food consumption was highly prevalent in both genders. Controlling for socioeconomic and demographic variables, increased fast-food consumption was independently associated with male gender, older age, higher household incomes, non-Hispanic black race/ethnicity, and residing in the South. Children who ate fast food, compared with those who did not, consumed more total energy (187 kcal; 95% confidence interval, CI: 109-265), more energy per gram of food (0.29 kcal/g; 95% CI: 0.25-0.33), more total fat (9 g; 95% CI: 5.0-13.0), more total carbohydrate (24 g; 95% CI: 12.6-35.4), more added sugars (26 g; 95% CI: 18.2-34.6), more sugar-sweetened beverages (228 g; 95% CI: 184-272), less fibre (-1.1 g; 95% CI: -1.8 to -0.4), less milk (-65 g; 95% CI: -95 to -30), and fewer fruits and nonstarchy vegetables (-45 g; 95% CI: -58.6 to -31.4).

**Cook et al. (2004)** developed household food security scale used in national surveys, is an effective research tool. They examined the associations between food
insecurity and health outcomes in young children. In this sample, 21.4% of households were food insecure (6.8% with hunger). The food-insecure children had odds of "fair or poor" health nearly twice as great [adjusted odds ratio (AOR)=1.90, 95% CI=1.66-2.18], and odds of being hospitalized since birth almost a third larger (AOR=1.31, 95% CI=1.16-1.48) than food-secure children. Food insecurity is associated with health problems for young, low-income children. Ensuring food security may reduce health problems, including the need for hospitalizations.

Janssen et al. (2004) studied the overweight and obesity prevalence rates for 11-16-year-old Canadian youth (n=5890) and examined associations between overweight and obesity with dietary habits and leisure-time physical activities. Fifteen percent of 11-16-year-old Canadian youth were overweight (preobese) and 4.6% were obese in 2002. These prevalence rates were greater in boys than girls (p<.001), but did not vary according to age. There were no clear associations observed between dietary habits and measures of overweight and obesity. However, physical activity levels were lower (p<=.05) and television viewing times were higher (p<.01) in overweight and obese boys and girls than normal-weight youth.

Nasrin et al. (2004) examined the frequency of fruit and vegetable intake among a sample of adolescents in the city of Tehran, Iran. They observed less than daily consumption of vegetables and fruits was reported by 18% and 27% of adolescents, respectively. A significant association was found between gender and low vegetable but not fruit intake. Psychosocial and behavioural risk factors associated with inadequate fruit and vegetable intake.

Chandrasekara et al. (2005) surveyed the 305 children age 3 to <6 years in Kurunegala for determination the factors associated with nutritional status of preschool children living in urban and peri-urban areas. The nutrient intake was assessed using a 3 day diet diary. A two-day activity recall was used to assess mother time on childcare activities. The prevalence of anaemia was 30.5%. Mean intake of energy, fat, carbohydrate, vitamin C and percentage of energy derived from carbohydrate and protein were significantly below the recommended dietary allowances (RDA) and calcium, iron, and percentage of energy derived from fat were significantly above the RDA for the total group.

Ngatia et al. (2005) determined the dietary patterns and nutritional status of pre-school children in Nairobi, Kenya. Three hundred and four pre-school children (149 males and 155 females) aged three to five years were assessed. They observed
that about 96% of the children had been breastfed 46.7% of them for 12-24 months (46.7%), and the mean breastfeeding duration was 20.17 months. The most commonly consumed foods on a daily basis were fruits, vegetables, bread, ugali, porridge and milk. The level of malnutrition was low with underweight at 16% stunting 4.3% and wasting 1.0%. The factors that positively correlated with child nutritional status were the age of the mother and father. The children were consuming a variety of foods both at home and in school, and this together with the high literacy levels the parents/guardians could have contributed towards the good nutritional status.

Vahatalo et al. (2005) investigated the diet of school-aged children in north-west Namibia. Data on food consumption were collected using the 24-h recall interview method. The subjects were schoolchildren aged between 8 and 15 years living in either a small town (n=43) or a rural area (n=10). They observed that, in town, the main sources of energy were maize porridge and wheat bread, and for the rural children, sour milk and maize. The consumption of vegetables, fruit and legumes was very low in both groups. The mean intakes of energy were 6.7 MJ/day for children living in town and 4.7 MJ/day for rural subjects. The intakes of vitamin A, vitamin C and folate were inadequate in both groups.

Vereecken et al. (2005) described food habits in adolescents in thirty-five countries and regions (European countries/regions, Israel, Canada and the USA), based on the food-frequency questions from the cross-sectional Health Behavior in School-aged children survey of 162 305 pupils of 11, 13 or 15 years of age. They found large differences in food habits between countries, the consumption frequency of fruit varied from on average 2.8 to 5 d/week, the consumption of vegetables varied from on average 2.4 to 5.5 d/week, the consumption of soft drinks varied from 2.1 to 5 d/week and sweet consumption from 2.6 to 5 d/week.

Baxter et al. (2006) investigated body mass index, sex, interview protocol, and children's accuracy for reporting kilocalories. Forty 4th-grade children were observed eating school meals (breakfast, lunch) interviewed. The kilocalorie variables were analyzed using separate four-factor (BMI group, sex, race, interview protocol) analyses of variance. No effects were found for reported or matched kilocalories. More kilocalories were observed (P<0.02) and omitted (P<0.05) by high-BMI than low-BMI children. For intruded kilocalories, means were smaller (better) for high-BMI girls than high-BMI boys, but larger for low-BMI girls than low-BMI boys.
Bulliyya et al. (2006) carried out the study among the Dongria Kondhs primitive tribal group (PTG) and Domb scheduled caste populations in Rayagada district of Orissa. Diet survey was conducted on 10% sub sample of households covered for nutrition assessment by 24-hour recall method. A total of 708 households were covered for the study that included 82% Dongria Kondh and 18% Domb communities. The average family size 4.8 and majority of these households were nuclear families. Only 2.8% of Dongria and 16.7% Domb household heads were literate. The total literacy level found to be very low at 6.5% and 23.9% respectively for Dongria and Domb. Data on food and nutrients intake was collected from 164 households. In general, rice and millets formed the bulk of dietaries and comparable to the suggested levels of 460g. The mean intake of pulses was much less than suggested 40g in both the communities (14.7g and 18.5g). The average consumption of green leafy vegetables was marginally lower 24g and 26g in Dongria and Domb than the suggested level of 40g. The consumption of vegetables and roots-tubers was less than 50% of the RDI. Consumption of milk and milk products, fats/oils, sugar and jaggery were grossly inadequate in both communities. The proportion of Dongria and Domb households consuming adequate amounts of both protein and calorie (P+C+) accounted for only 9% and 10% respectively, while about 63% and 61% were consuming inadequate amounts of both protein and calorie (P- C-).

Chhabra and Boora (2006) examined the nutritional status of pre-school children from rural areas of Rewari district, Haryana, India. Two hundred and eight pre-school children (99 male and 109 female of 4-5 years) were selected proportionately from four villages (Nangal Ugra and Shahpur of Bawal block, Chirrh and Karawara of Jatusana block). They observed that the daily mean intake of all food stuffs i.e. cereals, pulses, green leafy vegetables, roots and tubers, other vegetables, fruits, milk and milk products, facts and oils and sugar were lower than RDA. Mean daily intake of energy, iron, beta-carotene, riboflavin, niacin and vitamin C of both boys and girls was below the RDA. The intake of various foods and nutrients was significantly (P<0.05) higher in boys than girls.

Singh et al. (2006) Studied the nutritional status of children(n= 914) aged 0-5 years in a drought-affected desert area of Jodhpur District of western Rajasthan, India. They revealed the growth retardation. Stunting (malnutrition of long duration) was
observed in 53% of children and underweight in 60%. Wasting, an indicator of short-duration malnutrition, was present in 28% of children. The extent of malnutrition was significantly higher in girls than boys (P<0.05). Vitamin A and B complex deficiencies were found in 0.7 and 3.0% of children, respectively. Prevalence of marasmus (protein-energy malnutrition, PEM) was 1.7% (2.3% in boys and 1.1% in girls). Overall deficits in mean energy and protein intakes were very high (76 and 54%, respectively). They concluded that the prevalence of wasting was high, greater than the cut-off point of 15% stated by the World Health Organization to indicate that the severity of malnutrition is critical.

**Blijham et al. (2007)** evaluated specific household factors that influence food intake of preschool children aged 3-6 years and school children aged 7-12 years in the northern city of La Trinidad. In total, 73 households, including 37 with preschool children and 36 with school-aged children, were included in the study. They found that major factors that influence the children's nutritional status were parental control (specifically the mother) over food intake and the children's individual food preferences. Household income only had a minor impact on the children's nutritional status. For specific nutrient intakes, of the preschool children evaluated, 46% met the RDA for energy, 76% met the RDA for protein, 5% met the RDA for vitamin A, and 46% met the RDA for vitamin C. For school-aged children, 14% met the RDA for energy, 56% met the RDA for protein, 11% met the RDA for vitamin A, and 31% met the RDA for vitamin C.

**Chiang et al. (2007)** evaluated the food protein sensitization patterns in a population of Asian children (n=227) with possible food allergy. They observed that ninety (40%) of the positive skin tests were positive to egg, 87 (39%) to shellfish, 62 (27.3%) to peanut, 30 (13.2%) to fish, 27 (11.8%) to cow's milk, 21 (9.3%) to sesame, 13 (3.7%) to wheat and eight (3.2%) to soy. Peanut sensitization was the third most common sensitizing allergen, and seen mostly in young atopic children with multiple food hypersensitivities and a family history of atopic dermatitis.

**Fidelis and Osorio (2007)** analysed the food consumption of macro and micronutrients by children (n=948) under 5 years old in the State of Pernambuco, Brazil based on the Dietary Reference Intakes, in 3 geographic areas: Metropolitan, Urban and Rural. The 24-hour recall method was used to register food consumption. Energy and micronutrient deficiencies prevailed in children of all age ranges and geographic areas; however, protein consumption exceeded the references levels.
There was a high prevalence of micronutrient inadequacy, especially iron and zinc, in children above 12 months old. The results in the Rural Interior were the lowest, considering the nutrients analysed. They concluded that the food consumption by children in was low in energy, macro and micronutrients.

Srihari et al. (2007) reviewed the nutritional status of school children aged 6-18 years from middle and high socioeconomic status in India. They observed that the prevalence of anaemia (Hemoglobin concentration <120 g/litre) ranged from 19 to 88% across 5 different cities in India. Overweight and obesity were prevalent among school children (8.5-29.0 and 1.5-7.4%, respectively) as indicated by 11 studies. The predominant components of children's diet were cereals and pulses, followed by milk and milk products; the fruit and vegetable component was comparatively lower. They suggested that the nutritional status of children in India needs attention especially with respect to the high prevalence of anaemia, overweight and obesity.

Shaaban et al. (2009) designed to study the nutritional knowledge and attitude of 1000 adolescent school girls aged 12 to 16 years from governmental and private schools in Cairo. The frequency of the intake of the RDA was high for both schools girls as regards to protein, CHO, vitamin B1, vitamin C, Na and phosphorous. The overall results show that girls from both governmental as well as private schools in Cairo had below average knowledge about healthy food and the importance of sound nutrition (total prevalence of knowledge is <50% for each of them). Private school girls had significant better knowledge than governmental schoolgirls as regards to food groups, healthy food, low salt diet, low fat cheese, best food to eat during dieting. Private school girls had significantly use computer more and perform sports less than governmental schoolgirls (p<0.05). Obesity was highly prevalent among adolescent school girls who reported excessive intake of junk food and beverages with high prevalence of computer and video games (>70%) and minimal sport performance (<50%).

2.2.3 Relational Analysis

Hutchinson et al. (1997) examined the mean height-for-age of the children was -0.37+or-0.95 Z-scores with 4.9% having heights-for-age <-2 s.d. of the NCHS references. Anaemia (Hemoglobin <11 g/100 ml) was present in 14.7% of the children, 38.3% were infected with Trichuris trichiura and 19.4% with Ascaris lumbricoides. Achievement levels on the Wide Range Achievement Test were low,
with children performing at grade 3 level. With multilevel analyses, controlling for socioeconomic status, children with Trichuris infections had lower achievement levels than uninfected children in spelling, reading and arithmetic (P<0.05). Children with Ascaris infections had lower scores in spelling and reading (P<0.05) Height-for-age (P<0.01) was positively associated with performance in arithmetic. Ascaris infection (P<0.001) and anaemia (P<0.01) predicted poorer school attendance.

**Brentlinger et al. (1999)** measured the prevalence of stunting (low height for age) in children younger than 5 years. Prevalence of stunting was 32.4%. Stunting was significantly more prevalent among children whose families cultivated less land. Less than half of newly transferred land was being cultivated by its owners. Most of the children (84.7%) lived in families cultivating 2 ha or less of redistributed land. Stunting was also more prevalent among children whose households lacked piped water vs those who had had piped water since before the cease-fire.

**Ochoa et al. (1999)** investigated the association between farmers' socioeconomic conditions and their children's health in La Fraylesca, Chiapas, Mexico. They found that the children of private farmers and 'wealthy peasants' displayed better nutritional status, higher quality diet, lower prevalence of intestinal parasites, and a lower risk of dying than those whose parents were communal farmers, from ejidos, or 'poor peasants'.

**Alaimo et al. (2001)** investigated the associations between family income, food insufficiency, and health among US preschool and school-aged children. Children were classified as food insufficient if the family respondent reported that the family sometimes or often did not get enough food to eat. Regression analyses were conducted with health measures as the outcome variables. Prevalence rates of health variables were compared by family income category, with control for age and gender. They observed that the low-income children had a higher prevalence of poor/fair health status and iron deficiency than high-income children. After confounding factors, including poverty status, had been controlled, food-insufficient children were significantly more likely to have poorer health status and to experience more frequent stomach aches and headaches than food-sufficient children; preschool food-insufficient children had more frequent colds. Food insufficiency and low family income are health concerns for preschool and school-aged children.

**Verma et al. (2001)** analyzed the factors influencing Anaemia among 1295 girls of school going age (6-18 years) from the urban slums of Ahmedabad city. They
studied the variables i.e. hemoglobin level, age, body mass index, parent's education, parent's occupation, socio-economic status, consumption of tea/coffee, green leafy vegetables, lemon/sour fruits, knowledge about anaemia and status of menstruation. They observed that the prevalence of anaemia (Hb< 12 gm/dl) was 81.8% (n=1153) and had significant association with variables such as occupation of father, habit of post meal consumption of tea/coffee, consumption of green leafy vegetables and body mass index. They also observed that the overall prevalence of mild, moderate and severe anaemia was 55.2%, 26% and 0.6% respectively. It was significantly higher among girls with the following attributes, namely: those having the post meal habit of consuming tea/coffee (94.4%)(p<0.01); whose father were working as semiskilled/skilled workers (77%)(p<0.02) and those having a BMI of 18.5 or lower (82.4%) as compared to those with BMI more than 18.5(79.7%). The prevalence of anaemia was significantly lower in girls consuming green leafy vegetables (p<0.01). No significant relationship of anaemia was observed with socio-economic class, knowledge about anaemia, parent's education, status of menstruation and daily consumption of lemon/sour fruits.

Galal and Hulett (2003) examined the between children's nutritional status and their educational achievement and academic performance of school-age children. They shown that undernourished children have lower attendance, shorter attention span, lower performance scores, and more health-related problems than their well-nourished counterparts.

Patel and Bhavsar (2004) analyzed the data from National Family Health Survey (NFHS), Gujarat (n=3845) for to know the effects of selected demographic and socio-economic factors on three dimensions of malnutrition among children below age three years. They found that the predictors significantly influencing dependent variable (stunting) were current age of child, birth order, height of the mother and education of mother. Education of mother has shown significant influence on children being stunted as compared to the children of illiterate mothers. The relative risk of being stunted was 47 percent, 65 percent and 74 percent less for children of mothers whose education level was less than middle school, middle school complete and high school complete respectively. This indicates that the women’s educational level has a remarkable effect on the stunting of their children. In Gujarat, the predictors significantly influencing the dependent variable (underweight) were current age of child, sex of child, size of child, mother’s height, mother’s BMI and
whether mother had taken TT injection or not. The living standard of household was also influencing the child being underweight in case of both male and female. Among the household variables, the household standard of living index is found to be significantly influencing the incidence of wasting among the male children, children belonging to rural areas and to Gujarat state as a whole.

Ulukanligil and Seyrek (2004) examined the relationship between nutritional status and parasitic infections of schoolchildren and demographic, socioeconomic factors of nine hundred and eight schoolchildren: 57.2% boys and 42.7% girls. Data indicated that older children had significantly lower mean z scores of height (P<0.0001) and weight for age (P<0.0001) than younger children, and boys had significantly lower mean z scores of height for age than girls (P<0.0001). Children living in shantytown areas had significantly lower mean z scores of height for age (P<0.0001) and weight for age (P<0.0001), lower mean hemoglobin concentrations (P:0.003) and a worse parasitic infection status (P<0.0001) than those living in apartment areas. Children who were hungry when they arrived at school had significantly lower mean hemoglobin concentrations than those who had eaten (P:0.04). Multiple regression analyses indicated that mean z scores of height for age were significantly related to maternal (multiple R=0.183; P<0.0001) and paternal illiteracy (multiple R=0.216; P:0.004). Mean z scores of weight for age were significantly related to maternal illiteracy (multiple R=0.154; P<0.0001), as was parasitic infection status (multiple R=0.261; P<0.0001) and the number of children in the family (multiple R=0.267; P:0.005). Hunger status was significantly related to maternal (multiple R=0.095; P:0.016) and paternal illiteracy (multiple R=0.104; P:0.005), as was belonging to a large family (multiple R=0.104; P:0.009). These findings indicate that school health programmes may improve the nutritional and health status of schoolchildren.

Young et al. (2004) was carried out the study of two northeast Georgia counties of USA for examined the middle school students’ perceptions of selected parents behaviours directly explaining variations in fruits and vegetable consumption. A sample of 366 middle school students from 25 classes studying in 3 middle schools was taken. The students’ age ranged from 12-16 years. It was found that perceived parent modelling, perceived parent support, self-efficacy, and perceived fruit and vegetable availability were significant predictors of fruit and vegetable consumption. The relationship between perceived parent support and fruit and vegetable consumption
consumption was mediated by self-efficacy. It was suggested that nutrition educators might focus on improving home fruit and vegetable availability and student’s self-efficacy, and parent support and modeling. The level of availability may indicate where efforts should form for enhancing parents’ behavior. Findings showed that what parents eat in front of their child influenced and encouraged consumption patterns. Parents’ involvement should play a role in nutrition interventions aimed at middle school students.

Chandrasekara et al. (2005) surveyed the 305 children age 3 to <6 years in Kurunegala for determination the factors associated with nutritional status of preschool children living in urban and peri-urban areas. The multiple stepwise regression analysis indicated that birth weight, male gender, average care received from mother, educational level of father are positive determinants whereas child morbidity and number of children in the family are negative determinants of the nutritional status of the pre-school children in urban and peri-urban areas in Kurunegala.

Frost et al. (2005) examined the relationship between maternal education and child nutritional status, socioeconomic status, health knowledge, modern attitudes towards health care, female autonomy, and reproductive behavior. They suggested that socio-economic factors are the most important pathways linking maternal education and child nutritional status, and that modern attitude about health care also explain the impact of education. Health care knowledge accounts for less of the effect of maternal education on child nutritional status, with autonomy being the weakest pathway. Other pathways, such as reproductive behaviors, appear to influence nutritional status independent of maternal education. Overall, the pathways examined accounted for 60 percent of the effect of maternal education on child nutritional status.

Rathnayake et al. (2005) evaluated the nutritional status among pre-school children (n=1,764) in Sri Lanka. Nutritional status of the pre-school children was measured using the weight-for-age anthropometric indicator (underweight) which reflects both long term and short term nutritional status. Multiple linear regression and multinomial legit models were used to evaluate the determinants of underweight. The results revealed that relatively higher incidence, depth and severity of underweight children are recorded in Sabaragamuwa, Uva and North Western provinces. They found that the area of residence, household size, age of the child, mother's education, birth-weight of child and household income have significant effects on the status of
malnutrition. The effect of household income on reducing malnutrition appears to be small compared to other determinants.

**Hughes et al. (2006)** measured habitual physical activity and sedentary behaviour in a clinical sample of 116 obese and 53 non-obese children. Habitual physical activity and sedentary behavior were measured over a 7-day period using CSA accelerometers. They observed that the obese children (n=116) spent on average 80.4% of their monitored time in sedentary behavior and 2.5% of their monitored time in MVPA. Total activity was significantly higher in the non-obese group (n=53) than the obese group (n=53). Time spent in sedentary behavior averaged 80.9% (s.d. 6.6) in the obese group and 79.3% (s.d. 6.2) in the non-obese group, with no significant between-group difference.

**Kikafunda et al. (2006)** studied dietary factors and their association with the nutritional status of pre-school children (three to six years of age) in a poor suburb of Kampala city, Uganda. They found that the diet showed a significant association between the nutrition status of the children and some of the foods consumed. Children who were above the 50th weight-for-age centiles consumed significantly more bread (p=0.008) and light-green-leafy vegetables (p=0.020) than those who had lower weight-for-age centiles. Children who were above their 50th height-for-age centiles consumed significantly (p=0.049) more soyabeans than children who had lower height-for-age centiles. They concluded that the dietary factors were found to be inextricably linked and have been shown to be significantly associated with the nutritional status of suburban pre-school children.

**Vereecken et al. (2006)** studied the several environmental factors influence adolescents’ food habits and television (TV) viewing. Data were collected from 162 305 children among 11, 13 and 15 year-old school pupils. They observed large differences between countries in reported daily TV viewing time, from an average of 2.0 h in Switzerland to 3.7 h in Ukraine. The results indicate that those most likely to watch TV are boys, 13 year-olds and pupils of lower socio-economic status. Those who watched more TV were more likely to consume sweets and soft drinks on a daily basis and less likely to consume fruit and vegetables daily, although the latter associations were not so apparent among Central and Eastern European countries.

**Goldstein et al. (2007)** studied the influence of maternal variables on energy intake and body weight of sixty-five pre-adolescents (age of 9.0+or-0.2 years). They used the 3-day diet recall method for the estimation of daily energy and macronutrient
intakes. BMI (mothers) and BMI%-for-age (children) were calculated from measured heights and weights. They observed that the children of disinhibited mothers reported higher daily energy intakes than children of mothers who were not disinhibited (p<=0.05). However, these variables did not predict children's body weight. The regression modeling (R2=0.59; p<=0.0001) revealed that restriction, concern for child weight and maternal BMI were positive predictors of children's BMI%-for-age and pressure to eat was a strong negative predictor (p-value range=0.02-0.004). These results suggest that in pre-adolescent children, current energy intakes were positively related to maternal disinhibition. However, BMI%-for-age, a measure of long-term energy balance, was related to child feeding practices and maternal BMI.

Chaudhari et al. (2008) assessed the growth and sexual maturity of non-handicapped children with birth weight less than 2000g followed up till the age of 12 years. The cohort of 180 low birth weight (LBW) infants (birth weight less than 2000 g) was divided into 3 groups according to their gestation–preterm SGA (n=73), full term SGA (n=33) and preterm AGA (n=74). Ninety full term AGA infants served as controls. Preterm SGA children had significantly less height (mean deficit 5.8cm), weight and head circumference (P<0.001). There was no significant difference in sexual maturity and onset of menarche between the study group and controls. There was a correlation between head circumference and IQ and preterm SGA children had the lowest mean IQ (85.4 ± 17.7). Mother’s height contributed 14% variance to a total variance of 25.3% for Z score of height at 12 years. Mother’s weight contributed a variance 21.1% to a total variance of 29.4% for Z score of weight. Preterm SGA children were shorter, lighter and had the smallest head circumference, and also had the lowest IQ. Mother’s height and weight was an important determinant of height and weight at 12 years.

Shaaban et al. (2009) designed to study the nutritional knowledge and attitude of 1000 adolescent school girls aged 12 to 16 years from governmental and private schools in Cairo. They found that there was insignificant association between the nutritional knowledge and dietary behavior of the studied adolescent school girls, their deficient nutritional knowledge was likely to have a negative impact on their nutritional status. Correlation studies showed no relation between BMI of school girls from both studied schools and the knowledge of different food elements (p>0.05).
2.2.4 Health Programmes:

Meme et al. (1998) examined the dietary intake and nutritional status of 162 children in a school with a lunch programme (the feeding-programme group) and 163 children in a school without a lunch programme (the no-feeding-programme group) in Nyambene District, Kenya. Daily energy consumption in the group with a feeding programme was higher than in the group without a feeding programme: 1590 kcal, or 86% of the recommended daily allowance (RDA), vs 1457 kcal, or 76% of the RDA (p<.05). The protein intake was mainly of plant origin. Although not significantly different between the two groups, it was higher for children without a feeding programme (62 g; 238% of the RDA) than for those with a feeding programme (56 g; 216% of the RDA). The prevalence of wasting among children with a feeding programme (9%) was higher than among those without a feeding programme (2%) (p<0.05). The level of stunting was about the same in both groups: 24% in the group with a feeding programme and 25% in the group without a feeding programme. There was no significant difference in the prevalence of underweight between the two groups. Overall, the nutritional status of girls was better than that of boys, although the difference was not significant.

Laxmaiah et al. (1999) They conducted the study to assess the effects of the Mid Day Meal (MDM) Programme on enrolment, attendance, dropout rate and retention rate in the schools and its impact on nutritional status and school performance. A total of 2694 children aged 6-11 years (MDM area: 1361; Non-MDM area: 1333) from 60 schools were covered in the study. They observed better enrolment (P<0.05) and attendance (P<0.001), higher retention rate with reduced dropout rates (P<0.001) a marginally higher scholastic performance and marginally higher growth performance of MDM children. They also concluded that the MDM programme was associated with a better educational and nutritional status of school children in Karnataka.

Ghannem et al. (2000) suggested a school heart health programme for to assess the risk to Tunisian children of cardiovascular diseases (CVD), of 1569 urban schoolchildren aged 13 and 16 years from Sousse. Prevalence rates for CVD risk factors were determined. Hypertension and hypertriglyceridaemia showed no statistically significant difference by sex. Hypercholesterolaemia, high levels of low-density lipoprotein cholesterol and obesity were all significantly higher for girls than boys. Smoking was significantly higher among boys. The relatively low CVD risk
factor profile of Tunisian schoolchildren should be encouraged in adulthood and a school heart health programme should be established.

Magnussen (2001) assessed the school health programme in Mwera Division, Pangani District, Tanzania included treatment of malaria attacks occurring on children aged 7-15 years during school time. Plasmodium falciparum accounted for 100% of infections and the parasite prevalence varied between 32.7 and 35.3%. Children in grades 1-4 (age 7-13) accounted for 64.6% of cases. Symptoms and oral temperature were recorded for 1258 children. Of these, 992 (78.9%) complained of fever and at least one other symptom when presenting to teachers, 98 (7.8%) had fever as their only complaint and 168 (13.5%) presented without a perception of fever, but with other symptoms. Of these children, 36 (21.4%) had a temperature <37.5 degrees C. Blood slides were prepared from 37.2% of children diagnosed by teachers and 71.4% were found positive. With little training and regular supervision, it was feasible for school teachers to make a presumptive diagnosis of malaria. We concluded that teachers can play a major role in school health programmes and are willing to be involved in health matters as long as they are supported by health and educational authorities.

RomaKumari and Bishnoi (2001) conducted the study to assess the effect of supplementary feeding programme of ICDS (Integrated Child Development Services) Scheme on the health of preschool children (n=400) in Varanasi (Uttar Pradesh) and East Champaran (Bihar), India. They observed that the supplement feed provided to each child by anganwadi centres was 300 calories and 10 g of protein. The diet supplement was not enough to show statistically significant difference in the growth of children. It is recommended that the authorities involved in planning of supplementary feeding programme should increase it, so that the impact of supplementary feeding on anthropometry might be profound.

Sahota et al. (2001) evaluated the school-based health promotion programme aimed at reducing risk factors for obesity, and implementation process and its effect on the school. Data collected from 10 schools of 634 children (350 boys and 284 girls) aged 7-11 years. They reported that 76 (89%) of the action points determined by schools in their school action plans were achieved, along with positive changes in school meals. A high level of support for nutrition education and promotion of physical activity was expressed by both teachers and parents. 410 (64%) parents responded to the questionnaire concerning changes they would like to see
implemented in school. 19 out of 20 teachers attended the training, and all reported satisfaction with the training, resources and support. Intervention children showed a higher score for knowledge, attitudes and self-reported behaviour for healthy eating and physical activity. They concluded that the programme was successfully implemented and produced changes at school level that tackled risk factors for obesity.

Swami et al. (2001) investigated the nutritional status of 1286 pre-school children residing in urban, rural and slum areas of Chandigarh, India. They observed that the overall prevalence of protein energy malnutrition (PEM) was found to be 51.6% while 65.4%, 26.3%, 5.3% and 3% of children had grades I, II, III and IV PEM, respectively. The prevalence of malnutrition significantly increased with increase in age till 3rd year, then started declining (P<0.001). The prevalence of PEM was significantly higher among Integrated Child Development Service (ICDS) beneficiaries (53.8%) than non-ICDS beneficiaries (46.9%); P<0.05. More attention and better impetus are required to be given to improve the nutritional status of pre-school children in Chandigarh.

Giampietro et al. (2002) carried out a primary school health programme and assessed children's growth and body composition. 869 (448 M, 421 F) primary school children were screened and height, weight, four skinfolds, and four circumferences were measured. A family-reported questionnaire was used to determine family composition, history, and lifestyle. Age was 118+ or - 5 months, BMI 18+ or - 3 kg/m2. No difference by gender was observed for BMI or blood pressure. Offspring BMI was correlated with birth weight (P<0.05), parental BMI and scholarship level (P<0.001), children blood pressure (P<0.001), and hours per day spent in television viewing (P<0.01). Family history for diabetes was associated with higher BMI, SSF, waist circumference (P<0.05). Three of 869 children had BMI>30 kg/m2 (2 boys and 1 girl), 33 had BMI>25 kg/m2 (17 boys and 16 girls). The percentages of children who could be considered overweight (BMI<more or = >95th percentile of age- and sex-specific data) were boys, 10.0%, and girls, 9.3%.

Choi HyunJung and Seo JungSook (2003) investigated nutrient intakes and obesity-related factors in obese children (11 to 13 years old) and the effect of nutrition education program from Daegu, Korea. The subjects were classified into an obese group and a nonobese control group. Frequency of skipping breakfast and eating rates in the obese group were significantly higher than those in the control group. There
was no significant difference between obese and control group in nutrition knowledge scores. Except for vitamins B1, B2 and iron, the average daily intakes of nutrients in obese individuals were greater than those in the control group. The most significant contributing factor to BMI was cholesterol intake. After nutrition education targeting obese children, nutrition knowledge scores improved, but dietary behaviour scores were not significantly changed.

Petersen et al. (2004) assessed the oral health outcomes of a school-based oral health education (OHE) programme on children, mothers and school teachers in China. 803 children and their mothers, and 369 teachers were included at baseline in 1998. After three years, 666 children and their mothers (response rate 83%), and 347 teachers (response rate 94%) remained. They observed that more children in experimental schools adopted regular oral health behaviour such as toothbrushing, recent dental visits, use of fluoride toothpaste, with less frequent consumption of cakes/biscuits compared to controls. In experimental schools teachers showed higher oral health knowledge and more positive attitudes. The programme had positive effects on gingival bleeding score and oral health behaviour of children, and on oral health knowledge and attitudes of mothers and teachers. No positive effect on dental caries incidence rate was demonstrated by the OHE programme.

Brener et al. (2006) analysed data from the 2004 School Health Profiles for public secondary schools (i.e., middle, junior high, and senior high schools) serving students in grades 6-12 in 25 states in the USA and 10 large urban school districts to identify which nutrition and physical activity topics are being taught in school health education. They indicate that in 2004, approximately one half to three fourths of schools in the participating states and school districts taught all 15 nutrition and dietary behaviour topics listed in the School Health Profiles questionnaire in a required health education course, and approximately one third to two thirds taught all 12 physical activity and fitness topics. State and local education agencies should continue to encourage schools to provide education on nutrition and physical activity as part of a coordinated school health programme and promote staff development for health education teachers.

Adegbenro (2007) assessed the impact of school health programme (SHP) on ensuring safe environments for ten primary school children in Nigeria. Data were collected on existing facilities in schools and behavioural practices that can promote safe environments both pre-and post-intervention by the SHP. They observed that a
well organized and properly executed SHP can be used to create safe environments for school children.

**Shaaban et al. (2009)** designed to study the nutritional knowledge and attitude of 1000 adolescent school girls aged 12 to 16 years from governmental and private schools in Cairo. They recommend that health education programs explaining the nutritional importance of vitamins and minerals, especially during future pregnancy, should be incorporated within the curriculum intended for schoolgirls in preparatory and secondary Egyptian schools. The importance of changing the dietary behaviors in order to achieve the proper weight for age and height and to reach a healthy life style should be enforced upon.

**Izharul Hasan et al. (Dec, 2010)** The future of society depends on the quality of life of the children. Nutritional needs change thought life, depending on genetics, rats of growth, activity and many others. Nutritional State is the condition of health of individual as influenced by the utilization of nutrient.

**Gupta et. al (2011)** points out the role of gender and socio-economic states influencing prevalence of overweight and obesity girls tend to become thinner with advancement in age, as post pubertal girls become more concions of their physical appearance. Private schools and high economic status influence by the way of children indulging in the practice activity of chasing calorie dense fast foods and a life style involving less of physical activity and more of indoor activities like playing games on the computer, internet usage and watching television.

**Kaushik A. et al (2012)** found that the literacy status of the parents has been revealed to be strongly associated with the nutrinal status of children there is an increasing need to focus the efforts towards the parents to improve the nutritional status of primary school children.

**Ranjitbaby Joseph et al (2014)** assessed the nutritional & health status of rural school going children in Mandya District was found to be low especially with respect to the high prevalence of anemia, micronutrient deficiencies and personal hygiene emphasis should be given towards nutrition education, personal hygienic education, health education apart from the regular educational activities in the community.

**Nehal Patel et al (2015)** assessed the nutrition & health status of school going children in urban area of Ahmadabad city. They found malnutrition and related health
disorders are commonly prevailing childhood disease in the urban community and can effectively be addressed by appropriate public health program.

**CONCLUSION**

The review of related researcher helped the researcher in many ways. It helped in her decide not only the topic of the variable to be studied, It also helped her to decide and to develop the research tools for the study. Thus the present research was undertaken to assess the health status of children and knowledge of parents towards school health checkup programme. the details regarding the methodology of the present study has been discussed in the next chapter.