REVIEW OF LITERATURE

The literature reviewed has been grouped under the following heads.

2.1 Nutritional status: Definition and common methods of assessment

2.2 Nutritional requirements and recommended dietary allowances for children of 5-16 years

2.3 Common nutritional problems among children (with an emphasis on girls of primary and middle school age)

2.4 Literature / programmes highlighting girl’s education and nutritional status improvement

2.5 Mid-Day Meals: History, Reports and Research studies

2.6 Status of children’s attendance in schools, with an emphasis on girls

2.7 Nutrition counseling/ education: Importance and common methods
2.1 NUTRITIONAL STATUS: DEFINITION AND COMMON METHODS OF ASSESSMENT

Definition

According to the National Cancer Institute (2003) nutritional status is defined as the state of the body in relation to the consumption and utilization of nutrients.

Park (2004) defined nutritional status as the condition of health of an individual as influenced by nutrient intake and utilization in the body.

According to Srilakshami (2004) nutritional status is the condition of health of an individual as influenced by nutrient intake and utilization of the nutrients.

Joshi (2007) gave the opinion that nutritional status is the condition of the body as it relates to consumption and utilization of food.

Mudambi and Rajagopal (2007) defined nutritional status as the state of our body as a result of the foods consumed and their use by the body.

Saxena (2007) stated that nutritional status is the availability at the cellular level - in adequate amounts in proper combinations and at appropriate times - of all the essential nutrients required for normal growth, development, maintenance, repair and functioning of the organism.

Methods for assessment

Nutritional assessment systems utilize a variety of methods to characterize each stage in the development of nutritional deficiency. The methods are based on series of dietary, laboratory, anthropometric and clinical measures used either alone or more effectively in combination. Various methods suggested by different authors are summarized in this section.
**Dietary methods**

**Gibson (1990)** stated that first stage of nutritional deficiency is identified by diet assessment methods. In this method dietary intake of one or more nutrients (low level in diet) is identified.

**Clinical methods**

Signs and symptoms associated with malnutrition are detected in this method. Physical examination, along with medical history is used. The signs only develop in advanced stage of nutrition depletion. Therefore one cannot solely rely on this method of assessment of nutritional status (**Gibson, 1990**).

**Anthropometric methods**

**Waterlow et. al. (1972)** has recommended the use of both weight for height and height for age. In this classification children with low weight for height are considered as wasted and those with height deficit are considered stunted.

**Gibson (1990)** stated that anthropometry is one of the most common, convenient, as well as frequently used methods for the assessment of nutritional status. Measurements of physical dimensions (height and weight) and gross composition (head circumference, chest circumference, mid upper arm circumference) of the body are used in this method. The measurements vary with age and degree of nutrition and as a result are particularly useful in circumstances where chronic imbalances of protein and energy are likely. They can be used to detect moderate to severe degree of malnutrition. This method has an advantage of providing additional information on past history, which cannot be obtained with equal confidence using other techniques. Various methods have been suggested to classify children into various nutritional grades using the body weight, height, age etc.

**Bhasin et. al. (1990)** and **Agarwal (1992)** have recommended anthropometry as a reliable method to assess the nutritional status of children.
The **WHO (1995)** has stated that anthropometry is the single most universally applicable, inexpensive, and non-invasive method available to assess the size, proportion and composition of human body.

**Bamji et. al. (2004)** stated that mid upper arm circumference (MUAC) is an indication for the status of muscle development. MUAC has been reported to be useful, not only in identifying malnutrition but also in determining the mortality risk in children and it correlates well with weight, weight for height and clinical signs.

**Srilakshmi (2008)** has summarised the commonly used anthropometric classifications as shown in Table 2.1

**Table: 2.1 Commonly Used Anthropometric Classifications (Ref: Srilakshmi 2008)**

<table>
<thead>
<tr>
<th>Classification</th>
<th>Indicator</th>
<th>Cut-off level as % of NCHS median</th>
<th>Type/ degree of malnutrition</th>
<th>Usefulness</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gomez</strong></td>
<td>Weight/age</td>
<td>&lt;60</td>
<td>Severe</td>
<td>Index of current and past nutritional status</td>
</tr>
<tr>
<td></td>
<td></td>
<td>60-75</td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>75-90</td>
<td>Mild</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;90</td>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td><strong>Indian Academy of Pediatrics</strong></td>
<td>Weight/age</td>
<td>&lt;50</td>
<td>Grade IV</td>
<td>Index of current and past nutritional status</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50-60</td>
<td>Grade III</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>60-70</td>
<td>Grade II</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>70-80</td>
<td>Grade I</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;80</td>
<td>Normal</td>
<td></td>
</tr>
</tbody>
</table>
**Laboratory methods**

Several stages in the development of nutritional deficiency state can be identified by laboratory methods.

**Hemoglobin estimation as a diagnostic method:** There are several laboratory techniques for diagnosis of haemoglobin concentration. Most of those that have been and are still used in primary health care are inaccurate in routine practice and should be discarded. Now-a-days cyanmethaemoglobin method is more reliable for field experiments.

As reported by the **WHO (1968)**, considering the relatively small differences between age and sex groups, one can diagnose mild anaemia when haemoglobin concentration is above 10 g/dl but below the cut off level, moderate anaemia when the concentration is between 7 and 10 g/dl and severe anaemia when it is below 7 g/dl.

According to **Dacie and Lewis (1984)** the accurate and reliable procedures are those which convert haemoglobin to one of its compounds, the concentration of which is determined by matching the colour with a known standard in a photoelectric colorimeter or by measuring absorption in a spectrophotometer. These techniques in common use are the cyanmethaemoglobin (HbCN), Sahli’s method, oxyhaemoglobin (HbO) and the alkaline haematin methods.

**Cyanmethaemoglobin method or Drabkin method:** **Garby et. al. (1969)** recommended cyanmethaemoglobin method for estimation of haemoglobin and stated that filter paper technique is suited for field surveys.

**International Nutritional Anaemia Consultative Group (1985)** reported that the cyanmethaemoglobin method is most popular because it measures practically all haemoglobins except sulphaemoglobin. Another major advantage of this method is that the standards used remain stable for a long time.

**Cook and Reusser (1985)** reported that the International Nutritional Anaemia Consultive Group (INACG) and International Committee for Standarization in Hematology (ICSH)
have recommended the Drabkins as the method of choice and have suggested that all other methods should be adjusted to be comparable to this method.

According to ICMR (2001) and Jyothi et. al. (2001), in recent years cyanmethaemoglobin method is being used for different field experiments.

Agarwal (2005) also agrees that cyanmethaemoglobin method is the best time tested method for estimating the haemoglobin concentration quantitatively. Blood is diluted in a solution containing potassium cyanide and potassium ferricyanide. Haemoglobin in blood, found in variety of forms including oxyhaemoglobin, carboxyhaemoglobin, methaemoglobin, fetal haemoglobin and other minor components, are converted to cyanmethaemoglobin (HbCN).

Sahli’s method: Sahli’s method of haemoglobin estimation has been used since long. In spite of the availability of newer techniques, which gives more reliable and accurate results, this method is still vague.

According to Lewis (1988) the principle in Sahli’s method involves the conversion of haemoglobin to acid hematin and comparing visually the colour developed with that of haemoglobin tube.

Alkaline haematin method: Zander et. al. (1984) gave the opinion that in alkaline haematin D-575 method of haemoglobin estimation, blood is diluted using an alkaline solution containing a non ionic detergent. All haemoglobin derivatives are converted into a stable end product, alkaline haematin D- 575, whose absorption is maximum at $\lambda = 575$ nm. Lema et al. (1994) reported that alkaline haematin D-575 method for haemoglobin estimation is a colorimetric method that uses primary standards prepared from pure, crystalline chlorohaemin.

2.2 NUTRITIONAL REQUIREMENTS AND RECOMMENDED DIETARY ALLOWANCES FOR CHILDREN OF 5-16 YEARS

Darshan et. al. (1988) reported that the school going period being an active phase of growth
is known to respond more effectively to the changes in health and nutritional inputs.

Forbes (1992) stated that nutrient needs parallel the rate of growth, with the greatest nutrient demands occurring during the peak velocity of growth. At the peak of the adolescent growth spurt, the nutritional requirements may be twice as high as those of the remaining period of adolescence.

Nutritional requirements in proportion to body size are much higher for the primary school years than they will be in adult years. Moreover, childhood and adolescence are times of considerable physical activity and hence the energy requirement will vary widely depending upon the level of growth and activity. The basal metabolism of children is higher than that of adults. The major portion of this requirement of calories must be met by carbohydrates to spare protein. This will ensure that protein, which is vital for their growth, will not be divided for energy needs, (Charles, 1996).

Rao and Vijayaraghavan (1996) stated that an abundance of energy giving foods, good quality of proteins and minerals are required in the diet of school children because of their rapid growth.

Suhar and Counthors (1998) stressed the need of high nutrient intake in the morning. A nutritious breakfast that includes cereals is a central feature of diet that meets the need of the children to support their healthy growth and development.

Dietary allowances for Indians were first recommended in 1944 by the Nutrition Advisory Committee of the Indian Research Fund Association (now ICMR). Recommended Dietary Allowances (RDA) for children (5-16 years) prescribed by ICMR (2001) is represented in Table 2.2
Table 2.2 Recommended Dietary Allowances for girls in the age group of 5 -16 years
(ICMR, 2001)

<table>
<thead>
<tr>
<th>Age group of girls</th>
<th>Energy (kcal)</th>
<th>Protein (g)</th>
<th>Fat (g)</th>
<th>Calcium (mg/d)</th>
<th>Iron (mg/d)</th>
<th>Ascorbic acid (mg/d)</th>
<th>Retinol (µg/d)</th>
<th>Beta-carotene (µg/d)</th>
<th>Thiamin (mg/d)</th>
<th>Riboflavin (mg/d)</th>
<th>Folic acid (µg/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-6 Years</td>
<td>1690</td>
<td>30</td>
<td>25</td>
<td>400</td>
<td>18</td>
<td>40</td>
<td>400</td>
<td>1600</td>
<td>0.9</td>
<td>1.0</td>
<td>40</td>
</tr>
<tr>
<td>7 – 9 Years</td>
<td>1950</td>
<td>41</td>
<td>25</td>
<td>400</td>
<td>26</td>
<td>40</td>
<td>400</td>
<td>2400</td>
<td>1.0</td>
<td>1.2</td>
<td>60</td>
</tr>
<tr>
<td>10-12Years</td>
<td>1970</td>
<td>57</td>
<td>22</td>
<td>600</td>
<td>19</td>
<td>40</td>
<td>600</td>
<td>2400</td>
<td>1.0</td>
<td>1.2</td>
<td>70</td>
</tr>
<tr>
<td>13-15Years</td>
<td>2060</td>
<td>65</td>
<td>22</td>
<td>600</td>
<td>28</td>
<td>40</td>
<td>600</td>
<td>2400</td>
<td>1.0</td>
<td>1.2</td>
<td>100</td>
</tr>
<tr>
<td>16-18 years</td>
<td>2060</td>
<td>63</td>
<td>22</td>
<td>500</td>
<td>30</td>
<td>40</td>
<td>500</td>
<td>2400</td>
<td>1.0</td>
<td>1.2</td>
<td>100</td>
</tr>
</tbody>
</table>
Park (2001) observed that the nutritional status of an individual is often the result of many interrelated factors. It is influenced by the adequacy of food intake both in terms of quality and quantity and also by the physical health of the individual.

Swiney and Kanarek (2001) reported that afternoon snacks have positive effect on cognitive performance, because of their diverse effects of meals. It is important to monitor eating pattern of students, since their food consumption pattern can have impact on their training and performances.

Amirthaveni and Barikor (2002) reported that good nutrition is the fundamental basic requirement for maintenance of positive health. A proper diet is essential from a very early stage of life for growth, development and active life.

Kapil and Bhavna (2002) studied the adverse effects of poor micronutrient status during childhood and adolescence. Three micronutrients –vitamin A, iron, and iodine are among the most important of all the nutrients needed by the body because they are vital for developing normal learning and cognitive functions, immunity, work capacity and reproductive health. The body cannot synthesize them, so they must be made available through the diet. Deficiencies of these three micronutrients are known to have devastating effects on health.

Spear (2002) found that adolescence is an important time for gains in height as well as weight. While both muscle and fat increase, girls gain relatively more fat, and boys gain relatively more muscle. Thus, the requirement of energy as well as proteins increases considerably during this period. Energy and protein needs correlate more closely with the growth pattern than with the chronological age.

According to Elizabeth et. al. (2003) adequate nutrition is important for women not only because it helps them to be productive members of society but also because of the direct effect maternal nutrition has on the health and development of the next generation.

Savitha and Narayanan (2007) the girls and boys during adolescence have increased nutritional requirements. However, the girls’ nutrition generally suffers because of ignorance, lack of awareness and widespread gender discrimination in India.
2.3 COMMON NUTRITIONAL PROBLEMS AMONG CHILDREN (WITH AN EMPHASIS ON GIRLS OF PRIMARY AND MIDDLE SCHOOL AGE)

Pollitt (1980) reported that iron deficiency anemia among school students represents an impediment to learning. This evidence has educational implications, which are dramatic, because of the large number of children likely to be anemic, both in developing and developed countries. It has been estimated that there are about 1.3 million people who are anemic around the world. The effects of iron deficiency on cognitive function are reversible. Iron repletion therapy among iron deficient anemic pre-adolescent children result in significant improvement in school achievement measures. Iron deficiency is likely to affect the level of alertness (arousal) of children which in turn affect attention and therefore, learning.

Verma et. al. (1980) observed in their study that nutritional profile of 191 children in rural community as compared to urban children (about 46 per cent school children) was below standard in respect of height for age and 14 per cent were below standard in respect of weight for height.

According to information given by Agarwal (1989) malnutrition is among school children belonging to poor, rural population. These studies also bring out the prevalence of vitamin A deficiencies, for instance in Uttar Pradesh 4.1 per cent of school children had ocular signs of vitamin A deficiency, which indicates an advanced condition.

Pai and Naik (1989) assessed the nutritional status of 254 rural school children in Gharwal district by anthropometry and results revealed a significant difference in the weight of boys and girls. All the children were below the ICMR standards both in height and weight.

Madar (1990) found anaemia to be prevalent in 25-38 per cent of the population in U.K. while Asian children exhibited a worse situation with 38.63 per cent anaemic. The disease is also widespread among adolescent girls of developing countries.

On the basis of anthropometry UNICEF (1990) staff had made a comprehensive global, regional and country assessment of undernutrition. The main findings of this report are (i)
about 6 per cent (150 million) of the children under five in the developing world, excluding China are underweight, (i) about 39 per cent (169 million) are stunted and 8 per cent (35 million) are wasted, (iii) more than one-sixth malnourished children are suffering from severe malnutrition in terms of weight for age, (iv) Asia where nearly one child in two is malnourished, is most affected region,(v) rural malnutrition prevalence is inconsistently higher than urban, roughly one and a half times greater. There is little difference between male and female prevalence except in the case of wasting, where male prevalence appear to be greater.

According to a publication of Ministry of Health and Family Welfare, India (1991) Deficiency of vitamin A which is a nutritional problem among many young Indian children is known to affect many other parts of the body apart from eyes. Xerophthalmia with night blindness is considered one of the first signs of deficiency and blinding ulceration of keratomalacia the end stage. Severe forms of the disease can appear quickly without preceding milder signs and symptoms appearing sequential progression.

According to Braun (1992) reduction in calorie adequacy is found among various groups, in both women and preschool children, in various developing countries.

Data from food balance sheets of FAO (1992) indicated that during 1980-1990 dietary energy supplies were low and averaged only 2070 calories in approximately 50 per cent of the poorest countries

ICMR (1992) reported that iron deficiency anemia is a problem of serious public health significance, and has impact on psychological and physical development, behavior, and work performances.

Sachdev and Choudhury (1994) stated that in India, prevalence of anaemia is high among children and women.

According to a report of the World Health Organization (WHO, 1994) more than 30 per cent of the world’s children under five are still malnourished and underweight and out of these 80 per cent of them lived in Asia, 15 per cent in Africa and 5 per cent in Latin America.
Grantham (1995) reviewed studies on the relationship between mental development and severe malnutrition. The review showed that a large proportion of the school–aged children suffered from early childhood malnutrition and have generally been found to have poorer IQ levels, deficient cognitive functions, low levels of school achievement and greater behavioral problems than the matched controls and their siblings. The disadvantages are reported to last until adolescence.

Rahi et al. (1995) reported that 11 districts located in relatively underprivileged regions of Bihar, Uttar Pradesh and Rajasthan had prevalence of Bitot’s spot above 0.5 per cent level.

Kefroemble (1996) found that vitamin A deficiency is a public health problem only in primary school age group in Lucknow.

Oretega et al. (1996) studied the breakfast habits of different groups of Spanish school children (9-13yrs old). They found that 53 percent ate dairy products and cereals for breakfast and 10 per cent also ate fruit, 17 per cent of boys and 33 per cent of girls took only dairy product at breakfast. In most cases this was limited to a glass of milk, an intake insufficient to start the day. Three per cent of boys and five per cent of girls took no breakfast at all. Boys in general and younger children spent more time at breakfast than girls or older children. During holiday the percentage of children who took no breakfast decreased to two per cent of boys and one percentage of girls.

Ghosh (1997) found that the distribution of grade I, II, III, IV malnutrition is 48 per cent, 34.6 per cent, 10.2 per cent and 7.2 per cent respectively as, observed in a sample of 1500 children selected from block of Jaipur city.

Kartikan and Patodi (1997) studied the health status of school children of Indore city. Out of 1537 students (983 males and 554 female) in the age group of 5-14 years, majority belonged to the families of poor socio-economic status. They were suffering from skin and hair disease (13.12 per cent), nutritional disorder (27.58 per cent) and dental disorder (10.12 per cent) because of poor environmental condition, low level of personal hygiene and poor knowledge of health.
Sheshadri (1997) reported that despite marvelous increase on food production, here in India nutritional problems continue to be formidable. Iron deficiency anemia forms a major micronutrient deficiency. Two third of children in India are estimated to be suffering from iron deficiency anemia.

Swingle (1997) reported that “unhealthy” children are children with impaired learning. Any health problem- hunger, poor vision or hearing, increased blood lead levels, dental caries and child abuse can interfere with learning. Physical and mental health problems can impair their ability to learn. Furthermore, a report prepared by the Council of Chief State School Officers 1991 concluded that healthy children are teachable children. Studies have demonstrated that there is a link between poor nutrition and learning in children, well-fed children learn better than poorly fed children. Furthermore, studies indicate that children’s eating habits and attitudes about food develop early and last a life time. A 1988 Carnegie Foundation Survey of Teachers indicated that poor student nutrition was a problem in their schools.

UNACC (1997) reported that at least one – third of preschool children in the world suffer from anemia and many more are iron deficient to some degree.

According to the eminent nutrition scientist Gopalan (1998) at least 20 per cent of children in rural schools at any given point of time suffer from chronic or acute infection such as otitis medium sore throat, rheumatic heart disease etc. An annotated bibliography of the prevalence of malnutrition and parasites in developing countries bring out that 48.4 per cent school age children have chronic malnutrition 69.4 per cent iron deficiency, 55 per cent iodine deficiency and 48 per cent parasites. The scientist has further reported that a large proportion of children in the country consume poor diets.

According to NIN (1998) the common problems that occur due to micro-nutrient deficiency are: vitamin A deficiency, anaemia and iodine deficiency disorders (IDD): Up to 3 per cent of preschool children show Bitot’s sports and night blindness, and about 30-40 thousand children become blind every year. Vitamin A deficiency also increases the risk of diseases and health. A large segment of the population (approx. 50 per cent) suffers from nutritional anaemia. It is more prevalent in pregnant women (70-90 per
cent). More than 50 per cent of preschool children also suffer from anaemia. It is estimated that nutritional anaemia contributes to about 85,000 maternal deaths every year and is one of the important causes of low birth weight. It adversely affects work output among adults and learning ability in children. Iodine deficiency causes goiter (enlargement of thyroid gland in the neck), neonatal hypothyroidism among new born, mental retardation, delayed motor development, stunting, deaf-mutism and neuromuscular disorders. The most important consequence of iodine deficiency in mothers is cretinism in which the children suffer from mental and growth retardation since birth. About 90,000 still-births and neonatal deaths occur every year due to maternal iodine deficiency. Around 40 million persons are estimated to have goiter, 2.2 million have cretinism and 6.6 million suffer from mild psycho-motor handicaps. Malnutrition is also associated with mortality, disability and morbidity of young children. Common childhood infections like diarrhea, measles and pneumonia occur in association with malnutrition and contribute to about 70 per cent of mortality.

According to Gupta (1999) Vitamin A deficiency has been recently acknowledged as a major public health problem in India.

Rai et al. (1999) stated that in India, prevalence of anaemia is high in rural areas.

The Administrative Committee on Co-ordination (ACC, 2000) Geneva reported chronic malnutrition among girls in developing countries. The girls are more likely to remain undernourished during adolescence and adulthood, and when pregnant, are more likely to deliver low birth-weight babies. Epidemiological evidence from both developing and industrialized countries now suggests a link between fetal undernutrition and increased risk of various adult chronic diseases.

Costello et al. (2000) assessed the nutritional status of adolescent boys and girls in a rural community in Bangladesh and concluded that out of the total number of adolescents (906), seventy percent were thin (defined as BMI < 5th percentile of WHO recommended reference) with 75 per cent boys and 59 per cent girls being affected. On clinical examination angular
stomatitis was present in 46 per cent. 27 per cent had glossitis 38 per cent had pallor, 11 per cent had dental caries, 3.3 per cent had conspicuously enlarged thyroid and 2.1 per cent had eye changes of vitamin A deficiency. According to INACG (International Nutrition Anemia Consultative Group), 1985 cut off values, 94 per cent of the boys and 98 per cent of the girls were anemic.

**WHO (2000)** indicated that iron deficiency is the world’s most widespread nutritional disorder affecting both industrialized and developing countries, associated with other micronutrient deficiencies, parasitic infection such as malaria and hookworm and chronic infection such as HIV. In developing countries like India various forms of malnutrition affect a large segment of population and currently micronutrient deficiencies are among the major concerns. Low haemoglobin levels, termed as anaemia is the most widely spread deficiency disorder among children and women.

**UNICEF** reported in the year 2000 that a prevalence rate of underweight in rural areas is 1.5 times higher than urban areas.

**Jondhale et. al. (2001)** conducted a study to find out nutritional status of 300 school going girls in India. Sixty percent of the subjects were found to be anaemic.

**Mwanri et. al. (2001)** stated that iron deficiency anaemia is highly endemic in rural areas of Tanzania in many developing countries. It’s prevention among school children requires greater dissemination of knowledge of anaemia among children, teachers parents and the general community.

**Sunita and Sushila (2001)** conducted a study on the children of scheduled caste families of Bihar in particular and concluded that all children had low Hb level (<9.5 per cent) and 90 per cent were chronically energy deficient. Deficiency signs were more among girls than boys.
Bhandari et al. (2002) reported that although children of the affluent population in South Delhi were close to the NCHS/WHO reference population with regard to anthropometric indicators about 6 per cent of the children were underweight (weight-for-age Z-score), 3 per cent were stunted (length-for-age Z-score), and 4 per cent were wasted (weight-for-length Z-score).

Kapil and Bhavna (2002) stated that despite Indian’s substantial progress in human development since its independence in 1947, 5 to 7 per cent of its children have Vitamin A deficiency disorders in selected geographic areas, 53 per cent have iron deficiency anemia, and 9 per cent have goiter.

Laxmaiah et al. (2002) in their study entitled “Diet and nutritional status of rural school children in Punjab” concluded that despite the reported high rates of economic growth and food production in the state a higher proportion of school children were consuming diets which are inadequate with respect to energy, fat, iron, riboflavin, vitamin A and vitamin C. The prevalence of undernutrition was high as was found in other states.

A study conducted by NIN (2002) revealed that micronutrient deficiencies are widely prevalent even in the middle income groups. Subclinical deficiency was observed in riboflavin, folate and calcium.

Brahman et al. (2003) stated that iron deficiency anemia is a major nutritional problem of the developing world including India. Estimation of hemoglobin by cyanmethaemoglobin method revealed that about 82 per cent of the pre-school children were anemic.

Reddy (2003) reported that vitamin A deficiency remains widespread in many countries of South East Asia. However there has been a significant change in the profile over the years. VAD has been known to be the underlying cause of xerophthalmia and blindness for many years. During 1960s and 70s, attention focused on the ocular signs of VAD, and the criteria developed by the WHO were used for assessing public health significance of the problems. Surveys carried out in different regions revealed widespread nature and serious magnitude of
the problems, especially in South East Asian countries. Surveys repeated during 1990s revealed a significant decline in the prevalence of clinical VAD. In India, the prevalence of bitots spots declined from 1.8 per cent in 1970s to 0.7 per cent in 1990s and severe form of keratomalacia and blindness have almost disappeared.

Saroja and Jhansi Rani (2003) reported that anemia was common among girls and the anemics consumed insufficient energy, protein, iron and other nutrients, indicating negative energy balance (100%) as compared to the normal subjects.

Fernandes (2003) reported that malnutrition continues to be an important public health problem and one of the most neglected forms of human deprivation is malnutrition, particularly among children. Scientific evidence suggest that the risk of death from common diseases is doubled for a mildly malnourished child, tripled for a moderately malnourished child, and may be even as highly as eight times for a severely malnourished child, when compared with the risks faced by a well nourished child.

Rau et. al. (2003) found malnutrition common among preschool children and intervened with cereal – based ready mix enriched with micronutrients.

Shally et. al. (2003) conducted a study to assess the prevalence of anaemia among pre-school children and its association with malnutrition in rural Barabanki district of Uttar Pradesh, India. In this survey 654 boys and 546 girls were included. Mean Hb levels in g./dl. among boys and girls were 10.1 (SD: 1.66) and (SD: 1.67) respectively. The proportion of anaemic children (Hb<11g./dl ) was 70 per cent. Stunted children (87.6 per cent) had statistically significant lower mean Hb levels.

Bamji et. al. (2004) stated that in developing countries, undernutrition is the major health problem and marasmus and kwashiorkor are the two extreme clinical forms of protein – energy malnutrition, which require rehabilitation.
Caulfield et al. (2004) reported from the analysis of 310 national nutrition surveys that a significant proportion (52.5 per cent) of deaths in young children worldwide is attributable to undernutrition.

Joshi (2004) suggested that undernutrition results from a combination of three key factors: inadequate food intake, illness and deleterious caring practices. A major determinant of PEM is household caloric inadequacy. According to the 1993-94 round of National Sample Survey, about 80 per cent of rural population and 70 per cent of the urban population had caloric intakes below 2400 Kcal/d and 2100 Kcal/d recommended for rural and urban areas respectively. In 1993 – 94, the poorest 30 per cent and 10 per cent of India’s population consumed on an average, less than 1700 Kcal/d and 1300 Kcal/d respectively. Malnutrition is directly or indirectly responsible for more than half of the deaths of children below five years of age worldwide. In Kerala, 29 per cent of children under four years age are moderately or severely underweight, while the corresponding figures for Bihar and Uttar Pradesh are 63 per cent and 59 per cent, respectively. Malnutrition among children in India and selected states, for the year 1992-93 is represented in Table 2.3.

According to the United Nations Standing Committee on Nutrition (UNSCN, 2004) around 2 billion people worldwide suffer from anemia, most commonly iron deficiency anemia, a major cause of maternal deaths and of cognitive deficits in young children. It can permanently affect later motor development and school performance. Anemia has also negative impact on the economic wellbeing of individual and families and national economies. The UN Standing Committee on Nutrition (SCN) has estimated that the costs of anaemia in Bangladesh, for example, amount to 7.9 per cent of the country’s gross domestic products.

UNICEF (2004) reported that micronutrient deficiencies are damaging the health of one-third of the world’s population and economic development of nearly every country in southern hemisphere. It concludes that current efforts to remedy micronutrient deficiencies in the world’s poorer nations are inadequate and will remain so without new and more aggressive policies. The report summarizes results from nutritional studies undertaken in 80
countries and identifies four target nutrients crucial to health and development both in utero and in children: Iron, Vitamin A, iodine and Folate.

Youssef et. al. (2004) conducted a survey on 306 students from 7 primary schools of Kenitra in Morocco and concluded that the prevalence of anaemia among school children is high and the school system is weak.

NIN (2004-05) conducted a district level survey to assess nutrition profile of community of Uttar Pradesh and reported that the proportion of severe grade undernutrition was higher in 1-3 years children (11.4 per cent) as compared to 3-5 years group (6.7 per cent). Stunting was observed in about 72 per cent of preschool children, while wasting was noticed in about 13 per cent, indicating chronic undernutrition was more common. Under weight (< median 2SD) was observed in 53.2 per cent children of Uttar Pradesh and 68 per cent children (1-5year) of Allahabad district.

Chamay et. al. (2005) concluded in their study that adolescents with eating disorder often suffer from many physical and psychological problems owing to co-morbidity or as a consequence of their eating habits- chronic constipation, dyspeptic symptoms, headaches, hypotension, menstrual dysfunction etc.

GOI (2005) in its publication on the” Tenth Five Year Plan (2002-2007)” indicated that goiter due to iodine deficiency, blindness due to vitamin A deficiency, dry and wet beri- beri and pellagra were the major public health problems in pre-independent India. Sustained dietary changes resulted in the elimination of beri- beri and pellagra. Keratomalacia due to severe vitamin A deficiency is no longer a public health problem. However, there has not been any decline in the prevalence of anaemia due to iron and folic acid deficiency, the decline in vitamin A deficiency and iodine deficiency disorders has been very slow.
Table: 2.3 Per cent prevalence of malnutrition among children aged 1-4 years in India and selected states, 1992-93

<table>
<thead>
<tr>
<th>States</th>
<th>Underweight (Weight-for-age&lt;2SD of the median)</th>
<th>Stunted (Height-for-age&lt;2SD of the median)</th>
<th>Wasted (Weight-height &lt; 2SD of the median)</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>53.1</td>
<td>52.0</td>
<td>17.5</td>
</tr>
<tr>
<td>Bihar</td>
<td>62.6</td>
<td>60.9</td>
<td>21.8</td>
</tr>
<tr>
<td>Karnataka</td>
<td>54.3</td>
<td>47.6</td>
<td>17.4</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>52.6</td>
<td>46.0</td>
<td>20.2</td>
</tr>
<tr>
<td>Orissa</td>
<td>53.3</td>
<td>48.2</td>
<td>21.3</td>
</tr>
<tr>
<td>Gujarat</td>
<td>44.1</td>
<td>43.6</td>
<td>18.9</td>
</tr>
<tr>
<td>Jammu-Kashmir</td>
<td>44.5</td>
<td>40.8</td>
<td>14.8</td>
</tr>
<tr>
<td>Kerala</td>
<td>28.5</td>
<td>27.4</td>
<td>11.6</td>
</tr>
<tr>
<td>Rajasthan</td>
<td>41.6</td>
<td>43.1</td>
<td>19.5</td>
</tr>
<tr>
<td>Uttar Pradesh</td>
<td>49.8</td>
<td>49.2</td>
<td>16.2</td>
</tr>
<tr>
<td>Punjab</td>
<td>45.9</td>
<td>40.0</td>
<td>19.9</td>
</tr>
<tr>
<td>Haryana</td>
<td>37.9</td>
<td>46.7</td>
<td>5.9</td>
</tr>
</tbody>
</table>

**Kumari and Jain (2005)** assessed the nutritional status of school children from rural Bihar, and reported a high incidence of malnutrition as revealed by their anthropometry. However the increment in height and weight were more in girls than boys although intake of foods and nutrients did not show large variation among boys and girls. Poor anthropometric indices and nutritional deficiency diseases especially iron deficiency anemia, riboflavin deficiency, dental disease, protein energy malnutrition and vitamin deficiency may be due to lower intake than recommended intake of those nutrients. However the root cause of all ills was poor purchasing power of the families belonging to lower income groups.

**Abou et. al. (2006)** conducted a study on 513 students of five schools in Saudi and concluded that anaemia is highly prevalent among the school children, which is seriously affecting the growth of 6-14 years old children.

**Chandrika (2006)** reported in **The Hindu Times** that India has the largest number of cases of anemia in the world. Over 90 per cent Indian women, adolescent girls and children are anemic.

According to a publication of the **Directorate of ICDS Services (2006)** the micro nutrient malnutrition prevailing in the country is as follows:

**Iron Deficiency Anaemia (IDA)**

- Five out of ten married women suffer from iron deficiency anaemia.
- Every second child and adolescent girl is estimated to have IDA.
- Only 32 per cent mothers receive IFA tablets during pregnancy in the U.P state (2nd lowest in the country as per NFHS-2).

**Vitamin A Deficiency (VAD)**

- 3 out of 5 children (60 per cent) are at risk of developing Vitamin A deficiency.
- About one in ten children have sub clinical deficiency of Vitamin A as indicated by low levels of serum retinal.
• Only 9.5 per cent children reported to have received at least one dose of vitamin A supplement (VAS) in last six months (NFHS-2) and below 1 per cent reported to have received 2\textsuperscript{nd} -5\textsuperscript{th} dose of vitamin A.

**Iodine Deficiency Disorders (IDD)**

• IDD is widespread in UP and not limited only to the Sub-Himalayan regions of UP.

• The Total Goiter rate > 10 per cent (indicative of IDD being a public health problem) is found in almost all districts of UP surveyed to date.

• In 2003, only 6 per cent households reported to consume iodized salt in the state despite the legal ban on sale of non–iodized salt for edible purposes being in position in UP since 1987.

Goel et. al. (2006) reported that 57.4 per cent of children were found malnourished; proportion of malnourishment was more among males. Birth order, type of family, number of living children and literacy status of mother, were significantly associated with grades of malnutrition.

According to Siegel et. al. (2006) 58 per cent of the children living in South Central Nepal had hemoglobin <10.5 g/dl. Iron deficiency was present in 43 per cent of the children. Severe anemia was rare. Differences between caste groups among Hindus and between Hindus and Muslims were observed. The risk was greatest for the lowest caste group, the Shudras. Muslim children were at a slightly lower risk of having anemia and iron- deficiency anemia than the lower – caste Viaysha and Shudra infants; however, their risk was significantly higher than that of the high – caste Brahmin and Chhetri children.

Umadevi and Paravatham (2006) conducted a study on 500 children of school going age and noticed the prevalence of iron deficiency in 149 students among whom 84 were girls and 65 were boys.
UNICEF (2006) stated that in developing world, one out of every four children under 5 years old (around 27 per cent; that is 146 million children) are underweight; of these 57 million children live in India, that is 47 per cent children are underweight, also 46 per cent are stunted and 16 per cent are wasted. Malnutrition and anaemia are two sides of the same coin. More than 10,000 adolescents and children are believed to have died of malnutrition in the so-called progressive states like Maharashtra alone, in the previous couple of years. It is said that 47 per cent of India’s children and adolescents are moderately or severely malnourished. This is higher than that of Sub-Saharan Africa.

Joshi (2007) has reported that India a developing country, accounts for less than 20 per cent of the world’s child population, but it has 40 per cent of the malnourished children. Protein Energy Malnutrition (PEM) is the most widely prevalent form of malnutrition among children: over one half (53 per cent) of those under four years old, suffer from moderate and severe form of PEM. India and South Asia as a whole have higher rates of malnutrition than any other region of world, including Sub-Saharan Africa. Among the large countries India ranks second only to Bangladesh in the proportion of young children affected by malnutrition. Malnutrition varies widely across regions, states, age, gender and social groups with children under 5 years being the worst hit, It is found in the populous northern states, in rural areas, and among women, tribal populations and scheduled castes. In another chapter of her book, the same author (Joshi 2007) indicated some facts about malnutrition and micronutrient deficiencies as listed by the Department of Women and Child Development, Ministry of Human Resource Development. These are the following:

- Nearly one-third of the world’s children suffering from malnutrition are in India.
- Incidence of nutrition deficiencies: nutritional anaemia, vitamin A and iodine deficiencies are still very high.
- Rate of nutrition is falling much too slowly- at only one per cent per year.
- More than half of preschool children are stunted (56.5 per cent) and nearly a similar proportion, (49.2 per cent) are underweight. (DNP Survey, 1995-96),
- One in every six children is excessively thin (wasted).
• Nearly 16 per cent infants less than 6 months and about 43 per cent infants between six to eleven months are malnourished.

• About 30 per cent babies are low birth weight babies.

• Nutritional anaemia affects about 50 per cent of young children, adolescent girls and women in the reproductive age group.

• More that 10 per cent of population, in 235 districts of India is affected with goiter–an iodine deficiency disorder.

Muthayya et. al. (2007) conducted a survey on 2030 school going children aged 5-15 years in primary schools in Bangalore region Karnataka and found that the prevalence of anaemia in urban was 14.6 per cent and in rural was 12.3 per cent. It was concluded that anaemia is a serious public health problem in Indian school children.

Srihari et. al. (2007) studied the nutritional status of Indian school children 6-18 years from middle and high socio-economic status. Studies showed that anemia prevalence (hemoglobin concentration <12g/dl) ranged from 19 to 88 per cent across five different cities in India. Other micronutrient deficiencies including, folate, riboflavin, niacin, vitamin C, vit. A and vit. B12 were also present based on biochemical parameters in one study and clinical signs of deficiency in three other studies.

Talikoti and Chung (2009) initiated anaemia control programme for school going adolescent girls of Rajasthan with State Council of Education Research and Training (SCERT) and UNICEF and found that prevalence of iron deficiency anaemia (IDA) is severe in girls.

2.4 LITERATURE / PROGRAMMES HIGHLIGHTING GIRLS’ EDUCATION AND NUTRITIONAL STATUS IMPROVEMENT

Programmes for girls’ education
The Indian Express (2007) reported that “Kanya Vidhya Dhan Yojana” was among the projects decided by U.P’s Chief Minister Mulayam Singh during his tenure and Mayawati who became C.M. in 2007 shelved the projects. Under this project: ₹20,000 was given as educational grant to girls who passed class XII.

Various programs and projects of the Indian government having a gender focus, initiated since Independence through the Five Year Plans, have been discussed in an article of the IGNOU(2008), the paper title being “In –Service Teacher Education on Girls” Accordingly, the Education Commission (1964-66), the National Policy on Education-NPE-(1968) and the NPE (1986) and its Programme of Action- POA-(1992) have all emphasized the need to implement the programme of Universalization of Elementary Education (UEE). After the recommendations of NPE 1986, there have been a number of educational initiatives from the Central and State governments, along with Non government organizations (NGO) to achieve the goals of UEE. Some of the initiatives are: Bihar Education Project (BEP), U.P Basic Education Project, Lok Jumblish, Shiksha Karmi project in Rajasthan and District Primary Education Programme (DPEP). All these programmes and projects have special gender focus. For example, one of the criteria for selecting DPEP was low female literacy. The scheme known as Sarva Shiksha Abhiyan (SSA) was launched during the X Five Year Plan (2002-2007) to incorporate all the existing schemes and programmes related to elementary education, with the aim to provide quality elementary education to all children in the age group 6-14 years by 2010, with special focus on girls and children belonging to socio-economically disadvantaged group; children belonging to socio-economically disadvantaged groups and children with special needs. Some of the initiatives for girls under SSA are as follow:

National Programme for Education of Girls at Elementary Level (NPEGEL). The NPEGEL was launched in September 2003 as integral but separate gender component of the Sarva Shiksha Abhiyan. This programme provides additional components for enhancing the education of under privileged /disadvantaged girls at the elementary level through more intense community mobilization and development of Model Cluster schools. Gender sensitization, learning materials, and provision of need- based incentives like escorts, stationery, work books and uniforms are some of the endeavours under this programme.
Opening of Kasturba Gandhi Balika Vidyalaya (KGBV). The Government of India has launched a new scheme called Kasturba Gandhi Balika Vidyalaya (KGBV) for setting up upto 750 residential schools with boarding facilities at elementary level for girls belonging predominantly to the SC, ST, OBC and minorities in difficult areas. Out of a total 750 KGBVs, the Government of India has proposed to set up 117 KGBVs in blocks having predominance of Muslim population in which at least three-fourths of the seats will be for girls from marginalized or minority communities while the rest may be made available to girls from families below the poverty line.

Special provision under SSA for elementary education of girls: These include free textbooks, separate toilets for girls, recruitment of 50 per cent women teachers, Early Childhood Center and Education Centers in /near schools, Teachers’ sensitization programmes to promote equitable learning opportunities, Back to school camps for the out-of school girls, bridge courses for older girls, gender-sensitive teaching learning materials, intensive community mobilization efforts and Special fund for innovative need-based intervention for girls’ attendance.

Azad India Foundation (2010) brought out the decision of Minister of Human Resource Development, Government of India to provide freeships and scholarships to all girls from single child families from class VI up to the post-graduate level. This novel scheme, although decided in the view of correcting the low male-female sex ratio and limiting family size, is highly beneficial in improving girl’s education in the country. The scheme would apply to all government aided or affiliated schools and colleges in the country. If the two children in a family are girls, both will be entitled to a 50 per cent concession in fees. If there are two children in a family and one is a girl, she will still get the 50 per cent concession. The fee waiver will cover tuition fee but exclude money charged for transport and food. The scholarships for undergraduates will be given for non-medical and non-engineering courses in recognized colleges. At the end of three years, 1,650 students will receive these scholarships. The CBSE, which conducts entrance examinations for medical and engineering students, will also offer 500 fellowships every year for these courses; 350 for engineering students and 150 for medical students. These too will be given on merit. The UGC will give scholarships of ₹ 2,000 a month to first and second rank holders among girls in the B.A, B.
Sc, and B.Com courses to pursue higher degree. On the paper it seems a very generous scheme for universalizing and promoting female education. It is being hoped that it would have positive impact on the status of women by increasing their life choices through free education right up to college. It may also help to change family and community attitude towards girl’s education. But it is doubtful that it would achieve the stated objective of balancing the sex ratio as the society’s bias for male child is deep-rooted and the lure of free education for the girls is unlikely to change easily. Though the scheme is aimed at promoting education for girls, it would not benefit the girls belonging to the poor families and those in the rural areas because they generally drop out by high school. It is necessary that the government should improve the educational infrastructure and make it more accessible and meaningful for the girl child. There should be an income ceiling for the beneficiaries as it should be given to girls who have limited resources but are keen to pursue higher education.

**Sandhya (2010)** did an analysis of women’s education in India. It has been reported that Dr. Manmohan Singh, India’s Prime Minister termed the XI Five Year Plan (2007-2012) as India’s education plan. The National Development Council (NDC) placed highest priority on education as a central instrument for achieving rapid and inclusive growth. Among the aims listed, important ones included: lowering of gender gap in literacy to 10 percentage points and reduction of dropout rates of elementary school children.

**Isaac (2011)** gave a brief account of action taken for girl’s education in the country. The paper has brought out the information that a focus on girls’ education was put in place since the 1996 National Policy on Education and the 1992 Programme of Action followed by the SSA programme launched in 2001, National Curriculum Framework in 2005 and the National Curriculum Framework for Teacher Education in 2010. These policies were complemented by other schemes such as National Programme for the Education of Girls at the Elementary Level, Kasturba Gandhi Balika Vidyalaya Scheme, both ensuring inclusion and quality education for girls. The Mahila Samakhya programme was launched in 10 states targeting marginalized sections of rural women. Access to education was also facilitated by separate schools for girls, availability of open learning resources, residential schooling, coaching facilities; scholarships, textbooks, uniforms and transport including bicycles. The
Right of Children to Free and Compulsory Education (known as RTE) Act, 2010, charted a new roadmap for gender equality in education in India.

The importance of girl’s / women’s education has been highlighted under the Right to Education Project on the website Right to education html (Anonymous, 2012)b. Four important points have been brought out: (i) Education has been recognized as the right of everyone since the Universal Declaration of Human Rights (UDHR) in 1948; the right of girls to education is one of the most critical of all rights- because education plays an important role in enabling girls and women to secure other rights, (ii) Cultural and traditional values stand between girls and their prospects for education; improving educational opportunities for girls and women helps them to develop skills that allow them to make decision and influence community change in key areas, (iii) Basic education provides girls and women with an understanding of basic health, nutrition and family planning, giving them choices and the power to decide over their own lives and bodies, (iv) Educating girls and women is an important step in overcoming poverty and inequality.

An article about Kanya Vidhya Dhan Yojana on the website www.jobship.in stated that for promoting girls education in Uttar Pradesh, the Samajwadi party Chief Minister Akhilesh Yadav, in 2012 has decided to relaunch the Kanya Vidhya Dhan Yojana which the previous Samajwadi party (Mulayam Singh) government had started in 2002-2007. The project of 2002-2007 had the provision to distribute ₹. 20,000 to the girls/ women who were intermediate qualified and living below poverty line. Chief Minister Akhilesh Yadav promised in manifesto 2012 that ₹.30,000 would be given to High School passed Muslim girls to continue education. Also for the students in Matriculation, a tablet and to those in intermediate, a laptop, have been promised (Anonymous,2012)a. According to Amar Ujala Compact (2012) the Akhilesh Yadav government has promised a budget of ₹ 446.35 crore for Kanya Vidhya Dhan Yojana and ₹ 2,721 crore for distributing tablet and laptop to the students. The version of Newzstreet (2012) is that a provision of ₹ 446 crore has been made in the budget for offering the Kanya Vidhya Dhan and ₹ 30,000 to the Muslim girls passing XII Board examination.
Programmes for nutritional status improvement

The Government of India has introduced several large scale supplementary programmes aimed at overcoming specific deficiency diseases through various Ministries to combat malnutrition.

Cook and Reusser (1983) have reported *food fortification and enrichment* as one of the best approaches to lessen the high prevalence of Fe deficiency in developing countries but the vehicle and fortification compound must be chosen carefully because most Fe compounds cause discoloration or rancidity. Technology for fortifying wheat flour and bread is well established and the use of these vehicles has a significant impact on Fe status. For the past 60 years, fortification of flour with iron and vitamins has been demonstrated to be a cost effective way of reducing the prevalence of anemia in many countries of the world. Food fortification with iron has been recommended as one of the preferred approaches for preventing and eradicating iron deficiency but the success of iron fortification is dependent on delivering a meaningful level of bioavailability iron without affecting the taste and appearance of the finally consumed product. Fortification of salt with iron has been identified as a measure to control anaemia.

WHO (1989) has reported *nutrition education* as an important long term measure to eradicate malnutrition. In one of the publication, it has been stated that the success of all the technical approaches to control deficiency disorders including anaemia, depends on the active participation of the population. Hence there is a need for a public education support strategy, based on careful analysis of behavioral changes required.

Layrisse et. al. (1996) and Hurrell (1997) reported food fortification as an important approach to improve nutritional status.

Department of Women and Child Development (2002) has reported about the *Adolescent Girl’s Scheme (AGS)* or *Kishori Shakti Yojana*. This special intervention has been devised for adolescent girls, using the ICDS infrastructure. This was devised in 1991-1992. This intervention focuses on school dropout girls in the age group of 10-19 years, to meet their needs of self development, nutrition, health education, literacy, recreation and as skill
formation. This scheme attempts to mobilize and enhance the potential of girls as social animistic. The main objectives of the scheme are: (a) to improve the nutrition and health status of girls in the age group of 11-18 years,(b) to provide literacy and numeracy skills through non-formal education,(c) to train and equip adolescent girls to improve or upgrade home based skills and to enable them to run child care centers at a later stage, and (d) to promote awareness of health, hygiene, nutrition and family welfare issues and to encourage girls to marry only after 18 years. The scheme provides ‘hands-on’ learning at the Anganwadi centre, education, health check-ups and supplementary nutrition. A major thrust of the programme is to prevent teenage pregnancies. *Nutrition Programme for Adolescent Girls (NPAG, 2002)* is another scheme approved by the government of India. The programme has four important objectives: (i) improve nutritional and health status of girls, (ii) stimulate desire for social exposure and knowledge to improve their decision making capabilities,(iii) train and equip the adolescent girls to upgrade home based and vocational skills, (iv) promote health hygiene, nutrition, family welfare, home management and child care and to facilitate marriage only after the age of \( \geq 18 \) years.

Important programmes, as published by *Kishor (2002)* include the following twelve:

**(i) National Nutritional Anaemia Prophylaxis Programme:** The programme was launched in 1970 to prevent nutritional anaemia in mothers and children. Under this programme, the expectant mothers as well as acceptors of family planning are given one tablet of iron and folic acid containing 60 mg elemental iron which was raised to 100 mg elementary iron, however folic acid content remained same (0.5 mg of folic acid). Children in the age group of 1-5 years are given one tablet of iron containing 20 mg elementary iron (60 mg of ferrous sulphate and 0.1 mg of folic acid) daily for a period of 100 days. This programme covers children and pregnant women with haemoglobin level less than 8 g per cent and 10 g per cent respectively.

**(ii) Prophylaxis programme against Vitamin A deficiency:** This was initiated by the Government in 1970, the children in age group 1-5 years are given an oral dose of 0.2 million I.U. of vitamin A in oil every 6 months. During 1980, the Department of Food introduced a scheme of fortification of milk with vitamin A to prevent nutritional blindness. Presently the
milk supplied by Tamil Nadu Government is fortified with vitamin A. Children in the age group 1-5 years of ICDS receive 2,00,000.I.U.of vitamin A solution orally every six months.

(iii) **IDD Control Programme:** This programme was initiated by Government of India in 1962 to identify goiter endemic regions and to assess the impact of goiter control measures. Now there is increasing awareness about the broad spectrum of iodine deficiency disorder in the country. The Government of India started a scheme with effect from 1986 envisaging, “Universal Iodisation of Edible Salt” in a phased manner to cover the whole country. The States/ UTs have been requested to arrange for distribution of iodised salt through their public distribution system.

(iv) **National Diarrheal Disease Control Programme:** The programme was launched in 1981 to reduce the mortality due to diarrheal diseases in children below five years, through introduction of Oral Rehydration Therapy (ORT). The Anganwadi centers of the ICDS scheme have served as nucleus for the propagation of Oral Rehydration Therapy.

(v) **Applied Nutrition Programme:** The Applied Nutrition Programme (ANP) was introduced as a pilot scheme in Orissa in 1963 which later on was extended to Tamil Nadu and Uttar Pradesh with the objectives of a) promoting production of protective food such as vegetables and fruits and b) ensuring their consumption by pregnant and nursing mothers and children. During 1973, it was extended to all the states of the country.

(vi) **Special Nutrition Programme (SNP):** It was started to provide food to children of age group 1-6 living in tribal areas and in urban slums. The programme was launched in 1970-71 to provide supplementary feeding of about 300 calories and 10 grams of protein to preschool children and about 500 calories and 20 grams of protein to expectant and nursing mothers for six days a week.

(vii) **Balwadi Nutrition Programme:** The Balwadi nutrition programme of the Central Government was launched in 1970-71 through voluntary organizations. It provides about 300 calories and 10 grams of protein per child (3-5years) per day for 270 days a year.

(viii) **Integrated Child Development Services (ICDS):** This scheme was started on 2nd October 1975 and was partly funded by the central government and partly by UNICEF. ICDS
comes under Ministry of Social Welfare. The state government also gives grant in the effective implementation of this programme. The components of the programme are: (i) supplementary nutrition: for children below two years of age and nursing and expectant mothers from low income families,(ii) immunization for children under one year of age and expectant mothers,(iii) prophylaxis against vitamin A deficiency for children in the age group 1-5 years, (iv) nutrition and health education: (ICDS aims at effective communication of certain basic health and nutrition messages with a view to enhancing the mother’s awareness), and (v) health checkup of children in the age group of 0-6 years and mothers.

(ix) Tamilnadu Government Nutritious Meal Programme: This noon meal programme was launched on July 1, 1982 by the late M.G.Ramachandran, then the Chief Minister of Tamil Nadu. It was started initially in the rural areas and was then extended to the urban areas. Components of the programme are: (i) to improve the health status of the children (ii) to provide one third of daily requirement of food and (iii) all round development.

(x) Tamil Nadu Integrated Nutrition Programme (TINP): TINP is implemented in association with Social Welfare Department and World Bank in the state to improve the nutritional status of children below three years. Locally available ready to eat food is given to children. Children are supplemented with one –third requirement of calories and protein.

(xi) Wheat Based Supplementary Nutrition Programme: This centrally sponsored programme was introduced in 1986 but now transferred to the State Sector. The programme follows the norms of SNP or of the nutrition component of the ICDS. Central assistance for the programme consists of supply of free wheat and supportive costs for other ingredients, cooking, transport etc.

(xii) Mid Day Meal Programme: Mid day meal programme (MDM) aimed at improving the nutritional status of poor children and at ensuring better school enrollment has been functioning in various states of the country for over five decades. When started as a centrally sponsored scheme in 1995, the HRD Ministry was supplying 100 gram food grains per primary school child for 10 months in the year. However, revisions were made later by the government and cooked meals, instead of grains are now provided. The scheme has been extended to the Junior High School (Middle Schools). The meals are based on cereals, pulses
and vegetables. The primary school level children are provided 450 Kcal and 12gm protein whereas middle school children are given 700 Kcal and 20 gm protein.

**NFI (2003)** has highlighted MDM as one of the most important programme for improving nutritional status of school children.

In a handbook published by the **World Food Programme (2005)** it has been stated that the **World Food Programme (WFP)** is the United Nation’s food aid agency and the world’s front-line agency in the fight against hunger. WFP’s main partner is the government recognized by the United Nations. Other than national and local government entities, WFP partners include: (i) United Nations agencies such as UNHCR, UNICEF, FAO, UNDP, WHO and UNAIDS,(ii) international organizations such as ICRC, and (iii) NGOs. WFP’s programmes fall into four main categories: (a) emergency operation: response to disaster from natural and human causes, (b) protracted relief and rehabilitation operations: recovery after a crisis, (iii) country programme and development activities: food aid for social and economic development, and (iv) special operations: logistics to speed up the movement to food aid.

**Srilakshmi (2008)** has given remarks about three nutrition intervention programme: (i) **Nutrition Intervention for Vulnerable Groups:** which includes the Universal Immunisation Programme, Oral Rehydration Therapy and Integrated Child Development Services which have had a considerable impact on child survival and extreme forms of malnutrition,(ii)The **BPNI** (Breast Feeding Promotion Network of India) which recommends exclusive breast feeding for first six months, continued breast feeding upto two years and beyond and addition of complementary foods after six months of age as optimum infant feeding practices and, (iii)**The Baby Friendly Hospital Initiative** initiated by UNICEF and WHO to impart health education to rural women who deliver at home.

**2.5 MID-DAY MEALS: HISTORY, REPORTS AND RESEARCH STUDIES**

**MDM history**

**India Together (2004)** stated that it was the successful introduction of Tamil Nadu’s Nutritious Meal Programme which prompted the creation of a National Programme of
Nutritional Support to Primary Education (NPNSPE) popularly known as the Mid Day Meal Scheme. The NP-NPSE was launched as a Centrally Sponsored Scheme on 15th August, 1995, with a view to enhancing enrollment, retention and attendance and simultaneously improving nutritional levels among children of classes’ I-V of government, government aided and local body schools. Central assistance under the scheme consisted of :(a) free supply of food grains @100 grams per child per school days and (b) subsidy for transportation of food grains upto a maximum of Rs. 50/- per quintal. Cooking costs (cost of pulses, vegetables, cooking oil, fuel, wages to personnel etc.) were to be borne by the state governments. Many state governments resorted to distribution of only the food grains (not cooked meal) to the children, on account of budgetary constraints. Initially it was introduced in 2408 blocks in the country but by 1997-98 all blocks were covered. The apex court, in its judgment in people’ Union for Civil Liberties vs. Union of India and Ors (writ Petition (Civil) No. 196 of 2001) decreed thus: “state governments must implement the mid –day – meal scheme by providing every child in every government and government assisted primary schools with a prepared mid-day meal with a minimum content of 300 calories and 8-12grames of protein each day of school for a minimum of 200 days. Those governments providing dry rations instead of cooked meals must within three months (28 February 2002) start providing cooked meals in all government and government- aided primary schools in half of the districts of the state (in order of priority) and must within a further period of the three months (28 May 2002) extend the provision of cooked meals to the remaining parts of the state.” However, some states including Uttar Pradesh, Bihar and Jharkhand failed to meet the Apex Court deadline.

According to the publication “Mid Day Meals: A Primer” (Anonymous,2005) the mid day meal scheme in India was first introduced in Tamil Nadu by the Madras Municipal Corporation in the year 1925 and then in 1956 became a state-wide scheme under the Chief Minister Late. K. Kamaraj for Adi Dravida community schools as the “Poor Feeding Programme. It is sad that the idea of mid day meal occurred to Kamaraj after an encounter with a small boy who was looking after his cows and goats. When the Chief Minister asked him “Why didn’t you go to school today” the boy replied “If I go to school will you give me food to eat? I can eat only if I earn”. The boy’s answer sparked the whole MDM programme.
M.G. Ramachandran too experienced hunger as a child and protecting other children from hunger became his mission. In 1961, the state started receiving American aid for the programme and it was expanded to corporation and government schools in urban areas. However, full shape and form was given to the MDM in the state only in the year 1982, (July) when the Chief Minister Late Shri M.G.Ramachandran introduced the Puratchi Thalaivar MGR Nutritious Meal Programme (PTMGR NMP) in a phased manner in Child Welfare Centers in rural areas for pre-schoolers (5-9 yr). Subsequently in September 1982 MGR extended the programme to urban areas. In 1984 further extension was made for school children of 10-15 yrs. A free mid day meal in Tamil Nadu, since then is provided to all children in government, corporate, punchayat and municipal schools- primary and secondary levels. The scheme proved remarkably successful in improving school enrollment in that state. Moreover, the school dropouts decreased dramatically and girls’ retention in particular improved greatly. Additionally, it has provided employment to destitute mothers who work as cooks in the noon meal centers in the state.

A publication of India, Ministry of Human Resource Development (2006) shows that free mid day meals for school children were first introduced in a Japanese private school in the late 1800s. Later in 1938, Brazil and in 1946, the United States introduced the scheme. Evidently satisfactory results were reported by these nations. Japan and U.S. boasted 100 percent adult literacy and Brazil 87.3 per cent, according to the UNDP’s Human Development Report, 2003. The Global School Feeding Report of the United Nations World Food Programmes commented thus: “School feeding programs often doubles enrollment within a year and can produce a 40 per cent improvement in academic performance in just two years. Children who take part in such programmes stay in school longer and the expense is minimal”. By the mid 1980s, two more states viz. Gujarat and Kerala and the UT of Pondicherry had universalized a cooked Mid Day Meal Programme with their own resources for children studying at the primary stage. Mid day meal was also being provided to children in Tribal Areas in some states like Madhya Pradesh and Orissa. By the year 1990-91 the number of states implementing the scheme with their own resources on a large scale or universally increased to 12, namely Goa, Gujarat, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Mizoram, Nagaland, Sikkim, Tamil Nadu, Tripura and Uttar Pradesh. In another three states- Karnataka, Orissa and West Bengal- the programme was being implemented
with state resources in combination with international assistance. Another two- Andhra Pradesh and Rajasthan-were implementing the programme entirely with international assistance. In 2002 the scheme was extended to schools (I-V class) of Education Guarantee Scheme (EGS) and Alternative and Innovative Education (AIE). In September 2004, the NP-NSPE was revised to provide cooked mid day meal (instead of dry ration) with 300 Kcal and 6-12 gram protein to all children studying in classes I-V in government and government aided schools and EGS/ AIE centers. Provision was made for providing the meal to the children in drought affected areas in summer vacation also (for other children the meal is for 200 school days only). In the year 2006, again some revisions were made, to increase the energy content of the MDM to 450 Kcal and to ensure provision of adequate quantities of micronutrients.

**Hindustan Time (2007)** has reported that MDM has now been extended to children studying in middle schools (junior high schools) also i.e., up to class VII. In Uttar Pradesh (the state in which the present study was carried out), the scheme became fully operational quite late (Oct. 2004) for primary school children, and got extended for middle schools (junior high schools) in 2007.

**MDM reports/ research studies**

**Babu and Hallam (1989)** carried out an evaluation of the Tamil Nadu midday meal scheme in 1984 and found a highly significant increase in school enrolment due to school nutrition.

In a report **Gopaldas (1992)** has stated that the sizeable nutrient deficits in the diets of children, in spite of the mid-day meals were in respect to vitamin A and iron, rather than calorie or protein. These studies showed that in slum Baroda MDM children with intestinal parasitic infection were 53 per cent; and ocular signs of vitamin A deficiency 33 per cent, Anthropometric status was poor and it was revealed that only half the boys (5-15 years) were normal as per the WHO (1976) weight for height index. Anthropometric status worsened with age, only 31 per cent girls (10-15 years) being in the normal category. Upper Respiratory Infections (URI), and malaria were very common and often were the reasons for school absenteeism. Several intervention studies among underprivileged scholars of Baroda followed. In essence a package of health inputs consisting of a single dose of Albendazole
(400mg), Vitamin A tablets (200000IU) and folifer tablets (20 to 60 mg elemental iron) delivered at the beginning of each school term succeeded in bringing down the load of intestinal helminthes, the Hb levels increased by 1g/dl, and the clinical signs of Vitamin A deficiency reduced.

The impact of incentive programmes such as the noon- meal scheme for Nagarcoil district was studied by Rajan and Jaikumar (1992). They found that such programmes have had a positive effect on school attendance and had curbed drop out. It has had a greater impact on the enrolment of backward classes and Muslim communities compared to other communities investigated.

According to information obtained from http://evaluation of mid day meal (GOI, 1992) the Indian government recognized hunger as a potential consequence of child and family poverty and it was realized that hunger hindered child development. The MDM programme had the overall purpose of providing meals to students who came to school hungry. Objectives of the programme were (i) to provide meals to children in need, (ii) to promote a healthy school environment and (iii) to promote nutrition education.

The Mid Day Meal is a centrally funded welfare scheme, which offers free cooked meal to students in primary schools as an incentive to attend classes and is aimed to reduce the dropout rate. The scheme involves awarding of multi – core contracts for the purchase of goods and construction of a kitchen building and a godown to store food stock for the schools. (National Programme of Nutritional Support, 1995)

Earlier research on primary education in rural India suggests that mid day meals enhance school participation, especially among girls. In a study Dreze and Kingdom (2001) estimated that the provision of a mid day meal in the local school is associated with a 50 percent reduction in the proportion of girls who are out of school.

The Times of India (2002) reported that the Maharastra Government had decided to wash its hands off the MDM scheme for primary schools, claiming that it had no funds to provide
cooked meals to students. The onus of running the scheme has been passed on the Grampanchayats.

The Hindu, an Indian daily reported in 2002 that the Mid Day Meal Scheme was not being adequately implemented to nearly nine lakhs children studying in 1,800 primary schools of the Municipal Corporation of Delhi. Whatever was being given to the students was unhygienic and sub-standard.

Dreze and Goyal (2003) in “The Future of Mid-Day Meals”, reported the findings of a survey which suggests that Mid-Day Meal initiative could have a major impact on child nutrition, school attendance and social equity. They however felt that, the quality issues need urgent attention if mid-day meal programmes are to realise their full potential. In conclusion Dreze and Goyal observed universal and nutritious mid-day meals would be a significant step towards the realisation of the right to food.

The NFI (2003) has reported that mid day meal could serve the important purpose of improving school enrollment and attendance especially enrollment of girls, thus contributing to gender equality. With MDM, it will be easier for parents to persuade their children to go to school and for teachers to retain children in the classrooms. It could foster sound social behavior among children in the dispel feelings of difference between various castes. MDM can also contribute to gender equality by reducing the gender gap in education by boosting female attendance in school.

The website India Together (2004) reported a study of mid day meal schemes in three states of the Indian Union (Chhattisgarh, Rajasthan and Karnataka) conducted by the Center for Equity Studies of the Delhi School of Economics. It clearly indicates the nexus between improved student enrolment and retention and the free mid day meal. Jean Dreze, Visiting Professor at the Delhi School of Economics was a member of the team which conducted the study. The study covered 81 schools in which free mid day meals were introduced in July 2001. Findings indicate that class I enrolment rose by 15 per cent within the year. Particularly impressive jumps were made in female enrolment in Chhattisgarh (17 per cent) and Rajasthan (29 per cent). Provisional enrollment data for Chhattisgarh and
Rajasthan as a whole supplied by the education department, also suggest major improvement in female enrolment in 2002-03: 19 and 18 per cent respectively after the introduction of the mid day meals scheme. There is also much informal evidence which indicates that mid-day meals have enhanced daily school attendance and not just annual enrolment. Many parents, for instance reported that the availability of a mid- day meal made it much easier for them to persuade their children to go to school in the morning. Most teachers also concur that mid- day meals have raised daily attendance especially among young children. Dreze believes that apart from boosting school attendance and child nutrition, mid day meals have an important socialization value and foster gender equity. “As children learn to sit together and share a common meal, one can expect some erosion of caste prejudices and class inequality. They also reduce the gender gap in education, since they boost female school attendance more than male attendance,” he said.

Swaminathan et. al. (2004) in their paper “Tamil Nadu’s Midday Meal Scheme: Where Assumed Benefits Score over Hard Data”, attempted to analyze the need to re-examine the original rationale for the scheme, namely, getting children to school and retaining them. In the two decades of the scheme’s existence, the educational profiles as well as the nature of problems at the ground level have changed significantly. Much of this, the paper felt, is not reflected in the data presented and available with the government. On the other hand, the scheme has not been able to bring all children to school. If the midday meal is to retain its effectiveness and relevance, Padmini concluded that it may have to be modified in the light of these changes. The noon-meal programme benefits 38.24 lakh students in the primary classes amounting to about 71 per cent of the children enrolled in classes I to V. Boy students benefit marginally more as compared to girl students.

A study conducted by Thorat and Lee (2004) of Indian Institute of Dalit Studies (IIDS), New Delhi showed: (a) Uttar Pradesh and Bihar, where one third of India’s dalits live, deny dalit and other poor childrens’ access to their legislated entitlements from the very beginning, by simply refusing to implement the shared, cooked MDMs; (b) the distribution of dry grain to government school children under the MDMs takes place in dominant caste localities; and (c) employment of dalit cooks is problematic in Rajasthan and Andhra Pradesh.
Afridi’s publication of the year 2005 “Mid day Meals in Two States: Comparing the Financial and Institutional Organisation of the Programme” is based on the findings of a survey of the midday meal programme in Madhya Pradesh. Comparison of the new ‘suruchi bhojan’ with the old ‘daliya’ programme in the government primary schools in the survey area and observations on programme implementation in Karnataka, suggested a pressing need to overhaul the administrative and financial organisation of the scheme in order to increase its effectiveness.

A study conducted by Pratichi Trust (2005) in West Bengal showed: (a) the MDMS was started in some 1,100 primary schools in five districts (Murshidabad, Birbhum, Bankura, Paschim Midnapore, and Jalpaiguri) and extended to some other districts. A total of 5,200 primary schools were brought into the fold of the programme till March 31 2004;( b ) only a few of the richer households, mainly of caste Hindu background, were against the continuation of the MDMS; (c) there were a handful of upper caste children, who in unison with their parents’ inhibition towards the meal showed their disliking towards the cooked meal; (d) some children highlighted the need for a change in the monotonous menu of khichari (made of boiled rice, pulses, turmeric, little oil and local vegetables) everyday; (e) inadequate salaries were paid to the cooks; (f) in most of the schools, it was reported that the conversion cost was found too inadequate to make a proper meal; and (g) the scope for involving the parents in the process of implementation of the programme was very limited.

Since the Supreme Court says that the onus to monitor the implementation of the scheme essentially lies with the Central government, as it is the Central government that is providing assistance, it is important that leakages from the MDMS should be stopped at all cost. The quality of cooked food served needs to be enhanced. More allocation of funds for MDMS would be able to attract students in the Sarva Shiksha Abhiyan (SSA) and increase retention in schools (Zaidi, 2005)

A study of MDMS in Delhi by De et. al. (2005) showed: (a) MDMS was officially implemented on 1st July 2003 in only 410 Municipal Corporation of Delhi (MCD) schools. In the next phase, starting from September 2003, more schools were brought under the scheme, and all schools were covered since April 2004;( b) MCD began with as many as
72 suppliers, which was whittled down to 56, then to 32 and presently consists of only 11 NGOs (non-government organizations), running 13 kitchens; (c) the quality of *rajma* and vegetable *pulao* has not been up to the mark; (d) parents were never allowed to taste the meal distributed; (e) hygiene was seldom maintained in the case of MDMS; (f) some teachers preferred dry food instead of cooked meal; (g) most of the schools lack adequate infrastructure (*including toilet facilities*) for the successful implementation of MDMS; (h) serving of meal by various contractors under the disguise of NGOs has become a business venture; (i) a few school children found the food very unattractive; some said that eating the food made them ill; and (j) some parents felt that the food served was not sufficient for growing children.

**Gangadharan (2006)** conducted a study of MDMS running in Kerala. The scheme in the state is called “Noon meal scheme”. He reported that (a) the physical facilities for MDMS are available only in 50 per cent schools; 94 per cent schools depend on firewood for cooking; separate building for kitchen outside class rooms are rare; adequate space is not there in 50 per cent schools. School verandah is the main venue for serving food; (b) the government grant is far less than the total expenditure in many schools. The average annual financial deficiency in schools is around 15 per cent; (c) schools with less number of students have higher per day student expenditure; (d) the Panchayati Raj Institutions (PRIs) have yet to show active interest in the management of the programme; (e) the average MDMS enrolment rate is between 85 and 95 per cent; (f) there is a demand that the menu should be improved and made more attractive and the noon meal programme be made a full-fledged School Lunch Programme meant for all teachers as well as students with partial or free packages; (g) storage provisions are rarely available in most of the schools; and (h) the cooks engaged in schools are untrained, inexperienced, aged and educationally under-qualified.

Records at the Department of Public Instruction show that school attendance has improved since the introduction of the MDMS by 2-10 per cent across Karnataka (**Ravi, 2006**).

In December 2006, **The Times of India** reported a scam involving government schools that siphoned off food grains under the mid-day meal scheme by faking attendance.
A study of MDMS in Rajasthan by **CUTS (2007)** found: (a) initially, students were distributed boiled wheat supplemented with groundnut and jaggery (*Gur*) under the MDMS; (b) more than 90 per cent parents and students were satisfied with the MDMS; (c) each school is required to send a monthly expenditure statement and vouchers to the *Panchayat Samiti*, which is supposed to reimburse the amount within 15 days; (d) only 21 per cent of the schools received the funds every month, in time. The rest got funds in a time ranging from 2 to 6 months (12 per cent got funds once in 6 months); (e) 97 per cent of the teachers reported receiving good quality food grains; (f) only 23 per cent of the schools were able to receive food grains after getting them weighed before delivery; (g) the absence of a weighing mechanism in most schools makes it difficult to measure the quantity of food grains delivered; (h) most schools lack adequate cooking and storage facilities; (i) 62 per cent of the cooks interviewed said that the MDM was cooked in the open, which is unhygienic; and (j) teachers are spending close to 20 per cent of their time or more on managing MDMS instead of teaching.

**Hindustan Times (2008)** reported that in the school records in Puranpur, Sadar and Bisalpur tehsils of Pillibhit district a large number of children were registered under meal scheme but in reality a few children turn up in the school for taking meal.

Based on the 1999-2000 National Sample Survey data, **Joshi (2007)** NIN observed that a large majority of children in India from poorer households did not have access to the meal schemes operational in the country. The only exception as per her analysis to this was Tamil Nadu where the schemes seemed to work the best in rural areas in the age group of seven to nine-year olds, without any discernible gender gap and was well targeted among the needy households.

**Mishra (2007)** found substandard raw material (grains etc.) in some primary schools of Lucknow district and this was one of the most common causes of food poisoning in the school children.

In the year 2007, four different articles indicating poor quality of food and unhygienic conditions while preparing mid day meals in Uttar Pradesh, were brought out in one of the
newspapers (*The Times of India, 2007*a,b,c and d*). The first one (30th September) reported a lizard being found in the mid day meals at a primary school at Kasimpur Jharahe under Kaudhihar block in Soaron area (U.P.). Over a dozen children of Jharaha Primary school fell ill after they took meal offered by the school authorities. The second article (12th October) stated that after a surprise inspection, 5 schools were found to provide sub-standard food items to the children of Allahabad district of Uttar Pradesh. The third article (12th Dec.) showed that following several incidents of children taking ill after eating mid day meal in various schools the state government has decided to constitute a mother’s committee to monitor the food quality along with the teachers, assistant teachers and shikshamitras. In the forth article (21st Dec.) it was reported that the Allahabad district authorities decided to involve parents in the MDM scheme regarding the quality and quantity of the food served.

Provision of dry rations and biscuits, which were part of the NPNSPE before the Supreme Court order on cooked meals has shown that children often did not consume these. Although MDMS has ensured enrolment, it had little impact on attendance and retention levels (*Baru 2008*).

According to *Gupta (2008)* children come in primary school to take mid day meal only and teachers are not interested in the whole process. So good education is only an illusion in many primary schools of Uttar Pradesh.

*Kausar (2008)* reported that in Unnao district of Uttar Pradesh, the total primary Schools during 2007-08 were 1958. The enrolment in primary schools was 2,18330 in 2007-08. Under SSA the books and uniform are free for girls and because of mid day meal programme the participation of girls in schools are increased.

In Barabanki district, the total primary Schools during 2007-08 were 1815 and upper primary schools are 626. The enrolment in primary schools was 3000667 in 2007-08 and in upper primary total enrolment is 73114. Nearly 50 per cent enrolment of girls in Primary schools and also more then 50 per cent in upper Primary schools in 2007-08. In Barbanki district total numbers of beneficiaries are 372837. In that the SC are 36 per cent and OBC are 43 per cent. In that area ST students are not registered in the schools.
Singh (2008) reported that some officers have lackadaisical attitude towards mid day meal scheme remaining in Pilibhit district(U.P.) even the food mentioned in the menu was not distributed among the children and quality of the given food was very poor.

Venkatram (2008) reported that INDUS projects launched by the Indian government in 21 districts of the country to eliminate child labour and involving mothers in the MDM programmes has brought the children into school faster than any other scheme.

Kushwaha (2008) reported that the average daily nutritional contribution in MDM of Allahabad district, the 7-15 years age group of children for energy, protein, fat and iron are 231 kcal-256 kcal, 10.5 g-15 g, 2.2 g to 5.5 g and 2.6 mg to 5 mg respectively, which are not reaching 1/3\textsuperscript{rd} of RDA as recommended by nutrition experts.

The Times of India, (2009)a reported that due to lizard being found in the mid - day meal at Kothari primary school in Varanasi over 50 children fell down and became ill.

Some primary schools of Bihar, Himanchal Pradesh, Karnataka, Andhra Pradesh, Delhi, Kerala and Orissa showed significant improvement in school attendance due to mid day meal; Bihar had the lowest rate of attendance of 42.2 per cent. (The Times of India, 2009)b

India News (2009) reported that rescued child labourers, studying in about 1,400 schools in Bihar, will be provided mid day meals,” All children studying in child labour schools will be provided free mid day meals. It is part of an incentive to attract children to child labour schools in the state,” Bihar Labour Resources Minister Avadesh Narayan Singh said.

Divya et. al. (2010) conducted a study in urban and rural schools. Children exhibited varying degrees of undernutrition. The diets were lacking in many nutrients, both macro and micronutrients. Notable were low intakes of calcium, carotene and riboflavin which were less than 50 per cent adequate. The contribution of MDM was significant for some of the nutrients like fat, carotene and niacin where in nearly 40 per cent of intake came from MDM; however, the contribution of rest of the nutrients was very low.

Gupta et. al. (2010) carried out the assessment of mid day meal intake on 150 Government schools children aged between 5to 13 years. The mean values of the nutrients had been
calculated and were found as follows: 458 kcal, 10.58 g protein, 40.18 mg calcium, 6.57 mg vitamin C, 2.90 mg iron, 5.26 g fat, 92.01g, carbohydrates, 2.00 mg niacin and 0.05 mg riboflavin.

2.6 STATUS OF CHILDRENS’ ATTENDANCE IN SCHOOLS, WITH AN EMPHASIS ON GIRLS

Drèze and Kingdon (2001) reported that the boys are about 25 per cent more likely to attend school than girls. Parental education has a strong positive effect. One year of incremental education for either parent increases the probability that the child goes to school by 3 per cent. School attendance is generally increasing in wealth levels of the family, with a negative coefficient on the livestock ownership variable possibly reflecting the fact that children are often responsible for rearing livestock. High dependency ratios also deter school attendance. On a relative basis Muslim children are less likely to attend school than Hindus, and schedule castes less than the upper castes. Moreover, children appear to be less likely to attend school in Bihar than in UP.

Reetika (2002) found that female enrolment at the primary level was 36 per cent higher in September 2002 than in September 2001.

It has been reported by Swaminathan et. al. (2004) that during the year 2002-03, there were about 54.12 lakh students enrolled in primary classes (from classes I to V). They were more or less evenly spread across the five classes. Proportion of boys enrolled in schools out of total students enrolled was slightly higher at 51.2 per cent as compared to girls (who constituted 48.7 per cent). The drop-out rate (the closest that one can come to, in assessing this phenomenon) in Tamil Nadu has been on a steady decline at the primary level. During 1987-88, the dropout rate for girl students at the primary level was 24.45 and by 2000-01 this decreased to 16.03. The author has tabularized data provided by the Department of Elementary Education, Government of Tamil Nadu as given in Table 2.4 and 2.5
Table 2.4 Enrolment in Classes I-V across Gender, Tamil Nadu, 2002-03 (Swaminathan et. al. 2004)

<table>
<thead>
<tr>
<th>Class</th>
<th>Boys</th>
<th>Per Cent</th>
<th>Girls</th>
<th>Per Cent</th>
<th>Total</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Std</td>
<td>575745</td>
<td>51.2</td>
<td>548284</td>
<td>48.7</td>
<td>1124029</td>
<td>100</td>
</tr>
<tr>
<td>II Std</td>
<td>540267</td>
<td>51.1</td>
<td>51614</td>
<td>48.8</td>
<td>1056391</td>
<td>100</td>
</tr>
<tr>
<td>III Std</td>
<td>544698</td>
<td>51.1</td>
<td>521758</td>
<td>48.9</td>
<td>1066456</td>
<td>100</td>
</tr>
<tr>
<td>IV Std</td>
<td>578133</td>
<td>51.5</td>
<td>543501</td>
<td>48.4</td>
<td>1121634</td>
<td>100</td>
</tr>
<tr>
<td>IV Std</td>
<td>533363</td>
<td>51.1</td>
<td>510379</td>
<td>48.8</td>
<td>1043742</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>2772206</td>
<td>51.2</td>
<td>2640046</td>
<td>48.8</td>
<td>5412252</td>
<td>100</td>
</tr>
</tbody>
</table>
Table 2.5 Drop-Out Rate in Tamil Nadu (Swaminathan et. al. 2004)

<table>
<thead>
<tr>
<th>Year</th>
<th>Boys</th>
<th>Girls</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987-88</td>
<td>19.44</td>
<td>24.45</td>
<td>21.78</td>
</tr>
<tr>
<td>1988-89</td>
<td>19.17</td>
<td>24.01</td>
<td>21.42</td>
</tr>
<tr>
<td>1989-90</td>
<td>18.78</td>
<td>23.64</td>
<td>21.05</td>
</tr>
<tr>
<td>1990-91</td>
<td>18.27</td>
<td>22.68</td>
<td>20.32</td>
</tr>
<tr>
<td>1991-92</td>
<td>17.71</td>
<td>21.16</td>
<td>19.31</td>
</tr>
<tr>
<td>1992-93</td>
<td>17.11</td>
<td>19.62</td>
<td>18.27</td>
</tr>
<tr>
<td>1993-94</td>
<td>16.39</td>
<td>18.35</td>
<td>17.30</td>
</tr>
<tr>
<td>1994-95</td>
<td>15.58</td>
<td>17.65</td>
<td>16.54</td>
</tr>
<tr>
<td>1995-96</td>
<td>14.88</td>
<td>16.97</td>
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<td>1996-97</td>
<td>14.05</td>
<td>16.20</td>
<td>15.06</td>
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<tr>
<td>1997-98</td>
<td>13.99</td>
<td>16.18</td>
<td>15.05</td>
</tr>
<tr>
<td>1998-99</td>
<td>12.98</td>
<td>16.15</td>
<td>14.52</td>
</tr>
<tr>
<td>2000-01</td>
<td>12.86</td>
<td>16.03</td>
<td>14.40</td>
</tr>
</tbody>
</table>

According to a joint report by the UNESCO Institute for Statistics and UNICEF (UIS and UNICEF, 2006) 115 million children of primary school age are not in school.

Friedrich (2007) reported that 21 million children of primary school age in India were out of school in 2006, more than in any other country. Compared to 2000, the number of
children out of school has fallen by 9 million, but the Millennium Development Goal of universal primary education by 2015 can only be met if the increase in primary school attendance accelerates in the coming years. According to data from a nationally representative Demographic and Health Survey (DHS), the primary school net attendance rate (NAR) in India was 83 per cent in 2006. (In India, the DHS is referred to as National Family Health Survey or NFHS.) In other words, more than 8 out of 10 children of primary school age (6-10 years in India) were attending primary school. In 2000, the primary school net attendance rate was 76 per cent. Although the attendance rate has increased, there are persistent disparities in the education system of India. The bar graph (Figure 2.1) and Table 2.6 display the primary school NAR. In the country, 85 per cent of all boys and 81 per cent of all girls are in school and is therefore close to gender parity. On the other hand, there is a larger gap between urban and rural areas. The urban primary NAR is 89 per cent and the rural NAR is 82 per cent.

Fig. 2.1 Primary school net attendance rate (NAR), India 2006 (Friedrich 2007)
Table 2.6 Primary school attendance in India by state and territory, 2006 (Friedrich 2007)

<table>
<thead>
<tr>
<th>State or Territory</th>
<th>Primary NAR (%)</th>
<th>State or Territory</th>
<th>Primary NAR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andaman and Nicobar Islands</td>
<td>-</td>
<td>Lakshadweep</td>
<td>-</td>
</tr>
<tr>
<td>Andhra Pradesh</td>
<td>89.2</td>
<td>Madhya Pradesh</td>
<td>81.0</td>
</tr>
<tr>
<td>Arunachal Pradesh</td>
<td>67.3</td>
<td>Maharashtra</td>
<td>91.7</td>
</tr>
<tr>
<td>Assam</td>
<td>91.1</td>
<td>Manipur</td>
<td>80.3</td>
</tr>
<tr>
<td>Bihar</td>
<td>58.5</td>
<td>Meghalaya</td>
<td>60.4</td>
</tr>
<tr>
<td>Chandigarh</td>
<td>-</td>
<td>Mizoram</td>
<td>91.8</td>
</tr>
<tr>
<td>Chhattisgarh</td>
<td>86.5</td>
<td>Nagaland</td>
<td>71.9</td>
</tr>
<tr>
<td>Dadra and Nagar Haveli</td>
<td>-</td>
<td>Orissa</td>
<td>86.8</td>
</tr>
<tr>
<td>Daman and Diu</td>
<td>-</td>
<td>Pondicherry</td>
<td>-</td>
</tr>
<tr>
<td>Delhi</td>
<td>89.9</td>
<td>Punjab</td>
<td>89.1</td>
</tr>
<tr>
<td>Goa</td>
<td>94.1</td>
<td>Rajasthan</td>
<td>81.0</td>
</tr>
<tr>
<td>Gujarat</td>
<td>91.1</td>
<td>Sikkim</td>
<td>77.6</td>
</tr>
<tr>
<td>Haryana</td>
<td>87.6</td>
<td>Tamil Nadu</td>
<td>98.5</td>
</tr>
<tr>
<td>Himachal Pradesh</td>
<td>97.8</td>
<td>Tripura</td>
<td>89.6</td>
</tr>
<tr>
<td>Jammu and Kashmir</td>
<td>86.7</td>
<td>Uttar Pradesh</td>
<td>81.4</td>
</tr>
<tr>
<td>Jharkhand</td>
<td>72.1</td>
<td>Uttarakhand</td>
<td>93.4</td>
</tr>
<tr>
<td>Karnataka</td>
<td>88.5</td>
<td>West Bengal</td>
<td>85.1</td>
</tr>
<tr>
<td>Kerala</td>
<td>98.1</td>
<td>India</td>
<td>83.3</td>
</tr>
</tbody>
</table>
**Kushwaha (2008)** carried out a study on 510 children of four primary schools in Allahabad. The school attendance for seven months was recorded and it was found that majority (90 per cent) of the subjects had good attendance records of more than 70 per cent in the schools. General the girls’ records were better than boys.

**Mukul (2008)** reported that comprising more than 13 per cent of Indian population, Muslim enrolment at the primary level (class I-V) was a meager 9.39 per cent while in upper primary class (VI-VIII) it was 7.52 per cent in 2006-07.

**Chough (2008)** reported that Maharashtra state has 106403 recognized government schools with primary and upper primary grades. The state is having total enrolment of 8845062 at the primary level of which the girls constitute 47.9 per cent of the total enrolment. At the upper primary level the total enrolment is 4312463 and girls constitute 47.9 per cent of the total enrolment.

**The Times of India (2008)** reported that Jammu and Kashmir had 66.97 per cent Muslim population. Enrolment in schools showed 62.52 per cent at the primary and 60.55 per cent in upper primary classes. Andhra Pradesh had 9.17 per cent Muslim population and enrolment in primary level was 10 per cent and upper primary 9.11 per cent. West Bengal enrolment in primary was 27.92 per cent but came down to 19.63 per cent in upper primary classes. Kerala had 24.7 per cent Muslim population but enrolment was pathetic at 10.13 per cent at the primary and upper primary level.

**Mukul (2009)** reported that the number of out-of-school (OOS) children in the 6-14 age group has come down dramatically from 1.34 crore in 2005 to 80.4 lakh in 2009. U.P showed negligible decline in OOS children from 8.15 per cent in 2005 to 7.58 per cent now.

**Rajni et. al. (2009)** conducted a study in Haryana state by selecting two districts namely Hisar and Sonipat. Children (girls and boys) who dropped in the years between 2001-2006 were taken as subjects in the sample. Most of the dropouts were in the year 2005. As concerned for dropout rate, more girls left school in 7th, 9th, 10th and 12th than the boys. Boys’ dropout rate was high in 6th, 8th and 11th standard. In Sonipat girls enrolments were less and dropout rate was high. Most of the girls (29.96 per cent) dropped out in year 2005, followed
by 28.91 per cent in the year 2004 and 16.32 per cent in the year 2003. Maximum number of dropouts had occurred in the age of 13-16 years either from Hisar or Sonipat district.

The Times of India, (2009) has reported Indian student’s attendance in primary and middle schools, as shown in Table 2.7. Children in Bihar had lowest attendance rate of 42.2 per cent in the primary schools and 36.8 per cent at the middle school level. The children in Andhra Pradesh scored 72.7 per cent and 76.6 per cent respectively. Delhi had 73.5 per cent children attending school regularly. It was only natural for Kerala which enjoys the highest literacy rate in the country to record an attendance of 91.4 per cent and 92.0 per cent, children in Tamil Nadu scored 88.3 per cent and 87.8 per cent. In Orissa where teacher showed 85 per cent attendance rates, children didn’t reciprocate. Their scores stood at 66.8 per cent and 69.0 per cent respectively. The Children in Himachal Pradesh probably loved going to school. They scored the highest (94.6 per cent primary and 93.3 per cent middle). Only 86 per cent children in Karnataka attended school regularly. The attendance scores of students ranged between 60 per cent and 80 per cent in the states.

Table 2.7 Indian Student’s attendance in primary and middle school (Times of India, 2009)

<table>
<thead>
<tr>
<th>Gender and social group</th>
<th>Primary school</th>
<th>Middle school</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>68.9</td>
<td>75.2</td>
</tr>
<tr>
<td>Girls</td>
<td>70.6</td>
<td>78.7</td>
</tr>
<tr>
<td>SC</td>
<td>68.7</td>
<td>76.5</td>
</tr>
<tr>
<td>ST</td>
<td>70.5</td>
<td>76.5</td>
</tr>
<tr>
<td>Minority (Muslim)</td>
<td>66.4</td>
<td>79.1</td>
</tr>
<tr>
<td>Rural</td>
<td>68.0</td>
<td>73.7</td>
</tr>
<tr>
<td>Urban</td>
<td>71.2</td>
<td>79.9</td>
</tr>
</tbody>
</table>
It has been reported by (Sandhya 2010) that enrolment of girls is an important aspect for the Universalization of Elementary Education (UEE) and Education For All (EFA) as well. Data from table 2.8 and 2.9 reveal that the number of Girls’ enrolment has increased from 45.1 million (36.4 per cent) in 1994-95 to 54.52 million (41.3 per cent) in 2004-05. In case of Upper Primary Level, there was an increase in the number of girls from 14.3 million (39.29 per cent) in 1994-95 to 18.72 million (45.32 per cent) in 2004-05.

Table 2.8 Enrolment of Girls by School Category (in million) (Sandhya 2010)

<table>
<thead>
<tr>
<th>Year</th>
<th>Primary</th>
<th></th>
<th>Upper primary</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Girls</td>
<td>%</td>
<td>Total</td>
</tr>
<tr>
<td>1994-95</td>
<td>105.1</td>
<td>45.1</td>
<td>36.4</td>
<td>14.3</td>
</tr>
<tr>
<td>1995-96</td>
<td>107.1</td>
<td>46.2</td>
<td>37.5</td>
<td>14.8</td>
</tr>
<tr>
<td>1996-97</td>
<td>108.2</td>
<td>46.8</td>
<td>38.1</td>
<td>15.2</td>
</tr>
<tr>
<td>1997-98</td>
<td>11.03</td>
<td>48.0</td>
<td>39.5</td>
<td>15.9</td>
</tr>
<tr>
<td>1998-99</td>
<td>110.9</td>
<td>48.2</td>
<td>40.3</td>
<td>16.3</td>
</tr>
<tr>
<td>1999-2000</td>
<td>113.6</td>
<td>49.5</td>
<td>42.1</td>
<td>17.0</td>
</tr>
<tr>
<td>2000-2001</td>
<td>113.8</td>
<td>49.8</td>
<td>42.8</td>
<td>17.5</td>
</tr>
<tr>
<td>2001-2002</td>
<td>113.9</td>
<td>50.3</td>
<td>44.8</td>
<td>18.7</td>
</tr>
<tr>
<td>2002-2003</td>
<td>93.4</td>
<td>44.1</td>
<td>30.5</td>
<td>13.48</td>
</tr>
<tr>
<td>2003-2004</td>
<td>108.02</td>
<td>51.27</td>
<td>30.3</td>
<td>16.29</td>
</tr>
<tr>
<td>2004-2005*</td>
<td>114.6</td>
<td>54.52</td>
<td>41.3</td>
<td>18.72</td>
</tr>
</tbody>
</table>

Provisional Sources: i) Selected Educational Statistics 2002-03, MHRD, Govt. of India.

ii) * Elementary Education in India, Analytical Report 2004-05, NIEPA
Table 2.9 Year-wise Estimated Additional Enrollment (in million)

Ref :( Sandhya 2010)

<table>
<thead>
<tr>
<th>Year additional enrollment</th>
<th>Primary</th>
<th></th>
<th>Upper primary</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
<td>Total</td>
<td>Boys</td>
</tr>
<tr>
<td>2002-2003</td>
<td>0.67</td>
<td>2.01</td>
<td>2.68</td>
<td>1.14</td>
</tr>
<tr>
<td>2003-2004</td>
<td>0.67</td>
<td>2.10</td>
<td>2.77</td>
<td>1.19</td>
</tr>
<tr>
<td>2004-2005</td>
<td>0.67</td>
<td>2.18</td>
<td>2.85</td>
<td>1.25</td>
</tr>
<tr>
<td>2005-2006</td>
<td>0.69</td>
<td>2.27</td>
<td>2.96</td>
<td>1.31</td>
</tr>
<tr>
<td>2006-2007</td>
<td>0.69</td>
<td>2.37</td>
<td>3.06</td>
<td>1.37</td>
</tr>
<tr>
<td>Total</td>
<td>3.39</td>
<td>10.93</td>
<td>14.32</td>
<td>6.26</td>
</tr>
</tbody>
</table>

According to Census (2011) Uttar Pradesh is most populous state with 199 million people. Allahabad district has a population of 59,59,798 including 31,33,421 males and 28,26,319 females. In Census 2001, the city’s population was 49, 36,105. The Times of India (2011)\textsuperscript{a} reported that in comparison to previous census figures recorded in U.P. since 1981, the increase in literacy level has been significant one. From 33.4 per cent in 1981, 41.6 per cent in 1991 and 56 per cent in 2001, the state has recorded a healthy growth with 69.72 per cent registered as “literate” in the latest census. Even on the female literacy front, the increment has been significant. From a dismal 17.2 per cent in 1981 with the state ranking 27\textsuperscript{th} in the country, the numbers improved to 25.3 per cent in 1991. But the state’s rank slipped to 28\textsuperscript{th} position in the country. In 2001, the number rose to 42.2 per cent, but the growth rate showed the maximum improvement in the last decade with female literacy level jumping to 59.26 per cent. Thereafter it was also reported (The Times of India, 2011\textsuperscript{b}) that Allahabad district has
the highest literacy rate (74.41 per cent) in the region, as compared to neighboring districts of Kaushambi (63.69 per cent), Fatehpur (68.69 per cent) and Partapgarh (73.10 per cent). In Allahabad district, about 85 per cent males and 62.67 per cent females of the population are literate and the percentage of the decadal growth (2001-2011) is 20.71.

2.7 NUTRITION COUNSELING/ EDUCATION: IMPORTANCE AND COMMON METHODS

Fidanzer (1981) and Jelliffe (1983) stated that nutrition education is defined as “education of the public aiming at a general improvement of the nutritional status mainly through promotion of adequate food habits, elimination of unsatisfactory dietary practices, introduction of better food hygiene and more efficient use of food resources”. Nutrition education, which preferably should be called nutrition guidance, has been used as a specific tool in an attempt to reduce morbidity and mortality rates from nutritional disorders in many parts of the world and has been realized as one of the essential means of improving the nutritional status of any community.

In one of the WHO (1989) publications, it has been stated that the success of all technical approaches to control deficiency disorders including anaemia, depends on the active participation of the population. Hence there is a need for a public education support strategy, based on careful analysis of the behavioral changes required.

Chawla (1992) reported significant improvement in knowledge and attitude of the women of Ludhiana towards good nutrition after nutrition education and these women tried to practice the same knowledge in their day to day life.

Bhangoo and Kaur (1994) in their study developed pamphlets, leaflets, charts etc on self-directed education for providing information in the form of written material. After exposure to print media adult learner showed significant gain in knowledge.

Malviya et. al. (1995) developed a software i.e. synchronized tape cum slide story for rural women on nutrition education. The women were assessed for their knowledge at pre and post-exposure stages and significant gain in knowledge was recorded.
Sharma (1996) stated that health education is required to play a much more expanded and critical role in the developing countries where nutritional deficiencies and communicable diseases still are major causes of morbidities and mortalities.

Ma and Contento (1997) in Taiwan demonstrated to Taiwanese Education Officials that their nutrition education program for elementary students could be fun and interesting, `and even without examinations; students could gain knowledge, skills, motivation, attitudes and self-efficacy needed to adopt healthy eating patterns.

Auld et. al. (1998) in a nutrition education program in Denver, Colorado, known as the Integrated Nutrition Project, reported a change in lunchroom dietary behavior of students and also the attitudes of teachers due to nutrition education in the schools.

Kochar et. al. (2001) gave nutrition education along with iron supplementation to the anaemic girls and result showed a highly significant gain in the level of knowledge and significant increase in mean daily intake of calories, carbohydrates, protein, iron and β-carotene but the nutrient intake was still lower than Recommended Dietary Allowances. It has been inferred that for prevention of anaemia, imparting of nutrition education is essential along with iron supplementation.

Kapur et. al. (2002) reported that nutrition education can improve dietary intakes in family for receiving needed macro/micro nutrients as protein, iron and vitamins like folic acid, B12, A and C etc. for haemoglobin synthesis.

Joshi and Singh (2002) developed and evaluated educational booklet for nutrition education and concluded that the structured dissemination of knowledge in form of educational booklet did have a positive impact in raising the levels of knowledge in the area of health and nutrition. The study demonstrated that the nutrition and health related messages incorporated into educational material (booklet) were successfully transmitted and received by the target groups of women as there existed a felt need in this area.

Kumar et. al. (2003) in their study on production and impact study of vitamin A related video film for school children concluded that conspicuous increase in knowledge among school children was brought about through the video film imparting nutrition education. It
has been recommended that more such films on various nutrition aspects need to be produced for nutrition education among school children.

**Park (2004)** expressed that the aim of nutrition education is to guide people to choose optimum and balanced diets; remove prejudices and promote good dietary habits. Nutrition education is a major intervention for the prevention of malnutrition, promotion of health and improving the quality of life.

**Deshpande et. al. (2005)** produced audio visual aids leaflets and charts, for imparting nutrition education to rural women (N=160) of Bhopal district in order to improve the nutritional status. The nutrition education brought a significant and remarkable improvement in the dietary pattern of farm women.

**Sharma and Chawla (2005)** observed highly significant gain in nutrition knowledge of 13-14 yrs old school girls after imparting nutrition education. Children’s Hb rose from 7.4 ±0.19 to 7.7 ± 0.20.

**Deshpande and Bargale (2006)** imparted nutrition education to create awareness among the group for consumption of balanced and nutritious diets. The impact was seen by conducting follow up programmes in the study area. The results clearly indicated that the women in the study area improved their dietary habits after their participation in the nutrition education programme.

**Sangha et. al. (2006)** imparted nutrition education to parents of obese children through lecture cum leaflets and personal discussion on various topics. They found a significant difference (p<0.01) in the scores of pre-test and post-test of nutrition education of the parents of both male and female subjects.

**Kaur et. al. (2007)** in a study on nutrient intakes of adolescent girls found that nutrition education was effective in increasing the level of nutrition knowledge as well as nutrient intake. In terms of energy, protein, carbohydrate as well as all the minerals and vitamins except vitamin B12 nutrient intakes increased significantly (P< 0.01).
Laza and Lotrean (2008) concluded that almost half of students revealed to have an irregular diet. Social status as well as the irregular diet is reflected in general status: There is a wide diversity in nutrition customs of children. Some of them are due to inappropriate nutritional knowledge or a wrong perception of being on fashion as well as to social status. Although the economic conditions are difficult to change, they consider that nutrition education should still be a part of health teaching.

Tripathi (2009) imparted training to 36 rural women in Allahabad, on vegetables dehydration and their product formulation. A video and booklet were developed for nutrition education emphasizing the importance of green leafy vegetables in control of anaemia. Nutrition education was imparted to rural women. Results revealed a significant gain of knowledge score.

Verma (2010) observed highly significant gain in nutrition knowledge of 80 school girls (13-18 years) in Allahabad after imparting nutrition education through booklet.
MATERIALS AND METHODS

3.1 Selection of locale, baseline survey and selection of schools

3.2 Selection of Subjects/Respondents

3.3 Development of survey schedule

- Schedule for general information about the selected schools
- Schedule for data on mid day meal (through Authorities/teachers)
- Schedule for survey of subjects (MDM and NMDM children)
  - General profile
  - Diet survey.
  - Food consumption frequency
  - 24 hours dietary recall method
  - Anthropometric survey
  - Haemoglobin survey
  - Clinical survey
  - Additional information on NMDM subjects
  - School attendance of girls
- Schedule for attitude/ opinion and knowledge related to MDM and nutrition-((for MDM beneficiaries, parents, school personnel)

3.4 Collection of data on schools and mid day meal

- General data collection about schools
3.5 Collection of general and dietary information about MDM and NMDM subjects (children)

- General profile data collection
- Food consumption frequency survey
- 24 hour dietary recall (home diet)
- Calculation of nutrient composition of home diet
- Assessment of daily nutrient intake (home diet and MDM combined) and comparison with RDA

3.6 Collection of anthropometric data and comparison with standards

- Height
- weight

3.7 Assessment based on Hb status

- Cyanmethaemoglobin method
- Categorization of subjects as ‘anaemics’ and ‘non-anaemics’

3.8 Clinical data collection and clinical based classification of subjects

3.9 Collection of data on school attendance of MDM and NMDM subjects and categorization into different levels
3.10 Data collection on knowledge and attitude / opinion regarding MDM and other related nutritional aspects (data prior to nutrition counseling)

3.11 Development of communication material for nutrition counseling

3.12 Nutrition counseling

➢ Exposure to booklet

➢ Re-inforcement of nutrition knowledge through C.D

3.13 Data collection on knowledge after nutrition counseling

3.14 Score allotment and categorization of subjects into three knowledge categories

3.15 Comparison of pre and post exposure stages of nutrition counseling

➢ Assessment of gain in knowledge

➢ Assessment of actual gain in knowledge

3.16 Application of statistical tests for data analysis