ASSESSMENT OF NUTRITIONAL STATUS OF SCHOOL GOING GIRLS (7-9 YEARS) RESIDING IN SHELTER HOMES OF UDAIPUR CITY

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MISS UMANG NIGAM

Thesis

Master of Science (Home Science)

IN

(FOODS AND NUTRITION)

2017

DEPARTMENT OF FOODS AND NUTRITION

COLLEGE OF HOME SCIENCE, UDAIPUR

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This is to certify that this thesis entitled **"Assessment of nutritional status of school going girls (7-9 years) residing in shelter homes of Udaipur city"** submitted for the degree of **Master of Science** in the subject of Foods and Nutrition of the **Maharana Pratap University of Agriculture and Technology, Udaipur** embodies bonafide research work carried out by **Miss Umang Nigam** under my guidance and supervision and that no part of this thesis has been submitted for any other degree. The assistance and help received during the course of investigation have been fully acknowledged. The draft of the thesis was also approved by the advisory committee on .....

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This is to certify that this thesis entitled **"Assessment of nutritional status of school going girls (7-9 years) residing in shelter homes of Udaipur city "** submitted by **Miss Umang Nigam** to **Maharana Pratap University of Agriculture & Technology, Udaipur** in partial fulfilment of the requirements for the degree of **Master of Science** in **Home Science** in the subject of Foods and Nutrition after recommendation by the external examiner was defended by the candidate before the following members of the examination committee. The performance of the candidate in the oral examination on this thesis has been found satisfactory. We therefore, recommend that the thesis be approved.

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Dr. (Mrs.) Sarla Lakhawat
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Enclosed one original and two copies of bound thesis, forwarded to the Director Resident Instructions, Maharana Pratap University of Agriculture and Technology, Udaipur through the Dean, College of Home Science, Udaipur.

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CERTIFICATE – V

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This is to certify that **Miss Umang Nigam** (M.Sc. Scholar) has worked under me on **"Assessment of nutritional status of school going girls (7-9 years) residing in shelter homes of Udaipur city".**

1. I have monitored her research work.
2. My self and the scholar were in contact with the committee members and the research work was reviewed regularly.
3. The advisory committee members have gone through M.Sc. thesis critically and made the corrections as per requirement.

Dr. (Mrs.) Sarla Lakhawat
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MAHARANA PRATAP UNIVERSITY OF AGRICULTURE AND TECHNOLOGY
COLLEGE OF HOME SCIENCE, UDAIPUR
Department of Foods and Nutrition

M.Sc. Thesis (2017)

Topic: Assessment of nutritional status of school going girls (7-9 years) residing in shelter homes of Udaipur city

ABSTRACT

The present study was conducted with the objective to assess and compare the nutritional status of school going girls (7-9 years) residing in government and non-government shelter homes in Udaipur city (Rajasthan) and to impart nutrition education to the workers and assess their gain in knowledge. A comprehensive list of shelter homes was obtained from Department of social welfare. One twenty school going girls (60 girls each from Government and non-government shelter home) of age 7-9 years were selected. The data was collected by using questionnaire technique and analyzed using frequency, per cent, mean per cent score and paired t-test. Information was collected on general profile, anthropometric measurement, clinical assessment, dietary assessment (24 hours recall method) and nutritional knowledge of workers among shelter home. Among both the shelter homes (28.33%), (39.16%) and (32.5%) girls were in the age of 7,8 and 9 years. The mean height, weight and BMI of school going girls were, significantly ($P<0.05$) lower than their respective standard values in both the shelter homes. According to Gomez classification (18.33%) girls among non-government shelter home and (6.66%) girls in government shelter home were malnourished in the age of 8 years. According to BMI for age z- score of WHO (2007), (44.16%) of the respondents were in normal and (30.83%) of respondents were in severe under nutrition range. Clinical findings indicates that 11.66 per cent of respondents suffered from lack of luster in hair,9.16 per cent suffered from pale conjunctiva and 11.66 per cent suffered from cheilosis among both the shelter homes. As per haemoglobin estimation majority of girls were anaemic in the age of 8 and 9 years .The intake of pulses, roots and tubers, other vegetables, green leafy vegetables, sugar and jaggery and fats and oils were significantly ($P<0.05$) lower than RDI except milk and milk products were found non-significant in both shelter homes. The intake of Protein, Fats, B- carotene, Iron, Riboflavin, Niacin, Vitamin-C and Carbohydrates content was significantly ($P<O.05$) lower than respective RDA except the intake of

Energy, Thiamine and Calcium were found non-significant in both shelter homes. Before imparting nutrition education the workers had inadequate nutrition knowledge and after imparting nutrition education there is significant increase in the nutrition knowledge scores of the workers among both shelter homes. There is an need to educate workers of shelter homes about the importance of balanced diet and to include nutrient rich recipes based on locally available food stuffs in the girl's diet to improve their nutritional status. Hence, it can be concluded that feeding of nutrient rich supplements based on locally available food stuffs can go a long way in improving nutritional status of girls among shelter homes.

Major Advisor Research Scholar

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INTRODUCTION

“Children without families are the most vulnerable people in the world" - Brooke Randolph

Shelter homes are the registered welfare organization, has been in existence since 1981 to help abused, abandoned, neglected or at-risk children.

The large numbers of homeless children, pavement dwellers, street and working children and child beggars, left on their own and in need of care and support, is an urban phenomena of great concern. India’s 29 percent population resides in urban areas, half of which live in conditions of extreme deprivation compounded by lack of shelter and access to basic services like sanitation, safe drinking water, education, health care, recreational facilities, etc. The urban population is also expanding rapidly because of intense rural-urban migration, swelling cities and towns, further compromising the ability of civic authorities to meet people’s basic needs. A large proportion of the migrant population ends up residing in inhuman conditions in slums, squatter colonies, railway platforms, pavements, bus stops, tourist spots, etc. As a result, urban poverty and hunger are increasing. In this situation, children suffer the most. A vast majority of them, with or without parental support, end up at traffic intersections, railway stations, streets, sabzi mandi (vegetable market), etc. They can be seen begging for alms, wiping automobile windscreens, rag picking, vending wares and may also be involved in petty thefts, drug peddling or controlled by a begging or stealing mafia. Many of these children also peddle sex for survival. These children are very often victims of adult abuse of all kinds: physical, sexual, emotional as well as economic exploitation. (Manual, DWCD, Delhi).

For the first time in Gujarat, permission for opening an open shelter for boys and girls in Vadodara, Gujarat was given to the NGO, Don Bosco Snehalaya, from Gujarat State Child Protection Society (GSCPS), under the file number DSD/ICPS/2012/070 with permission to start the open shelter from 03/08/2015, with the objective of keeping the shelter open for 24 hours, providing them with food and clothes, safe drinking water, recreation and entertainment facilities.

Children are the backbone of a nation and development of any nation depends on the health and well being of its child population. India has the second largest child population in the world. Numbering over 2.2 billion world wide and 263.9 millions in India (Census, 2011). They represent boundless potential, so optimum development of children attains special significance in the context of national development. In the early childhood years school plays an important role in physical, mental and emotional development of children. Approximately twenty percent of the population in every country constitutes school age children 5-10 years.

School age is the active growing phase of childhood. It represents a dynamic period of physical growth as well as of mental development of the child. It is the period of atmost significance and presents a general health status of a community and nation as a whole thus the health of children is of fundamental importance. As today's children are the citizens of tomorrow's world, their survival, protection and development are the prerequisite for the future development of humanity.

A number of diet and nutrition surveys have revealed that majority of school children consume inadequate amount of food stuffs, especially protective foods such as pulses, leafy vegetables, milk and milk products lower than the recommended level. Along with inadequate dietary habits, non-availability of protective foods, low purchasing capacity, illiteracy and ignorance about the importance of nutrition during this period, unsanitary living conditions and prevalence of infectious diseases are some of the main causes of malnutrition. The consequences of malnutrition among school age children includes stunted growth, underweight, anemia, iodine deficiency and other health related problems such as malaria, diarrhoea, worm and respiratory infections. The most common types of morbidities reported among children in India during present days consist of fever (14%) diarrhoea (4%) and respiratory infections up to 4 per cent (Venkataiah *et al*., 2006). Malnutrition not only affects physical appearance and energy levels, but also directly affects many aspects of the children's mental functions, growth and development which have adverse effects on children's ability to learn, poor cognitive development, lower Intelligence Quotient (IQ), behavioural abnormalities, reproduction, and physical work capacity. Undernourishment also impairs immune function leaving them more susceptible to infections; children with infections are more susceptible to malnutrition which increases the risk of infections and infectious diseases.(Hasan *et al*., 2011).

The school going girls is in a state of process of growing up from puberty to maturity. Adolescent account for 1/5 of the world's population and in India they account for 22.8% of total population. They are tomorrow's adult. Their growth and development is closely linked to the diet they receive during childhood. They may represent a window of opportunity to prepare nutritionally for a healthy adult life. They have to encounter a series of serious nutritional challenges not only affecting their growth and development but also their livelihood as adults. Thus it is not surprising that girl population who are "mother to be" is considered as the most important section on which the future of nation depends. A large number of school based nutrition programmers have been implemented globally on obesity, the importance of activity and of vegetables & fruits in the diet. It is much more important to improve nutrition knowledge through nutrition education in order to have a positive influence on healthy food choices. Number of children in India particularly girls live under suboptimal conditions marked by poor nutritional status and high level of morbidity and mortality. In developing countries, factors associated with under nutrition of girls are poor household economic condition, periodic food shortage, burden of diseases, poor knowledge about long term consequences of under nutrition, quantity & quality of food and access to health and nutrition services. Girls have mere easy access to health and nutritional information through schools, recreational activities and mass media than they have later in their lives. Particularly, health and nutrition education and healthy habits of female adolescents will have critical roles to play in maintaining future family health and nutrition.

Nutrition status is a sensitive indicator of girl's health. Thus the assessment of nutritional status plays an important role. The principal aim of the nutritional assessment of a community is to map out the magnitude and geographical distribution of malnutrition as a public health problem, to discover and analyze the ecological factors that are directly or indirectly responsible and where possible to suggest appropriate corrective measures, preferably capable of being applied with continuing community participation. It is widely accepted that for practical purposes anthropometry is the most useful tool for assessing the nutritional status of girls. Of the various Parameters, weight for age, weight for height, arm circumference and height for age, either singly or in combination are extensively used for this purpose.

World Health Organization has recommended various indices based on anthropometry to evaluate the nutritional status of the school aged children.

Nutrition education is a sine qua non for bringing a permanent and favourable solution to the problem of malnutrition. Imparting nutrition education to workers helps to improve the dietary status of the shelter home as the worker's concept about balanced diet and how to provide it can be changed. With the improvement in nutritional knowledge of workers, girl's nutritional status also improves. Nutrition education also needs to be included in school curriculum as children are better able to retain nutrition knowledge gained at school level, when it is reinforced by favourable conditions in the home.

The school age period is nutritionally significant because this is the prime time to build up body stores of nutrients in preparation for rapid growth of adolescence. Nutrition plays a vital role, as inadequate nutrition during childhood may lead to malnutrition, growth retardation, reduced work capacity and poor mental and social development. Also most of the research work that has been conducted on nutritional status of children is limited to infants and preschool children only. There is dearth of information on nutritional status of school going girls particularly from shelter homes. It is much more important to improve nutrition knowledge through nutrition education in order to have a positive influence on healthy food choices which was taken care by the workers refers to functionaries indulge in planning, cooking and serving of food in the shelter homes . Therefore it is imperative that dietary patterns of school going girls are thoroughly assessed which can help in imbibing simple changes in their daily diet, thus improving their nutritional status. As the nutritional status of girls is also associated with the nutritional knowledge of the workers. Thus, considering the importance of nutritional needs of school going girls, the present study was planned with the following objectives:

1. To assess the nutritional status of the School going- girls (7-9 years) of government and non-government shelter homes in areas of Udaipur city.
2. To compare the nutritional status of the School going- girls (7-9 years) of government and non-government shelter homes in areas of Udaipur city.
3. To impart nutrition education to the workers of shelter homes and assessment of their gain in knowledge.

REVIEW OF LITERATURE

The main function of citing review of literature is to provide base for developing a frame work, provide insight into the methodology and suggest operational definition of the concepts and finally to work out a basis for interpretation of findings. Keeping in view the objectives of the study, the literature has been presented under the following sub-heads:

2.1 Studies on care and nutritional status of vulnerable school going girls (7-9 years)

2.2 Dietary adequacy in school going girls (7-9 years)

2.3 Studies related to Anthropometric measurements of girls (7-9 years)

2.4 Clinical assessment of school going girls (7-9 years)

2.5 Nutritional knowledge of workers and gain in knowledge

2.1 STUDIES ON CARE AND NUTRITIONAL STATUS OF VULNERABLE SCHOOL GOING GIRLS (7-9 YEARS)

Vulnerable children are often more prone to malnutrition and infections and less likely to receive health-care than other children (Cox et al., 2006). This is so especially with the very young children who are likely to suffer from lack of care, and die unnecessarily of malnutrition and respiratory infections (Young and Jaspars, 2006). School-age children are particularly vulnerable to under nutrition as the priority in nutrition interventions is often to prevent malnutrition during fetal development and the first years of life – the most critical period for growth and development (Bundy et al., 2006). There are 226 million children under the age of five in developing countries who suffer from moderate or severe stunting (Nokuthula, 2009). This is nearly 40 percent of this age group. Stunting and wasting are also wide spread among school-age children in developing countries (Burbano et al., 2009). High levels of stunting among children suggest that there will also be a long term deficit in mental and physical development that can leave children ill prepared to take maximum advantage of learning opportunities in schools.

During infancy and early childhood, frequent or prolonged infections and inadequate intake of nutrient particularly energy, iron, protein, vitamin A and zinc may contribute to preschool underweight and stunting (Black et al., 2008). Underlying

such immediate causes will be inadequacies in one or more of the three main preconditions for good nutrition: food, care and health (Druck, 2010). A child who is stunted at five years of age is likely to remain stunted throughout life (Semba and Bloem, 2008).

With the high incidence of poverty and HIV/AIDS, it is true that malnutrition prevalence is also high (UNICEF, 2009). Malnutrition needs to be viewed as an indication of inadequate realization of some of the most basic of all human rights, as a reflection of inadequate investment and progress in a range of issues related to human capital development and as significant influence on future economic development of a country (WHO, 2010). In a healthy, well fed population of children, it is expected that only two to three percent of children would fall below two standard deviations from the median of the reference population for each of the three nutrition indices namely wasting, stunting and underweight (UNICEF, 2005). Encompassing more than just hunger, malnutrition can lead to weakened immune systems when vitamin A is lacking and a child is neither hungry nor underweight (Mattimore and plangemann, 2008). Even when it does not cause death, malnutrition can inflict lifelong damage on a child's health and development (UNAIDS, 2006). Malnutrition and infection kill together jointly.

Children may not adjust to the change in their lives, to the extent that they deny the reality of their loss of family life, and their emotional needs fail to be met (Abebe and Aaes, 2007). Moreover, institutionalization is less likely to be holistic in meeting the economic needs of children. Besides, assisting the orphan in the family calls for partnership with caregivers, while in some instances, support offered through income generating activities enables them to care for the orphans and vulnerable children. The proliferation of property-grabbing has led some to call for an increase in orphanages. Supporters of increasing the use of orphanages argue that many communities are overwhelmed and can no longer effectively care for children and vulnerable children.When these children are put in institutions, there is likelihood of losing their identity. Further, they may not be able to safe guard their inheritance. As such, when they are eventually reintegrated into the society, they may find difficulties in fitting in the society, knowing and adjusting to their relatives and following up on their inheritance, which may have been taken by their relatives (Skovdal et al., 2009).

Because a child's brain undergoes tremendous growth between the ages of 0-11 years, caloric and protein intake impact a child's future mental abilities (Cox et al., 2006). Micronutrients also play an important role. Iodine and iron deficiencies have been cited as two of the leading reasons for poor developmental outcomes for young children in developing countries (USAID/HACI, 2010). It is common knowledge that nutrition contributes to physical growth and play contributes to socio-emotional development. However, research has shown that the developmental domains of early childhood are highly interdependent. A recent study found that socio-emotional stimulation was equally as important for aspects of physical development as good nutrition.

Nutritional status of affluent Indian school children (6-18 years) from middle and high socio economic status was observed by Srihari *et al.* (2007). It was found that anaemia prevalence ranged from 19 to 88 per cent. Other micronutrient deficiencies including, folate, riboflavin, niacin, vitamin C, vitamin A and vitamin B12 were also present. Overweight and obesity were prevalent among 8.5-29.0 per cent and 1.5-7.4 per cent, respectively, among school children. Predominant components in children's diet were cereals and pulses, followed by milk and milk products, the fruits and vegetables component was comparatively lower.

Neelam *et al.* (2007) assessed the nutritional status of school children (7-9 years) of two blocks of Chamba district and it was reported that intake of cereals was higher than RDA and intake of other food stuffs like pulses, GLV, roots and tubers, other vegetables, milk and milk products, sugar and jaggery etc. was lower than RDA by the respondents of both the blocks. The energy, fat, iron, carotene and riboflavin intake was less than RDA while intake of other nutrients like protein, calcium, thiamine, niacin and ascorbic acid was higher than RDA in school children of both blocks.

Studies have shown that the rural children are more likely to be underweight than the urban children. Further, poor children are twice more likely to be underweight than the rich. However, little difference is seen in underweight prevalence of boys and girls (MICS and DHS surveys, 2008).

Flores *et al.* (2009) estimated energy and nutrient intake among Mexican school-aged children. Food intake data from food frequency questionnaires was

analyzed for 8 716 children aged 5 to 11 years. Energy and nutrients intake and adequacy were obtained. The results heighted that median energy intake of children was found to be 1501 kcal/d (percent adequacy: 88.0). Overweight and obesity prevalence was 25.5%. Stunting prevalence was 10%. Children at lowest SES, indigenous and from rural communities showed the highest inadequacies for vitamin A, folate, zinc, and calcium. Overweight children and those highest SES had higher risk of excessive intakes.

Patil and Wasnik (2009) conducted study on "Nutritional and health status of rural school children in Ratnagiri district of Maharashtra" a total of 201 students (5-12 years) enrolled in the study and the findings of the study revealed that the overall prevalence of being underweight, stunting and thinness were found to be 19, 30.3 and 16.8 per cent, respectively. Based on the WHO classification of severity of malnutrition among children, the overall age and sex combined rates of underweight, stunting and thinness were medium (10-19%), high (30-39%) and very high (15%), respectively.

Grammatikopoulous *et al*. (2009) compared diet composition and growth of 248 children (2-12 years) living in two Greek Islands (Samos and Corfu). In Corfu, the diet comprised of 52 per cent carbohydrate, 34 per cent fat and 14 per cent protein, which was different from the composition of the samos diet (42% carbohydrate, 39% fat, 19%, protein). Inadequacies in micro-nutrient intake were evident only in the diet of Samos children.

Nahar *et al.* (2009) assessed the nutritional status of school children in Punjab and revealed that the per cent adequacy of energy and protein intake was found to be nearly half (50 and 54 per cent) of the RDA. The intake of vitamins and minerals-vitamin A, thiamine, riboflavin, niacin, ascorbic acid, calcium and iron was also lower.

Fazili *et al*. (2012) conducted a study on nutritional status of school age children (5-14 years) in a rural health block of north india (kashmir) and observed that both mean weight and height were higher in females than males. The overall prevalence of under nutrition was 19.2%. The prevalence of underweight was lowest in 5 year female (0.0%) and highest in 6 year male (21.5%). For Stunting 7 year males recorded the lowest (0.0%) and 12 year males the highest (28.5%) prevalence. The

highest and lowest prevalence of wasting was recorded in 6 year old females (2.56%) and 9 year old males (24.6%) respectively. Prevalence of thinness was lowest in 13 year old females (14.2%) and highest in 13 year old males (47.1%).

A study was conducted to ascertain the nutritional status of rural school going children ,Hisar district, Haryana by Sati and Dahiya (2012).The nutritional status of 200 rural school going children (7-9 years) was calculated and the results of the study revealed that food and nutrient intake was inadequate and anthropometric measurements (mean height and weight) were significantly ($P<0.05$) lower than reference value. Regarding prevalence of malnutrition, it was found that 54.11 percent of the children were stunted and 55.5% were underweight.

Srivastava *et al.* (2012) conducted study on urban slum of Bareilly, Uttar-Pradesh, India and observed that the mean height and weight of boys and girls in the study group was lower than the CDC 2000 (Center for status, prevalence of stunting and underweight was highest in age group 11years to 13 years whereas prevalence of wasting was highest in age group 5 years to 7 years. Except refractive errors all illnesses are more common among girls, but the gender difference is statistically significant only for anemia and rickets. The risk of malnutrition was significantly higher among children living in joint families, children whose mother's education was less than or equal to 6th standard and children with working mothers.

Nigudgi *et al*. (2013) carried out study on nutritional status in higher primary schools of Gulbarga city. Results of the study revealed that out of 935 school children under study 51.23% were boys and 48.77% were girls. 50.05% children were below average weight for age showing undernourishment. 22.35% children had specific deficiency diseases in which bitot's spot in 48.80% children and anemia is 10.05%. 91.44% school children had good personal hygiene.

Mehta *et al.* (2013) assessed nutritional contribution of Mid Day Meal to dietary intake of school children in Ludhiana district of Punjab. The data revealed that intake of all the nutrients was inadequate. The Mid day meal was found to be a substitute rather than a supplement for the home meal. The per cent contribution of energy, protein and fat by the MDM to actual nutrient intake of children was 28.2, 51.7 and 27.5 respectively. The per cent contribution of other nutrients was β carotene

(22.7), thiamine (28.3), riboflavin (25.3), niacin (28.7), folic acid (23.6), vitamin C (15.2), iron (25.7) and calcium (27.7).

Rana *et al.* (2013) compared the nutritional status of children attending urban and rural primary school. It was found that consumption of pulses, green leafy vegetables, roots and tubers and milk and milk products was lower than RDI's. Intake of iron, zinc and vitamin A was significantly lower than RDA. As per anthropometry, children belonging to urban school were found more wasted and stunted than rural counterparts.

2.2 DIETARY ADEQUACY OF SCHOOL GOING GIRLS (7-9 YEARS)

Mishra and Singh (2006) in their study on food habits among three hundred school going children aged 4 to 9 years in Ram Nagar town of Varanasi district observed that majority of the children (65.67%) were non-vegetarian, but only 22.33% of them were either regular or weekly eaters of non-vegetarian diets. Majority of the children (65.00%) belonged to middle class families, followed by low (31.00%) and upper (17.67%). In addition to routine meal, 46.33% children were provided other food items. The food prohibitions were reiterated by 26.33% children for milk and butter; green leafy vegetables, pulses and rajmah.

Dietary surveys conducted in various parts of the country have shown that majority of our school children consumed inadequate amount of cereals, pulses and green leafy vegetables. The deficit in food intake were replicated in the nutrient intake i.e. energy protein, vitamin A, riboflavin, iron and folic acid (NFHS, 2006; NNMB, 2006-07).

WHO (2006) reported that dietary recommendations for a healthful diet across Europe recommend consumption of at least five portions of fruit and vegetables a day, reduced intakes of saturated fat and salt and increased consumption of complex carbohydrates and fibre.

According to global survey, about 10.8 million child deaths occur in a year resulting from zinc, vitamin C, folate, selenium and calcium deficiencies in addition to the three major micronutrient deficiencies i.e. vitamin A, iron and iodine to which high attention is now being given (WHO, 2007).

Bisht and Raghuvanshi (2008) assessed the dietary intake and nutritional status of school children of Kumaon Hills of Uttarakhand state and observed that the

requirement of energy, protein and calcium in children were met upto 50 to 75 per cent of RDA and that of niacin was met upto 70 to 85 per cent. Intake of iron, carotene and riboflavin was most inadequate.

Awasthi and Kumar (2009) conducted a study on Nutritional Status of primary school children of Nanital and found that, mean daily intake of cereals and pulses was 75.4 and 47.0 per cent of RDI which was significantly lower than RDI and mean daily intake of protein was 81.5% and energy was 82.6% which were lower than RDA. Mean intake of iron (44.6%), zinc (65.8%), vitamin A (25.2%) was significantly lower than RD.

Sharma and Trivedi (2013) studied the Nutritional Status of Children of Sagar City (M.p.). The total respondents for the study comprised of 200 children including 104 boys and 96 girls of age group 7 to 12 years. The results of the study revealed that for girls grade I malnutrition was more prominent at the age of nine years. The grade II malnutrition was highest at the age of 11 years. The grade III malnutrition was more noticeable at the age of 12 yeas. The normal nutritional status was found to be 10 percent in boys' ad 7.5 percent in girls. It was concluded that female children were more malnourished than male children.

Ghate and Kotwal (2014) conducted cross sectional study to assess the dietary pattern and nutritional status of 7 to 9 year-old children of India and Ethiopia. The results of the study revealed that food and nutrient intake was inadequate and consumption of all the nutrients by the children was comparatively less than the recommended dietary allowances. The intake of fruits and vegetables particularly, that of green leafy vegetables was also found to be grossly inadequate which could possibly have led to the deficient micronutrient intake. Data on anthropometry revealed that out of total children screened (N=200), mean height and weight in all the age group was significantly less than the National Center for Health Statistics standards.

Soni and Katoch (2014) assessed the dietary adequacy of school going children in selected areas of Himachal Pradesh. Results of the study indicated that most of the rural and urban blocks school children had nuclear families and belonged to SC castes. Regarding family income 66% and 52% of the families of school children had family income Rs. 2000-4000/-. A large percentage of (80% and 77%)

selected school children were non-vegetarian. Intake of all the food groups such as cereals, pulses, green leafy vegetables, roots and tubers, other vegetables, milk and milk products, sugar and jaggery was lower than RDI, but intake of fat was significant ($P \leq 0.05$) in all selected school children. Intake of protein, energy, calcium, iron, carotene, thiamine, riboflavin and niacin was lower than RDA. Intake of fat and ascorbic acid was more than RDA in all the subjects.

2.3 STUDIES RELATED TO ANTHROPOMETRIC MEASUREMENTS OF GIRLS (7-9 YEARS)

Chandra *et al.* (2006) conducted Nutrition assessment Survey of School Children of Dharwad and Haliyal Taluks in Karnataka State, India and observed that the anthropometric methods spotted 44.4% of children as underweight /having lean BMI. Nutrition related disorders were not related to either the father's or the mother's neither illiteracy nor they were related to type of the occupation of the father. They were associated with the presence of underweight/lean body mass index ($p<0.01$). More boys than girls had nutrition related disorders ($p<0.05$). Backward Hindu ($p<0.001$) as well as Muslim and Christians had more nutrition related disorders than forward Hindu children ($p<0.05$). The literacy status was higher among forward Hindu parents than backward Hindus ($p<0.02$) and least among Muslims ($p<0.05$). The backward community children had better weight for age / BMI profile than forwards ($p<0.005$).

Oninla *et al.* (2006) conducted a comparative study of nutritional status among urban and rural Nigerian school children. 366 rural and 383 urban children were selected for the study. The results depicted that mean nutritional indices weight for age, weight for height and height for age were significantly lower in rural than urban children.

Measurement of head circumference provides information about brain growth, midarm circumference about muscle mass and abdominal circumference about water retention (Darnton-Hill and Nalubola, 2006)

In a study conducted by Suvarna (2007) on interrelation of nutritional status, level of intelligence and participation in extra-curricular activities of school children in the year 2005-2006 in Dharwad it was observed that the mean height and weight of older children 8 to more than 9 years was significantly lower than NCHS Standards.

Handa *et al*. (2008) investigated nutritional status of 7-10 years school going children. A total of 150 school going children were selected from four different schools of Allahabad district Data on anthropometry revealed that out of total children screened (N=150), mean height and weight in all the age group was significantly ($p<0.05\%$) less than the National Center for Health Statistics standards. The mean MUAC in all the age groups was significantly ($p<0.01\%$) less than the National Health and Nutrition Examination Survey standards. Hemoglobin test revealed that 65.33% had hemoglobin level below the normal (12 g dl 1) values, indicating anemia, out of which approximately half (53.33%) were mild anemic and 12% were moderate anemic.

A cross sectional study was carried out to determine the nutritional status of school children in Army School, Pune by Mukherjee *et al.* (2008). Anthropometric survey of 760 school children was carried out and compared against the NCHS/WHO standards. The prevalence of stunting was 13.81per cent, wasting 6.71per cent and underweight 9.87 per cent. Mothers' educational level, socio economic status and family

Hussain *et al.* (2013) conducted a study to compare boys and girls on their anthropometric variables. The results of the study indicated that there are significant differences between boys and girls in their height, waist circumference, hip circumference and BMI, whereas no significant differences were found in their body weight.

2.4 CLINICAL ASSESSMENT OF SCHOOL GOING GIRLS (7-9 YEARS)

Rao *et al*. (2008) conducted a study on 1608 children (6-14 years) for the assessment of health and nutritional status in Wardha district of Maharashtra. Angular stomatitis, xerosis, bitot's spot and phrynoderma were the main deficiency signs. Prevalence of clinical signs including conjunctiva xerosis (23.64%), bitot's spot (5.45%) angular stomatisis (4.54%) visible goiter (0.91%) and dental signs (cavity and mottling) (73.64 %) were observed.

Eilander *et al.* (2010) conducted a study of association between indications of body size, fatty acids and micronutrient status on cognitive performance in 598 Indian school-children aged 6-10 years found that 22 percent of the children were stunted and 30 percent were underweight. The prevalence of anemia was nine percent while that of iron ,folate, vitamin B_{12} and iodine deficiencies were 31, 17, 23 and 47 percent

respectively.

Chauhan *et al.* (2011) in a Cross Sectional Study on prevalence of Clinical Vitamin A Defciency among Primary School Children in Urban Slums of Ahmedabad revealed that the prevalence of VAD was found to be 2.9%. Prevalence of VAD among girls (4.1%) was signifcantly high than boys (1.9%). 0.5% cases of night blindness, 1.4% cases of conjunctival xerosis and 2.1% cases ofBitot'sspot were found. Type of family, lower social class (class IV& V) and poor intakes of green vegetables were significantly associated with the vitamin A deficiency.

Mehrotra *et al.* (2011) conducted the study to assess the nutritional health status of primary school children of rural and urban areas of Bareilly district". Four hundred children of 7-9 years of age were selected from the rural and urban areas. They were assessed for nutritional health status by applying Clinical Nutrition Survey Chart; 24-hr recall method and Food Frequency Questionnaire. The results indicate that the nutritional deficiency signs and symptoms were observed more in rural children than the urban children. Nutrient intake and consumption frequency of all the 6 food groups was more among the urban children compared to their rural counterparts.

Sireesha and Kusuma (2014) observed the Health and nutritional status of urban school children of Chittoor district, Tirupati with the help of clinical examination, and height and weight measurements. A total of 776 children (342 boys and 434 girls) formed the study group. the results of the study indicated close proximation in the appearance of deficiency symptoms and undernutrition between boys and girls, depicting their poor state of health and nutrition.

2.5 NUTRITION KNOWLEDGE OF WORKERS AND THEIR GAIN IN KNOWLEDGE

Institutional care: this entails keeping orphans and vulnerable children in institutions such as orphanages and children's homes. The children live in the institution and are provided with their basic needs such as food, clothing and shelter, while some institutions offer education. The traditional welfare provision for orphans and vulnerable children outside families and the kinship system has been containment in institutions, largely financed through charitable donations (Ennew, 2005). The level and quality of care provided in institutions differs from one institution to another,

depending on the type of internal organization (family-based or conventional dormitories), the size of the family or other internal unit, internal equipment, the number of qualified staff, the working hours of care-givers and the type of relationship they have with the children, management style, the overall atmosphere within the institution and financial resources (Cahajic et al., 2003). Although institutions are considered to be the last resort for the care of parentless children, they have a role to play in short-term, emergency placements for sibling groups (Sanou et al., 2009) and for children who may be too traumatized to be able to fit easily into a substitute family (Ansell and Young, 2004).

Skovdal et al., (2009) established that groups of community members had organized themselves to identify vulnerable children, developed resources through local fundraisings and set up day care centres supporting the children. Other Non Governmental Organizations, both local and International, have also initiated progammes at community level to assist orphans and vulnerable children in provision of their needs. The children get support in form of food, clothing, shelter, support for education and medical care from the community programmes (HACI, 2010). In some programmes, the orphaned children and their families are registered and visit the centre for the provisions such as food, clothing and support in education. Most of these programmes rely on volunteers from community to undertake their activities. The programmes face severe limitation of resources and are overwhelmed by the children in need (Ennew, 2005).

Children are educated within or outside of the shelter home. Shelter home provide an alternative to foster care or adoption by giving orphans and vulnerable children a community-based setting in which they live and learn. In the worst cases, orphanages can be dangerous and unregulated places where children are subject to abuse and neglect. Other alternative names are group home, children's home, rehabilitation center and youth treatment center (HACI, 2010).

It is necessary to strengthen governments, families and community capacities to ensure a supportive environment for orphans and vulnerable children by providing appropriate counseling and psychosocial assistance, ensuring they are educated and have access to shelter, good services; nutrition and health and social services on an equal footing with other children; provide orphans and vulnerable children protection

against all forms of ill treatment, violence, exploitation, discrimination, trafficking and loss of inheritance (GOK/HACI, 2010).

METHODOLOGY

Research in common language refers to a search for knowledge. It is a scientific and systematic search for pertinent information on a specific topic. It represents the logic behind the methods used by the researcher in the context of research study and explains the relevance of a particular method or technique adopted for the research purpose.

This chapter deals with the procedure adopted for conducting the present investigation. An attempt has been made to provide detailed outline of the methodological plan followed under the following sub-heads:

3. RESEARCH DESIGN

3.1 Locale of the study

3.2 Sample selection

3.3 Development of research tool

3.4 Measurement of variables

3.5 Preparation and delivering of information package

3.6 Data collection

3.7 Statistical analysis

3.1 LOCALE OF STUDY

The study was conducted in Udaipur city of Rajasthan as the researcher is well acquainted with the locale and lack of research studies was conducted in proposed

area. A comprehensive list of shelter homes was obtained from Department of social welfare (Samaaj Kalyaan Vibhaag, residency campus). According to the comprehensive list of shelter homes from Samaaj Kalyaan Vibhaag, there were 14 shelter homes in Udaipur city. From this list one government (Nirarshrit Balika Garh,Sector-14) and one non-government (Meera Nirarshrit Balika Garh , Udaipur) shelter home was selected purposively as these two homes were providing shelter to girls only whereas remaining 12 centers are for boys.

Plate 1: Glimpses of Government Shelter Home

Plate 2: Glimpses of Non-Government Shelter Home

3.2 SAMPLE SELECTION

- For assessing the nutritional status
- For imparting nutritional knowledge to workers

1. **For assessing the nutritional status**. Total of 120 girls (60 girls from government and 60 girls from non-government shelter homes) in the age group of 7-9 years enrolled in schools and resident of shelter home were selected by random sampling. The sample was selected by way of Random Sampling.

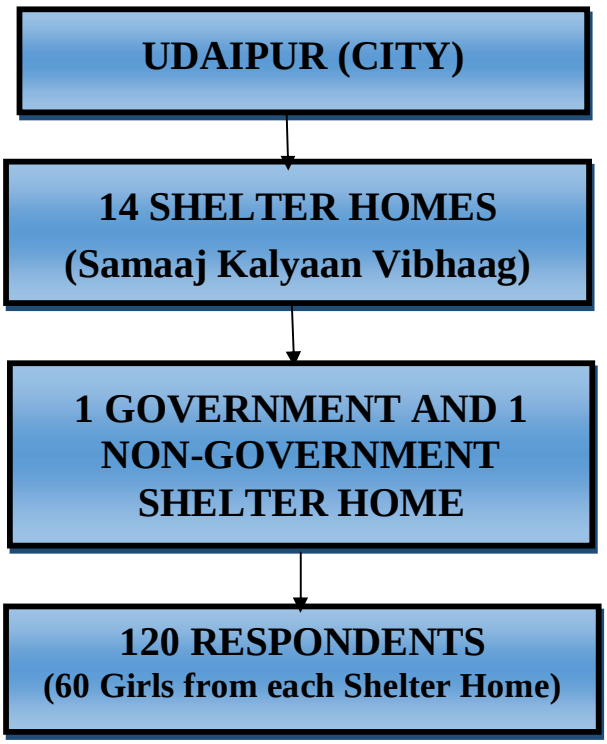

Figure 3.1 Procedure of sample selection

The sample was selected purposively as per the following criteria:-

- The subject must be residing in the shelter home atleast for one year.

2. **For imparting nutritional knowledge to workers -**. A sample of 10 workers was selected purposively for the study as the nutritional status of girls was also associated with the nutritional knowledge of the workers.

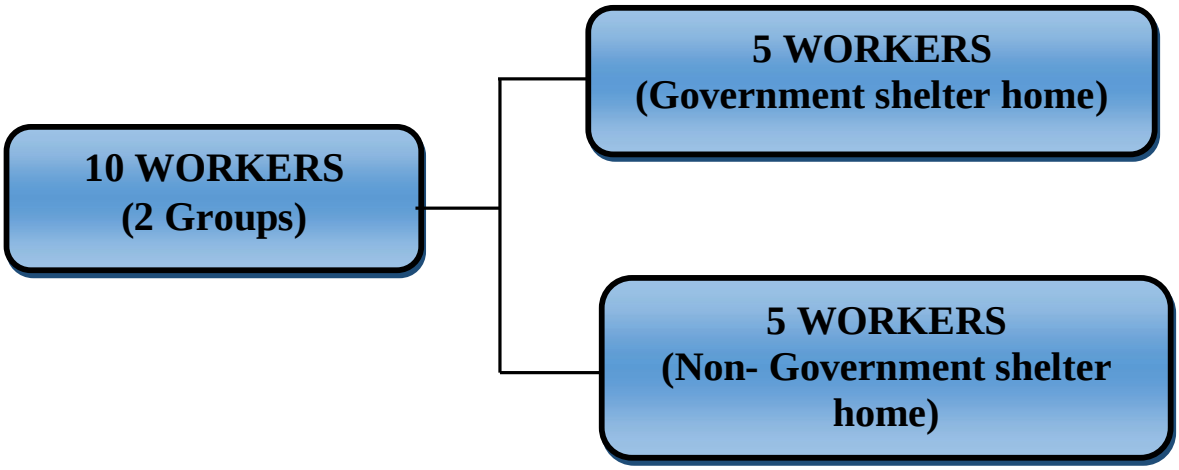

Figure 3.2 Procedure for workers selection

3.2 DEVELOPMENT OF RESEARCH TOOL

Research tool was divided in two phases.

1. **For assessment of Nutrition status of school going girls in shelter homes:-**A well-structured questionnaire was developed from which information was gathered on the various aspects like:-

a) **General Profile:-**It consist of particulars related to the respondents i.e. name, age, class and food habits.

b) **Anthropometric measurements:-** Respondents body height (in cm), weight (in kg) and BMI was measured.

c) **Clinical assessment:-** Clinical assessment including biochemical estimation (Haemoglobin) was carried out with the assistance of doctors from Primary Health Centre for the examination of clinical symptoms of nutritional deficiencies and presence of infections and others illness along with Rapid clinical survey.

d) **Dietary assessment:** Dietary survey was conducted of the respondents using 24 hour recall method for one day.

2. **For assessment of the nutrition knowledge of workers :- -** The nutritional status of respondents is influenced by sound nutrition knowledge of workers and cooking practices followed by them keeping this in view a Questionnaire was developed and was then reviewed and evaluated by committee of experts and after its approval it was used for data collection and post testing of workers knowledge containing different question pertaining various aspects *viz*

I. Food

II. Food groups

III. Functions of food

IV. Balanced diet

V. Nutrient deficiency disorders and their prevention

VI. Cooking methods

VII. Knowledge of recommended dietary allowances

- **Imparting Nutrition education to the workers :** Workers imparted nutrition education with the help of prepared Visual aids like Charts, posters, flash cards and then lectures, presentation and demonstration were given by referring already prepared resource materials keeping in mind the knowledge level of the study group.

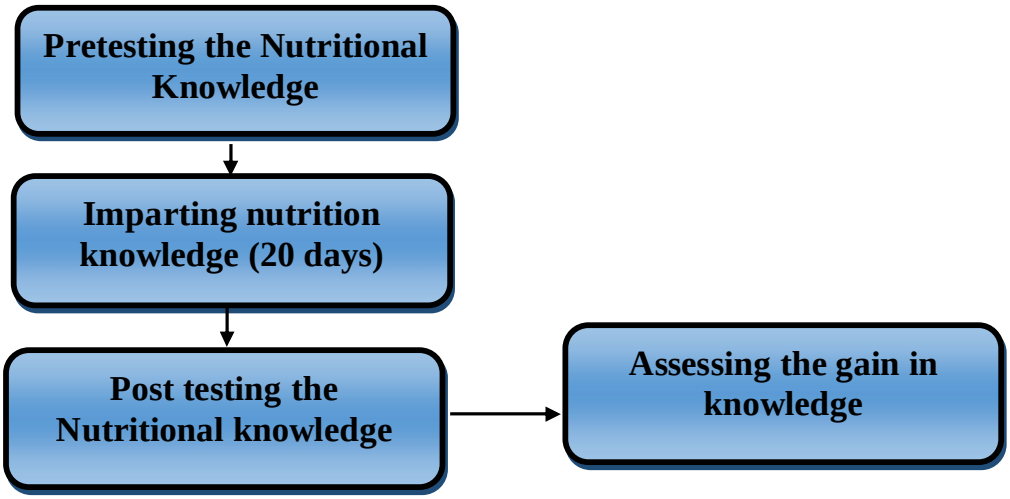

Figure 3.3 Procedure for imparting nutrition education to the workers Selection of different aspects of nutrition

3.3 Measurement of variables

A. Independent variables

For the purpose of analysis of data, different background variables were categorized as follows:-

1. **Age:** The chronological age of the respondents at the time of data collection was recorded. All respondents of age group 7-9 years were selected for study.

Age	Code
7 years	**1**
8 years	**2**
9 years	**3**

2. **Food habits :-** The food habits of the respondents at the time of data collection was recorded.

Food habits	Code
Vegetarian	**1**
Non-vegetarian	**2**

3. **Class:-** The class in which the respondents were studying at the time of data collection was recorded.

B. Dependent variables:

(1) Assessment of nutritional status of the school going girls residing in shelter homes:

For collecting the requisite information, a well-structured questionnaire was developed which was pre-tested on non-sampled respondents. Based on the responses obtained from pre-testing and difficulties faced, modifications were done to make the questionnaire more functional. The nutritional status of school going girls residing in shelter homes was assessed with the help of following procedures.

(a) Anthropometric measurements

(b) Assessing severity of under nutrition

(c) Clinical assessment

(d) Dietary assessment

(a) Nutritional anthropometry: Nutritional anthropometry is a good indicator of nuritional status. The pattern of growth and physical state of the body are profoundly influenced by the diet and nutrition. Measurement and indices like height and weight

Height: It is linear measurement made up of the sum of four components- legs, pelvis, spine and skull (Jelliffe 1966).

Technique: The height was measured using vertical anthropometric rod. The subjects were asked to stand erect looking straight on a leveled surface without shoes, with heels together and toes apart. The anthropometric rod was placed behind the subject in the centre of the heels perpendicular to the ground. The subjects were asked to stand with his/her back to the height rod. The back of the head, back, buttocks, calves and heels were made to touch upright, with feet together, The top of the external auditory meatus(ear canal) was made to level with the inferior margin of the bony orbit(cheek bone). The head piece of the anthropometric rod or the sliding part of rod was lowered so that the hair could be pressed flat. The head piece was leveled to skull vault and height was recorded to nearest 0.5 cm.

Weight: It is the most widely used and the simplest reproducible anthropometric measurement. It indicates the body mass and is a composite of all body constituents like water, minerals, fat, protein, bone etc. (Bamji *et al.,* 2003).

Technique: A platform spring balance was used for measuring weight of respondents. The zero error of the weighting scale was checked before taking the weight and corrected as required. The subjects were asked to stand on the platform

bare feet, with minimum clothing and without leaning against or holding anything. The measurement were observed to the nearest of 0.5kg (Jelliffe, 1966).

(b) Assessing severity of under nutrition

The nutritional status of the sample was ascertained with the help of indicators such as Gomez classification (% reference weight for age), Waterlow classification (height for age) and WHO (2006) classification (BMI for age) and results were calculated.

Gomez classification

The child's weight is compared to that of a normal child (50th percentile) of the same age. It is useful for population screening and public health.

$$\text{\% of Reference weight for age} = \frac{\text{Weight of subject}}{\text{Reference weight of normal child}} \times 100$$

Table 3.1: Indicators of malnutrition

S. No.	Conditions	Water Low's classification		Gomez's classification
		Weight for height (wasting)	Height for age (Stunting)	% Reference weight for age
1	Normal	>95	>95	>90
2	Grade-I (Mild)	80-90	90-95	75-89
3	Grade-II (Moderate)	70-80	85-90	60-74.9
4	Grade-III (Severe)	<70	<85	<60

Waterlow Classification

Chronic malnutrition results in stunting. Malnutrition also affects the child's body proportions eventually resulting in stunting.

$$\text{Per cent Height for Age} = \frac{\text{Height of subject}}{\text{Reference Height of normal child}} \times 100$$

$$\text{Per cent Weight for Height} = \frac{\text{Weight of subject}}{\text{Reference Weight of normal child}} \times 100$$

BMI (kg/m2) for age : The body mass index was calculated using the equation given by Garrow (1981).

$$\text{BMI (kg/m2)} = \frac{\text{Weight (kg)}}{\text{Height (m2)}}$$

Nutritional status has been assessed using the indicator BMI- for- age according to the z-score of WHO (2007).

Table 3.2: WHO Classification BMI for age (z- score)

> Median- 2SD to <1SD:	Normal
Median < -2SD to >-3SD:	Moderate under nutrition
< Median - 3SD:	Severe under nutrition
Median >+1SD to < + 3SD:	Overweight
>+3SD:	Obesity

(c) Clinical assessment: The school girls, in their existing nutritional conditions are in great need of health promotion, health appraisal and health restoration. For assessing health and nutritional status of a community, clinical examination has always been and remains an important practical method. The method is based on the examination for changes believed to be related to inadequate nutrition that can be seen or felt in superficial epithelial tissues, especially skin, eyes, hair and buccal mucosa. In the present study, an attempt has been made to evaluate the clinical health and nutritional status of school going girls. Clinical assessment was done with the assistance of doctors from Primary Health Centre an exhaustive list of clinical signs and symptoms was provided for the examination of nutritional deficiencies and presence of infections and others illness.

Table 3.3: WHO (1968) classification of normal haemoglobin levels

AGE	Normal haemoglobin level (g/dl)
Newborns	13.5-24
<1month	10-20
1-2 month	10-18
0.5-2 years	10.5-13.5
2-6 years	11.5-13.5
6-12 years	11.5-15.5
Female:12-18 years	12.0-16.0
Male:12-18 years	13.0-16.0
Female:>18 years	12.1-15.1
Male:>18 years	13.6-17.7
Men after middle age	12.4-14.9
Women after middle age	11.7-13.8

Plate 4 : Hemoglobin estimation of respondents with the assistance of doctor

(d) Dietary assessment: Dietary intake of 60 girls from government and 60 girls from non- government shelter homes was conducted through 24 hour recall method for one day with the help of standardized cups. The intake of different food groups for the day was compared with the balanced diet (NIN, 2010). The nutrient intake was calculated using food composition tables (Gopalan *et.al*., 1989) and with the help of a computer programme developed by Choudhary *et al.* (2001) in DBMS package. The intake of nutrients was compared with Recommended Dietary Allowances as suggested by Indian Council of Medical Research (2010).

Food intake: Balance diet for sample (7-9 years) recommended by NIN- 2010 was used to analyse the per cent adequacy of food intake, calculation was done as follows:

$$\textbf{Per cent adequacy of food intake} = \frac{\text{Food intake}}{\text{Recommended dietary intake (RDI)}} \times 100$$

Nutrient intake: Nutrient intake was calculated using food composition tables (Gopalan *et al.* 1989). Mean nutrient intake for one day was compared with recommended dietary allowances (NIN - 2010) and per cent adequacy was calculated as follows:

$$\textbf{Per cent adequacy of nutrient intake} = \frac{\text{Nutrient intake}}{\text{Recommended dietary allowance (RDA)}} \times 100$$

Plate-5: Dietary survey

(2) Assessment of Workers Nutritional knowledge :

Frances Horibe (1990) defined knowledge as a body of information, technique and experience that coalesce around the particular subject.

In the present study existing level of nutritional knowledge of workers was assessed in different aspects of nutrition with the help of questionnaire. The Questionnaire was developed under the guidance of experts and with due consideration of literature. The questionnaire was further subdivided into categories such as food, food group, Balanced Diet, Nutrient deficiency Disorder , Cooking methods and Knowledge of recommended dietary allowances (RDA). For the purpose of quantifying the qualitative data related to assessment of the extent of nutrition knowledge, a close ended knowledge inventory was prepared and responses were obtained under "yes" or "no" categories at the initial period i.e. before imparting nutrition education. Correct answer was given score 'one' and incorrect answer was given score 'zero'. After assessment of pre nutritional knowledge of respondents and based on their knowledge scores, areas of inadequate knowledge were recognized and based on those critical areas a nutrition education programme was planned and imparted to the respondents for 20 days (10 days each shelter home). After the delivery of the nutrition package, retention in knowledge was assessed by readministering the questionnaire. Post knowledge gain scores were then calculated and compared with the pre knowledge scores to assess gain in knowledge. The total score for each parameter were combined and divided into three categories inadequate, marginally inadequate and adequate and codes were given as below:

Table 3.4: Categories of scoring

Categories	**Code**
Inadequate	Below 50%
Marginally Inadequate	50-75%
Adequate	76% and above

Aggregate scores were computed to find out extent of nutritional knowledge possessed by respondents in the three Categories. The scores were used for comparison of knowledge.

3.5 PREPARATION AND DELIVERING OF NUTRITION EDUCATION PACKAGE

Workers of shelter homes were informed about the purpose of imparting nutrition education. Nutrition education was imparted to workers for 20 days (10 days each shelter home). An information package was developed using selected messages and for this in depth content was collected from the relevant and available literature. The audio visual aids related to content were also collected from Department of food and nutrition, MPUAT Udaipur. The content was delivered through lecture supplemented with audio visual aids in the form of videos, charts, Flashcards, Folders and slides, demonstration.

(1) **Charts and posters:** For disseminating nutritional information to workers charts and posters on topics such as balanced diets, food groups, deficiency disorders were exhibited and were explained to them.

(2) **Flash card:** Flash cards are visual aids in which the message are written or drawn on thick paper and presented step by step by the extension agent to the audience to synchronize with the talk. With regard to the study flash cards have been made on sprouting, supplementary foods, fruits and vegetables and food groups.

(3) **Videos:** The term videos are derived from Latin word meaning ‘to see’. Video is an electronic audio- visual system for preparing video tapes of programme and events, which could be projected through a receiving set with moving image and synchronized sound. For making the nutrition knowledge delivery programme effective videos related to eating habits, food groups, deficiency disorders were showcased to the workers.

(4) **Slides:** Slides is transparent mounted picture which is projected by focusing light through it. The projection may be made on roll back screen or on white wall. Because of availability of electricity in the locale selected, it was possible to use projector for imparting nutrition education. For the present study slides were made on balance diet for children, protein energy malnutrition, vitamin deficiency diseases.

Plate 6: Researcher imparting nutrition education through recipe demonstration and power point presentation

Plate 7: Researcher imparting nutrition education through flash cards and exhibition

(5) **Demonstration:** It is a generally accepted learning theory that the greater the degree of active participation and sensory involvement by the learner, the more effective learning will be. So keeping this point in view demonstration was planned for which nutritious recipies which could be made from cheap and locally available material were prepared. All sorts of Queries were entertained and doubts were clarified.

(6) **Exhibition:** An exhibition is a systematic display of models, specimens, charts, photographs, pictures, posters, information etc. in a sequence around a theme to create awareness and interest in the community. This method is suitable for reaching all types of people. In present study chart, poster and folder were used for exhibition.

3.6 PROCEDURE OF DATA COLLECTION

Data collection was done in two phases

1) In the first phase data regarding the nutritional status of school going girls residing in shelter homes was obtained.

2) In the second phase pre testing the nutritional knowledge of the workers with the help of appropriate tool and then after imparting nutrition education for a period of 20 days ,the same structured questionnaire was used, for post testing their nutritional knowledge level. Impact of nutrition education was assessed through change in scores of the workers before and after imparting the nutrition education.

4. ANALYSIS OF DATA

After collecting data, it is necessary to analyze it with help of statistics to arrive at proper and adequate conclusion. Following statistical measures were used to analyze the data:

A. **Frequency and percentage:** Frequency and percentage were used to analyze general background information and knowledge of respondents before and after 5 days of training for each group.

B. **Mean per cent Score:** MPS were calculated to assess the knowledge before and after 5 days of training for each group.

C. **Independent sample t- test :** Independent t test was used to compare the mean of two groups and used to find significant difference in height,weight and food and nutrients intake of girls among government and non-government shelter home.

The following formula to calculate the t-TEST.

$$t = \frac{M_X - M_Y}{\sqrt{\left[\frac{\left(\Sigma X^2 - \frac{(\Sigma X)^2}{N_X}\right) + \left(\Sigma Y^2 - \frac{(\Sigma Y)^2}{N_Y}\right)}{N_X + N_Y - 2}\right] \cdot \left[\frac{1}{N_X} + \frac{1}{N_Y}\right]}}$$

Σ = sum the following scores

M_X = mean for Group A

M_Y = mean for Group B

X = score in Group 1

Y = score in Group 2

N_X = number of scores in Group 1

N_Y = number of scores in Group 2

D. **Paired t- test:** Paired t test was used to find out the significant differences in mean scores of workers nutrition knowledge before and after the nutrition education programme.

$$t = \frac{\bar{d}}{\sqrt{s^2 / n}}$$

$d_i = x - y$

Where, x= before

y= after

n=to total no. of observation

RESULTS AND DISCUSSION

Diet and nutrition surveys carried out in India and other developing countries have shown that diets consumed by children were deficient in both macro and micro nutrients. Turin *et al.* (2007). The present study was conducted to determine the nutritional status of school going girls (7-9 years) residing in shelter homes. Nutritional status of school going girls was compared between selected government and non- government shelter homes from Udaipur city and assessed in terms of dietary intake, anthropometric measurements and clinical assessment. The data was collected in accordance with the research methodology to achieve the specific objectives of the study. The section of study sets forth clearly and precisely the finding and interpretation in the context of major objectives of study, thus providing a bird's eye view of complete study, which makes this section the most significant and crucial part of the research work. The results of the study have been systematically illustrated with the help of Tables and figures tracing the objectives of the presented under the following sections:-

4.1 General background information

4.2 Nutritional profile of school going girls

4.2.1 Anthropometric measurement

4.2.2 Assessment of severity of under nutrition in girls by comparing with different standards.

4.2.3 Clinical assessment

4.2.4 Dietary adequacy

4.3 Impact of nutritional education programme on nutritional knowledge of workers

4.3.1 Nutritional knowledge of respondents

4.3.2 Knowledge of respondents in selected nutritional aspects

4.1 GENTRAL BACK GROUND INFORMATION

This section deals with personal characteristics of the respondents i.e. age, class and food habits.

a. Age: Data in Table 4.1 reveals that out of 120 respondents surveyed, 60 were girls from government and 60 were girls from non-government shelter home. 28.33 percent respondents were in age of 7 years and 39.16 percent in age of 8 years and the rest 32.5 per cent of respondents belonged to 9 years.

b. Food Habit: Food Habits were categorized in three categories vegetarian, non – vegetarian and Ovo-vegetarian. From the findings it could be stated that all the respondents (100%) were vegetarian.

c. Class: : Data in Table 4.1 reveals that 23.33 percent respondents were studying in I standard and 34.16 percent were studying in II standard and the rest 42.5 per cent of respondents were studying in III standard.

Table 4.1: Percentage distribution of respondents by Background Information Variable

(N=120)

S.No	Background Information	Categories	Girls in government shelter home n=60		Girls in non-government shelter home n=60		Total N=120	
1.	**Personal factors**		**F**	**%**	**F**	**%**	**F**	**%**
1.	**Age (in years)**	7	20	33.33	14	23.33	34	28.33
		8	26	43.33	21	35	47	39.16
		9	**14**	**23.33**	**25**	**41.66**	**39**	**32.5**
2.	**Food habits**	Vegetarian	60	100	60	100	120	100
		Non vegetarian	0	0	0	0	0	0
		Ovo Vegetarian	0	0	0	0	0	0
3.	**Class**	I	14	23.33	14	23.33	28	23.33
		II	20	33.33	21	35	41	34.16
		III	26	43.33	25	41.66	51	42.5

4.2 NUTRITIONAL PROFILE OF SCHOOL GOING GIRLS IN GOVERNMENT AND NON-GOVERNMENT SHELTER HOMES

Nutritional status is one of the indictor of the overall well- being of population. Nutritional status of an individual is often the result of many interrelated factors. It is influenced by food intake, quantity and quality of food and physical health. The spectrum of nutritional status spread from obesity to severe malnutrition.

Following parameters were studied to assess the nutritional status of the school going children.

4.2.1 Anthropometric measurements

A measurement of growth has always been an important tool for assessing nutritional status. Anthropometric measurement is considered an important tool of assessment of nutritional status and is most widely used means to assess nutritional status. Measurements of height and weight provide important clues about health and nutritional well- being. Also from the public point of view, identification of sub clinical forms of malnutrition is very important for planning programme of nutrition intervention so as to prevent such mild cases going into severe forms with consequent risk of high morbidity thus clinical measurements also hold significance in assessing nutritional status of children.

In the present study height and weight measurement were taken. The body mass index (BMI) was calculated to assess the nutritional status of the subjects. Results pertaining to anthropometric measurements were calculated and are discussed and presented in Table: 4.2.

i) Height

Height is the distance from the bottom of the feet to the top of the head in a human body standard erect (Anomymous 2010). The height of an individual is influenced by genetic (hereditary) and environmental factors. The maximum growth potential of an individual is decided by nutrition and morbidity. Inadequate dietary intake or infections reduce nutrients availability at cellular level resulting in growth retardation (Sehagal, 2007). Height is also affected by long term nutritional deprivation and is considered as an index of chronic or long duration malnutrition

ii) Weight

Body weight is the most widely used and the simplest reproducible anthropometric measurement for the evaluation of nutritional status of young children. It indicates the body mass and is a composite of all body constituents like water, mineral, fat, protein, bone etc. (Sehagal, 2007).

Perusal of Table 4.2 indicates the calculated mean values for height and weight of respondents both shelter homes from different categories of age group that

is 7-9 years. The observed mean values for both height and weight was compared against the reference values and it was found that the observed values were significantly lower than the reference values at 0.05 % level of significance for both respondents of 7-9 years.

The findings of the present study are in conformity with the study conducted by Prekshi *et al.* (2008) on 300 pre-school children of Gurgaon district of Haryana. The mean height and weight of boys were 87.48 cm and 13.65 kg and of girls were 84.67 cm and 12.81 kg respectively which were significantly lower than references values.

The findings of the study are also in line with the findings of Bharati *et al.* (2005) who highlighted that the nutritional status of the school children from rural and urban areas in Raichur was lower than the NCHS standards also that girls showed lower measurements than boys.

Semwal *et al.* (2006) investigated the nutritional status of school children (6 - 14 years) in rural areas of Dehradun district and revealed that the expected height for age as per ICMR standard was less in both boys and girls of all ages.

Bose *et al.* (2008) almost observed similar values of height and weight. Sati and Dahiya (2012) also reported similar range of height, weight and triceps in school children of Hisar district, Haryana. The results of present investigation are in accordance with those of earlier workers (Kumari and Jain 2005; Sethi 2012). They pointed out that all girls and boys were lower in height and weight when compared to standard ICMR values and NCHS values.

Table 4.2: Anthropometric measurement of school going girls in government and non- government shelter home

N=120

Anthropometric parameters	Age (years)	Reference Value	Observed Value Government n=60	t-value	Reference Value	Observed Value Non-Government n=60	t value
Height (in cm)	**7**	**124.3**	123.76±9.56	0.43 NS	**124.3**	117.29±7.71	7.04*
	8	**130.1**	116.17±8.36	12.90*	**130.1**	123.28±10.62	4.97*
	9	**134.6**	119.53±8.08	19.24*	**134.6**	129.41±12.98	3.09*
Weight	**7**	**22.7**	20.33±2.80	6.55*	**22.7**	19±6.82	4.20*

(in kg)							
	8	**25.2**	18.39±3.34	15.79*	**25.2**	20.24±3.06	12.55*
	9	**28**	22.07±2.38	19.29*	**28**	21.13±5.07	10.49*

* Significant at 0.5 per cent
NS- non- significant

4.2.2 Assessment of severity of undernutrition in children by comparing with different standards.

1. Waterlow classification

Height for age and weight for height are an index of stunting and can be used as a criterion which quantifies chronic malnutrition.

i) Weight for Height:

Table 4.3: Comparison of nutritional status of girls from Government and Non-government shelter home with Waterlow classification (weight for height)

(N=120)

	Normal (>95 % of NCHS Standard)		**Mild (80-90 % of NCHS Standard)**		**Moderate (70-80 % of NCHS Standard)**		**Severe (<70% of NCHS Standard)**	
Age (in years)	**Govern Ment**	**Non-govern Ment**	**Govern Ment**	**Non-govern Ment**	**Govern Ment**	**Non-govern Ment**	**Govern Ment**	**Non-govern Ment**
7	8 (13.33%)	4 (6.66%)	9 (15%)	1 (1.66%)	3 (5%)	3 (5%)	0	6 (10%)
8	4 (6.66%)	7 (11.66%)	6 (10%)	6 (10%)	5 (8.33%)	3 (5%)	11 (18.33%)	5 (8.33%)
9	1 1.66%)	8 (13.33%)	7 (11.66%)	5 (8.33%)	3 (5%)	2 (3.33%)	3 (5%)	9 (15%)

Water low (1972)

Figure in parentheses indicate Percentage

According to Waterlow classification, Table 4.3 and figure 4.1 reveal that 10 per cent school going girls from non- government and no girls from government shelter home in age of 7 years were severely wasted. 8.33 percentage of girls from non- government and 18.33 per cent from government shelter home in age of 8 years were severely wasted. 15 percentage of girls from non- government and 5 per cent from government shelter home in age of 9 years were severely wasted.

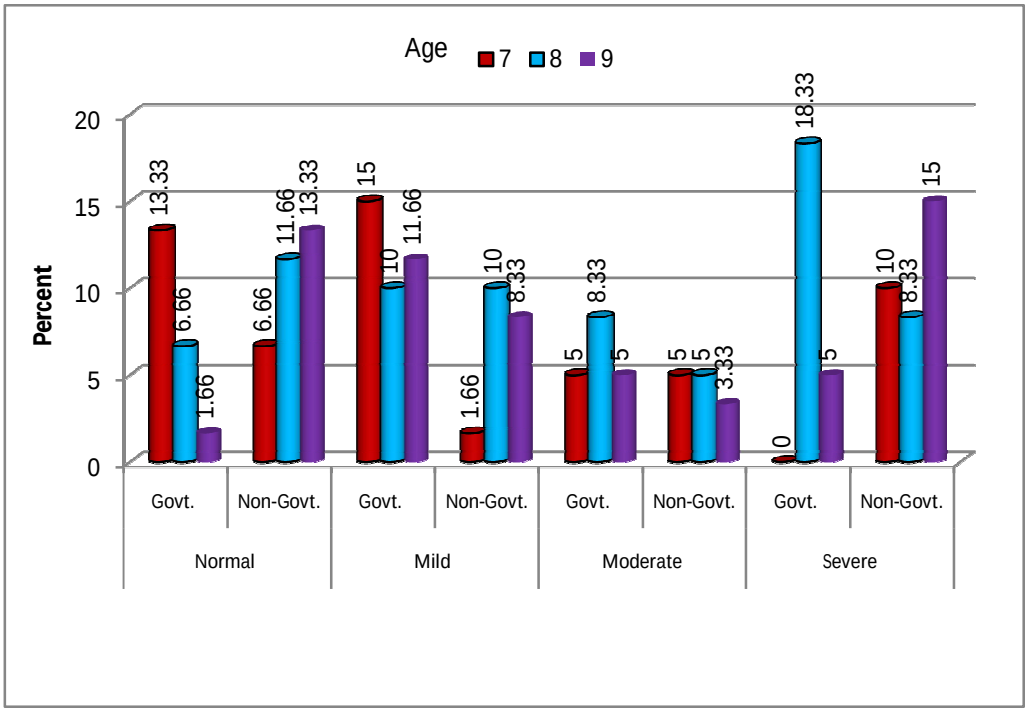

Fig. 4.1: Age wise percent distribution of Waterlow classification (weight for height) among girls of Government and Non-government shelter home

ii) Height for age

Table 4.4: Comparison of nutritional status of girls in government and non-government shelter home with Waterlow classification (height for age)

(N=120)

Age (in years)	Normal (>95 % of NCHS Standard)		Mild (90-95 % of NCHS Standard)		Moderate (85-90 % of NCHS Standard)		Severe (<85% of NCHS Standard)	
	Govern Ment	Non-Govern Ment	Govern Ment	Non-Govern Ment	Govern Ment	Non-Govern Ment	Govern Ment	Non-Govern Ment

7	15 (25%)	7 (11.66%)	3(5%)	6 (10%)	2(3.33%)	1 (1.66%)	0	0
8	6 (10%)	10 (16.66%)	7 (11.66%)	8 (13.33%)	6 (10%)	2 (3.33%)	7 (11.66%)	1 (1.66%)
9	2 (3.33%)	15 (25%)	2 (3.33%)	2 (3.33%)	7 (11.66%)	5 (8.33%)	3 (5%)	3 (5%)

Water low (1972)

Figure in parentheses indicate Percentage

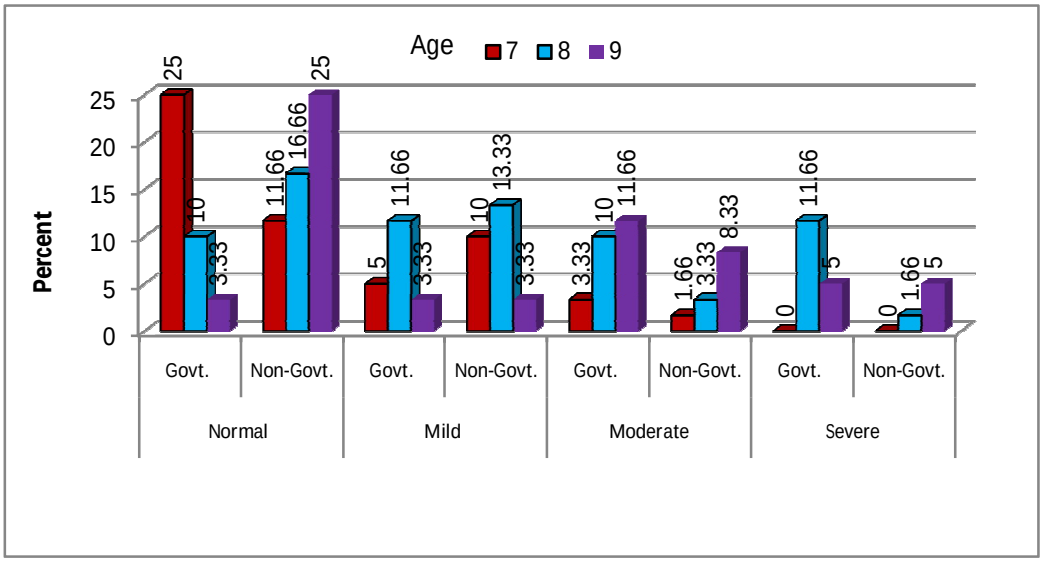

Fig. 4.2: Age wise percent distribution of Waterlow classification (Height for age) among girls of Government and Non-government shelter home

According to Waterlow classification, Table 4.4 and figure 4.2 reveal that 1.66 percentage of girls from non- government and 11.66 per cent from government shelter home in age of 8 years were severely stunted. 5 percentage of girls from non-government and government shelter home in age of 9 years were severely stunted.

It clearly depicts from above table that majority of girls of age 8-9 years were severely stunted.

2. Gomez classification

i) Weight for age

Table 4.5: Comparison of nutritional status of girls from government and non-government shelter home with Gomez classification (Weight for age)

(N=120)

	Normal (>90 % of NCHS Standard)	**Mild (75-89 % of NCHS Standard)**	**Moderate (60-74.9% of NCHS**	**Severe (<60% of NCHS Standard)**

					Standard)			
Age (in years)	**Govern Ment**	**Non-govern Ment**	**Govern Ment**	**Non-govern Ment**	**Govern Ment**	**Non-govern Ment**	**Govern Ment**	**Non-govern Ment**
7	8(13.33%)	4(6.66%)	11(18.33%)	3(5%)	1(3.33%)	6(10%)	0	1(1.66%)
8	4(6.66%)	7(11.66%)	9(15%)	9(15%)	9(15%)	5(8.33%)	4(6.66%)	0
9	1(1.66%)	7(25%)	7(3.33%)	3(5%)	6(10%)	4(6.66%)	0	11(18.33%)

Gomez (1955)

Figure in parentheses indicate Percentage

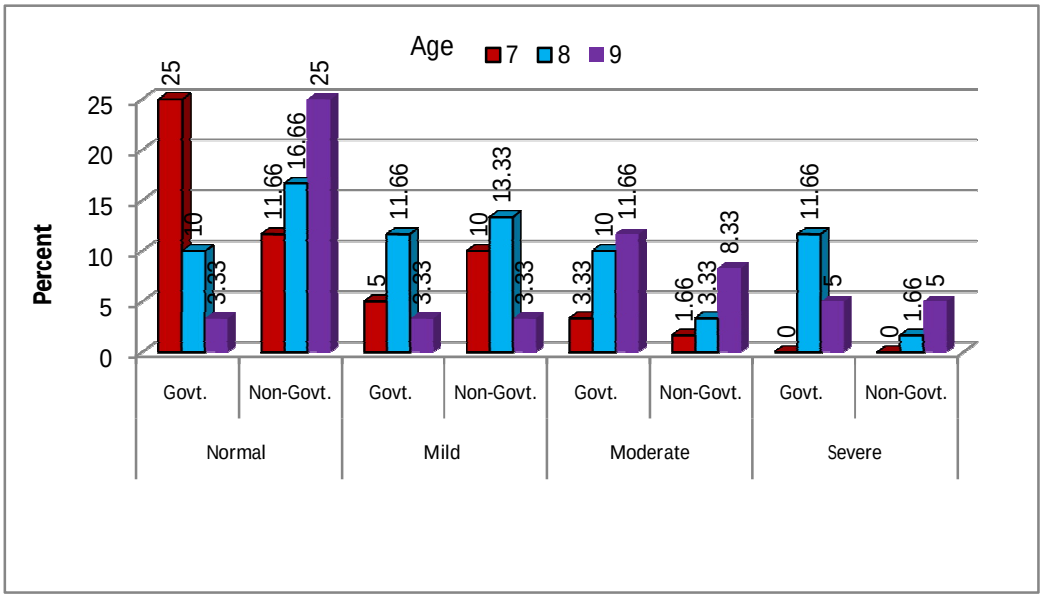

Fig. 4.3: Age wise percent distribution of Gomez classification (Weight for age) among girls of Government and Non-government shelter home

Weight for age is an indicator of underweight and reflects the long term malnutrition. Comparing the weight for age measurements with Gomez classification it was observed from table 4.5 and figure 4.3 that in the government shelter home 13.33 per cent in age 7 years, 6.66 percent in age 8 years and 1.66 percent in age 9 years were in normal category. In non-government shelter home 6.66 per cent in age 7 years, 11.66 percent in age 8 years and 25 percent in age 9 years were in normal category. 18.33,15, 3.33 percent of girls from government shelter home and 5, 15, 5 percent girls from non-government shelter home in the age of 7,8 and 9 years were falling in grade II malnutrition. Majority of girls in age group of 8-9 years were falling in grade III and severe malnutrition.

Joshi *et al.* (2011) reported 26 per cent of the students were found to be undernourished and 13 per cent stunted, 12 per cent wasted and only 1 per cent both stunted and wasted in western region of Nepal.

Rana *et al*. (2013) also detected stunting (27.5%), underweight (32.5%) and wasting (17%) among school going children of Hisar district, Haryana.

Further the findings corresponds with the study of Murugkar *et al.* (2013) which assessed nutritional status of 200 school going children (6-9 years) in Bhopal district and revealed that the height, weight and BMI of all respondents were significantly lower ($p \leq 0.05$) than the reference value. As per Water lows and Gomezs classification, only 12% of the children were normal. More than 50 per cent (55%) of the children were wasted and 47 per cent were severely malnourished.

The results are also in conformity with some of the studies conducted earlier such as Osei et al. (2010) conducted a cross-sectional study in 20 public primary school among 499 children of 6-10 years age group in Garhwali Himalayan villages of India and found that underweight, stunting and wasting were present in 60.9 per cent, 56.1 per cent and 12.2 per cent of school going children, respectively.

The findings of the study are in agreement with the Rezaeian *et al.* (2014) which assessed the health and nutritional status in Children based on school screening programs and observed that the prevalence of wasting, underweight, and stunting among school children was found to be 3.1 per cent, 9.48 per cent and 2.85 per cent, respectively. Hypertension was detected in 5.55 per cent (95% CI: 4.67, 6.43). The prevalence of caries, gingivitis, and hypertension was more common in boys than in girls.

3. Body Mass Index (BMI) for age

BMI provides a good correlation to fatness and low correlation with stature. It is simple index of weight- for- height that is commonly used to classify underweight, overweight and obesity.

Table 4.6: Anthropometric indicators (BMI for age)

(N=120)

BMI for age	Shelter Home		TOTAL
	Government	Non-government	

According to Z- score				
Severe under nutrition	< Median- 3SD	12 (20%)	25 (41.66%)	37 (30.83%)
Moderate	Median<-2SD to >-3SD	6 (10%)	10 (16.66%)	16 (13.33%)
Normal	>Median-2SD to+<1 SD	36 (60%)	17 (28.33%)	53 (44.16%)
Overweight	Median>+1SD to<+3SD	6 (10%)	5 (8.33%)	11 (9.16%)
Obesity	>+3SD	-	3 (5%)	3 (2.5%)

Classification based on WHO (2006) z-score

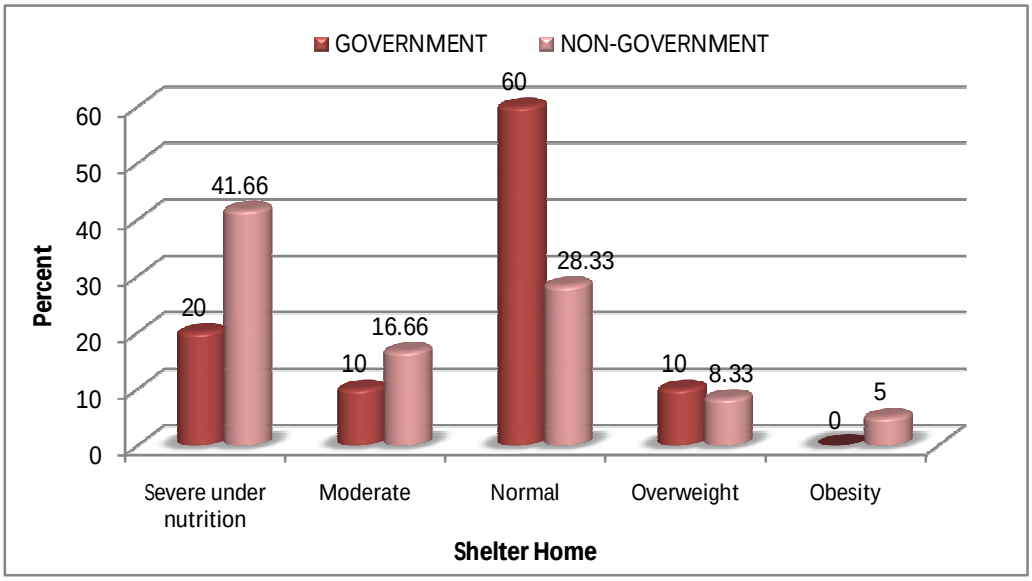

Fig. 4.4: Percentage distribution of anthropometric indicators (BMI for age) among government and non-government shelter home

Malnutrition is a persistent problem in India, though its often confused with hunger. According to the food agriculture organization (FAO), about 18 per cent of India's population was undernourished in 2012. According to UNICEF, India houses one third of the stunted, wasted and malnourished children of the world (Virmani, 2013).

Nutritional status has been assessed using the indicator BMI- for- age and compared with the z-score classification by WHO (2007) and as per the data from Table 4.6 and figure 4.4 it was observed that 20 per cent of girls from government

shelter home and 41.66 percent of girls from non-government shelter home were found severely under nourished. Whereas 60 per cent girls from government shelter home and 28.33 per cent girls from non-government shelter home were found in normal range. Moderate malnutrition was found among 10 per cent girls from government shelter home and 16.66 percent girls from non-government shelter home.

The findings of the study are in agreement with the findings of Mandot *et al.* (2009) which revealed that prevalence of thinness was higher among boys (69.7%) than girls (59.3%) belonging to Garasia tribe inhabiting in the Sirohi district of south Rajasthan.

Results of the present study are also congruent with the study conducted by Abdelaziz1 *et al.* (2015) which revealed that dietary habits were studied using a food frequency questionnaire. Obtained BMI z-scores as revealed that 2.8 per cent children were underweight (<−2SD) and 34.4 per cent were obese (>+2SD). More boys were found to be underweight (3%) than girls (2.2%).

The findings of the study are further supported by the study of Pradhan and Sharma (2011) which revealed that the overall (age-sex combined) prevalence of undernutrition among Bhil tribal children was as follows: underweight (69.3%), stunting (63.4%) and wasting (58.7%). In girls, prevalence of underweight (72.7%) and wasting (61.1%) was higher in comparison to boys (66.2% underweight and 56.4% wasting). However, boys suffered more by undernutrition than girls in the age group of 4- 6 years.

4.2.3 Clinical assessment

Clinical assessment is important for assessing the levels of health of individuals as influenced by the diet consumed. Clinical deficiency signs relate directly to the inadequate nutrition that can be seen or felt in superficial epithelial tissues, especially skin, eyes, hair and buccal mucosa. (Jellife, 1966).

Table 4.7: Clinical assessment of school going girls from government and non-government shelter home

(N=120)

Characteristics	Shelter home		Total
General appearance	Government	Non-government	

Good	50 (83.33%)	55 (91.66%)	105(87.5%)
Fair	10(16.66%)	5(8.33%)	15(12.5%)
Poor			
Very Poor			
Hair			
Normal	52(86.66%)	54(90%)	106(88.33%)
Lack of luster	8(13.33%)	6(10%)	14(11.66%)
Flag sign			
Thinness and sparseness			
Premature whitening			
Easy pluckability			
Face			
Normal	52(86.66%)	55(91.66%)	107(89.16%)
Diffused pigmentation			
Moon face	8(13.33%)	5(8.33%)	13(10.83%)
Eyes			
Normal	55(91.66%)	54(90%)	109(90.83%)
Night blindness			
Pale conjunctiva	5(8.33%)	6(10%)	11(9.16%)
Xerophthalmia			
Bitot spot			
Lips			
Normal	56(93.33%)	57(95%)	113(94.16%)
Angular stomatitis			
Angular scars			
Cheilosis	4(6.66%)	3(5%)	7(11.66%)
Gums			
Normal	60(100%)	60(100%)	120(100%)
Spongy gums & bleeding			
Skin APPEARANCE			
Normal	60(100%)	60(100%)	120(100%)
Xerosis			
Follicular hyperkeratosis			
Teeth			
Good	50(83.33%)	50(83.33%)	100(83.33%)
Mottled & discolored			
Caries	10(16.66%)	10(16.66%)	20(16.66%)
Tongue			

Normal	52(86.66%)	56(100%)	108(90%)
Oedema			
Scarlet and raw tongue	8(13.33%)	4(6.66%)	12(10%)
Magenta tongue			
Atrophic papillae			
Glossitis			
Gland			
Normal	60(100%)	60(100%)	120(100%)
Thyroid enlargement			
Parotid enlargement			
Nails			
Normal	59(98.33%)	58(96.66%)	117(97.5%)
Koilonychia	1(1.66%)	2(3.33%)	3(2.5%)
Subcutaneous Tissue			
Oedema			
Normal	60(100%)	60(100%)	120(100%)

Table 4.7 reveal that regarding general appearance, out of total sample of 120 girls 87.5 per cent were having good and 12.5 per cent girls were having fair general appearance among both the shelter homes. From the data produced in the Table 4.7 it was observed that 88.33 per cent girls were having normal hair, whereas 11.66 per cent girls showed lack of luster among both the shelter homes. It was found that the eyes of majority of the girls (90.83 percent) were normal whereas 9.16 per cent had pale conjunctiva among both the shelter homes. Moon face was observed in 10.83 per cent of girls while the rest 89.16 percent were found to have normal face. Deficiencies due to B- complex vitamins like cheilosis of lips were found in 11.66 per cent of the girls respectively, whereas 10 per cent showed the signs like scarlet and raw tongue. The data indicate that 83.33 per cent girls were having normal teeth while 16.66 per cent girls had caries, respectively. All girls were having normal gums, skin and gland without any kind of thyroid enlargement among both the shelter homes. It was found that 2.5 per cent girls had spoon shaped nails i.e. koilonychia, which is the sign of severe iron deficiency. All girls were found to have normal subcutaneous tissue without any signs of oedema.

Table 4.8: Hemoglobin estimation of girls among government and non-government shelter homes

(N=120)

AGE (in years)	*Girls with Hemoglobin levels < 11.5-15.5 g/dl were ANAEMIC		*Girls with Hemoglobin levels >11.5-15.5 g/dl were NORMAL	
	G n=60	NG n=60	G n=60	NG n=60
7	0	1 (1.66%)	20 (33.33%)	13 (21.66%)
8	2 (3.33%)	1 (1.66%)	24 (40%)	20 (33.33%)
9	3 (5%)	4 (6.66%)	11 (18.33%)	21 (35%)

*According to Classification based on WHO (1968) hemoglobin estimation

G- Government

NG -Non government

Table 4.8 and figure 4.5 depicts the hemoglobin estimation of girls among government and non-government shelter home in the age group of 7-9 years was conducted and results reveals that 3.33 percent girls from government and 1.66 percent girls from non-government shelter home were anaemic in the age of 8 years. In the age of 9 years 6.66 percent girls from government and 5 percent girls from non-government shelter home were anaemic. Few girls 1.66 percent in the age of 7 years were anaemic and majority 33.33 percent in the age group of 7-8 years were non-anaemic. Table 4.8 clearly shows that most of the girls were anaemic in the age group of 8-9 years due to inadequate iron intake among girls in the shelter home.

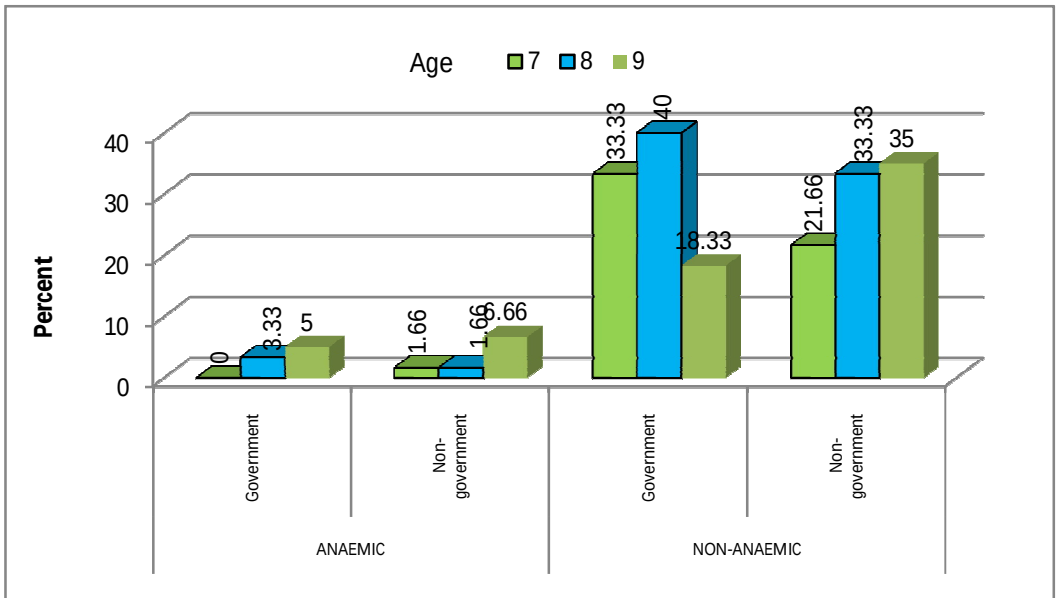

Fig. 4.5: Age wise percent comparison of hemoglobin levels of girls among government and non-government shelter homes

Iron deficiency is the most common and wide spread micronutrient deficiency in young children. Diets with inadequate level of iron impair physical growth, development and learning capacity in children. Global estimate of iron deficiency suggest that it affects 46 percent of school age children. The problem accentuating in developing nations whereas, the prevalence estimate range is 52 to 63 per cent (WHO, 2009).

A total of 550 children participated in the study, 26.2 per cent were anaemic, 54.9 percent iron deficient and 16.9 per cent had iron deficiency anaemia (IDA). It was observed that iron deficiency was significantly higher in girls compared to boys (Ngui *et al.*, 2012).

The results are in conformity with the study of Gain (2007) conducted in children of slum area Gorakhpur (India) revealed that prevalence of xerophthalmia was 10.9 and 8.9 per cent, night blindness was 0.58 and 0.29 per cent, conjunctival xerosis was 9.18 and 7.21 per cent.

Findings of the study are also in line with study of Shivaprakash and Joseph (2014) on 484 children who reported that the overall prevalence of underweight was 30.3 per cent (147) and stunting was 27.9 per cent (135). Pallor was noted in 123 (25.4%). Hair changes were seen in 19 children (3.9%). Eye changes noted in the

form of conjunctival xerosis in 100 (20.7%) and bitot's spots in 10 children (2.1%). Teeth changes were noted in the form of dental caries in 137 (28.3%) and enamel mottling in 19 children (3.9%). Skeletal changes were noted in 7 (1.4%) children. Flat nails or koilonychia were noted in 57 children (11.8%).

4.2.4 Dietary adequacy:

Dietary adequacy of the respondents was assessed by way of calculating the food intake as well as their nutrient intake.

(i) Food intake: In the present study food intake of the subject was studied by 24 hour recall method. Adequacy of food intake was compared with recommended dietary intake (RDI) given by NIN (2010) suggested for school going children. Data regarding food intake is presented in Table 4.9 and figure 4.6 and discussed below.

Cereals: Cereals constitute a major component of diets consumed of diet consumed in India. It contributes 70-80 per cent of calorie and a significant amount of several other nutrients except vitamin A and vitamin B. The mean per daily intake of cereals by school going girls of 7-9 year from government shelter home was 120.5±0.50 g/d. This was 66.94 per cent of the RDI. Table 4.9 and figure 4.6 reveals that there was inadequate intake of cereals in diet of respondents which may be due to their two time meal pattern and habit of skipping meal regularly.

Among school children, intake of macro and micronutrient rich foods such as cereals, pulses and green leafy vegetables, milk and milk products and fats and oils was lower than the RDI. Mean intake of all the nutrients was lower than the recommended level except for protein, calcium and thiamine (Laxmaaiah *et al.*, 2002).

Table 4.9: Mean daily food intake of school girls residing in government shelter home

(N=60)

Food group (g)	RDI (g)	Mean / SD	t value	Overall intake % age of RDI
Cereals	180g	120.5±0.50	921.77*	66.94
Pulses	60g	32.5±2.52	84.52*	54.16
Fats & Oils	30g	15.5±0.50	224.63*	51.66

Sugars & Jaggery	20g	15.25±0.25	147.17*	76.25
Green Leafy Vegetables	100g	50±0.50	774.59*	50
Roots & tubers	100g	62.5±2.52	115.26*	62.5
Other Vegetables	100g	70±10.08	23.05*	70
Fruits	100g	50.25±0.25	1541.44*	50.25
Milk & Milk products	500g	225±25.21	84.49*	45

RDI- Recommended Dietary Intake (NIN 2010).

*Significant at 0.5 per cent

Pulses: Pulses are the major source of protein in Indian diet. The recommendation for pulse consumption according to RDI is 60 g/d while the mean intake of pulse in the girls of government shelter home under study was only 32.5±2.52 g/d, which was 54.16 per cent of RDI. The intake was significantly ($p<0.05$) lower than RDI due to less consumption.

Milk and milk products: Milk is not only good source of protein, but it also provides calcium and riboflavin. The mean intake of milk and milk products was 225±25.21 ml/d; which was 45 per cent of RDI. The intake was significantly lower ($p<0.05$) than RDI.

Green leafy vegetables (GLVs): Green leafy vegetables are rich sources of calcium, iron, β- carotene, vitamin-c, riboflavin and folic acid. These not only provides essential nutrient but also provide bulk to the diet. In the present study the consumption of green leafy vegetables was inadequate in amount. The mean intake of green leafy vegetables was 50±0.50g/d, which was 50 per cent of RDI.

Roots and tubers: Root and tubers are richest sources of energy among vegetables. They also provide β-carotene (carrot), vitamin C (potato) and calcium (tapioca). Analysis of Table 4.9 and figure 4.6 indicates the mean intake of roots and tubers was found to be 62.5±2.52g/d, which was 62.5 per cent of RDI. It was found that consumption of root and tubers was significantly lower ($p<0.05$) than RDI. Consumption of potato was higher than carrot and onion as it was cheaper than other vegetables and thus affordable.

Other vegetables: Vegetables other than green leafy vegetables and root- tubers are categorized as other vegetables. This group of vegetables not only adds Variety to the diet, but also provides vitamin, minerals and dietary fiber. Perusal of Table 4.9 and figure 4.6 indicates that mean intake of other vegetables was 70±10.08 g/d which was significantly ($p<0.05$) lower than RDI with 70 per cent of RDI. In Other vegetables frequently consumed vegetables by girls in government shelter home included ladyfinger, lauki, arbi, tomato.

Fruits: Fruits are generally good source of vitamin C. In addition they also provide β carotene (papaya), energy (banana), and iron (dried fruits). Fruits also contain pectin, which provides bulk to the diet. Table 4.9 and figure 4.6 reveals that mean intake of fruits was 50.25±0.25 g/d. The consumption of fruits was found significantly ($p<0.05$) lower than RDI and the factor leading to this may be that the respondents were belonging to shelter homes and were not able to buy fruits for daily consumption. The fruits that were consumed mostly were banana and guava as it was cheaper than other fruits.

Sugar: Sugar and jaggery are sweetening agents and consumed by almost all people in varying amounts. They are added to beverages and other food to increase palatability. The mean intake of sugar was 15.25±0.25g/d which was 76.25 per cent of RDI. The consumption of sugar was less significant ($p<0.05$) when compared with RDI.

Fat and oils: The visible fats commonly in India are hydrogenated fats, oils, butter and ghee. Fat and oils provide essential fatty acids like linoleic and linolenic acid which are essential fatty acid for health. Fat is also known as the concentrated source of energy providing 9 kcal/g. The mean intake of fat was 15.5±0.50 g/d (visible) which was 51.66 per cent of the RDI. The mean intake was significantly ($p<0.05$) lower than RDI, since respondents consumed oil on daily basis but ghee was consumed only occasionally. This is may be attributed to unaffordability of ghee due to its high cost.

The results highlighted are in conformity with the Dietary surveys conducted by (NFHS, 2006; NNMB, 2006-07) in various parts of the country and have shown that majority of our school children consumed inadequate amount of cereals, pulses

and green leafy vegetables. The deficit in food intake were replicated in the nutrient intake i.e. energy protein, vitamin A, riboflavin, iron and folic acid.

Murugkar *et al.* (2013) in study on nutritional status of 200 school going children (6-9 years) in Bhopal district reported that except fat, diet consumed lacked all major and minor nutrients required for growth of children. Nutritional inadequacies, poverty, lack of infrastructure and poor education of mother resulted in severe mal-nutrition in school going children.

ii) Food intake of girls in non- government shelter home: In the present study food intake of the subject was studied by 24 hour recall method. Adequacy of food intake was compared with recommended dietary intake (RDI) given by NIN (2010) suggested for school going girls. Data regarding food intake is presented in Table 4.10 and figure 4.6 and discussed below.

Cereals: The mean per daily intake of cereals by school going girls of 7-9 year from non-government shelter home was 135±15.126 g/d. This was 75 per cent of the RDI. Table 4.10 and figure 4.6 reveals that there was marginally inadequate intake of cereals in diet of respondents which may be due to their meal pattern and habit of consuming meal irrregularly by the girls in non-government shelter home and some knowledge of workers or administrative department about food, food groups and balanced diet.

Table 4.10: Mean daily food intake of school girls from non- government shelter home

(N=60)

Food group (g)	RDI (g)	Mean / SD	t value	Overall % intake of RDI
Cereals	180g	135±15.126	23.04*	75
Pulses	60g	40±5.04	30.73*	66.66
Fats & Oils	30g	10.5±0.50	302.09*	35
Sugars & Jaggery	20g	11±1.00	69.71*	55
Green Leafy Vegetables	100g	7.5±2.52	284.32*	7.5
Roots & tubers	100g	30±2.01	269.76*	30
Other Vegetables	100g	60±5.04	61.47*	60
Fruits	100g	62.5±2.52	115.26*	62.5
Milk & Milk products	500g	225±25.21	84.49*	45

RDI- Recommended Dietary Intake (NIN 2010).

*Significant at 0.5 per cent

Pulses: The mean intake of pulse in the girls of non-government shelter home under study was only 40±5.04 g/d, which was 66.66 per cent of RDI. The intake was significantly ($p<0.05$) lower than RDI due to inadequate consumption which may lead to protein energy malnutrition girls.

Milk and milk products: The mean intake of milk and milk products was 225 ±25.21 ml/d; which was 45 per cent of RDI. The intake was significantly lower ($p<0.05$) than RDI.

Green leafy vegetables (GLVs): In the present study the consumption of green leafy vegetables was inadequate in amount. The mean intake of green leafy vegetables was 7.5±2.52g/d, which was 7.5 per cent of RDI.

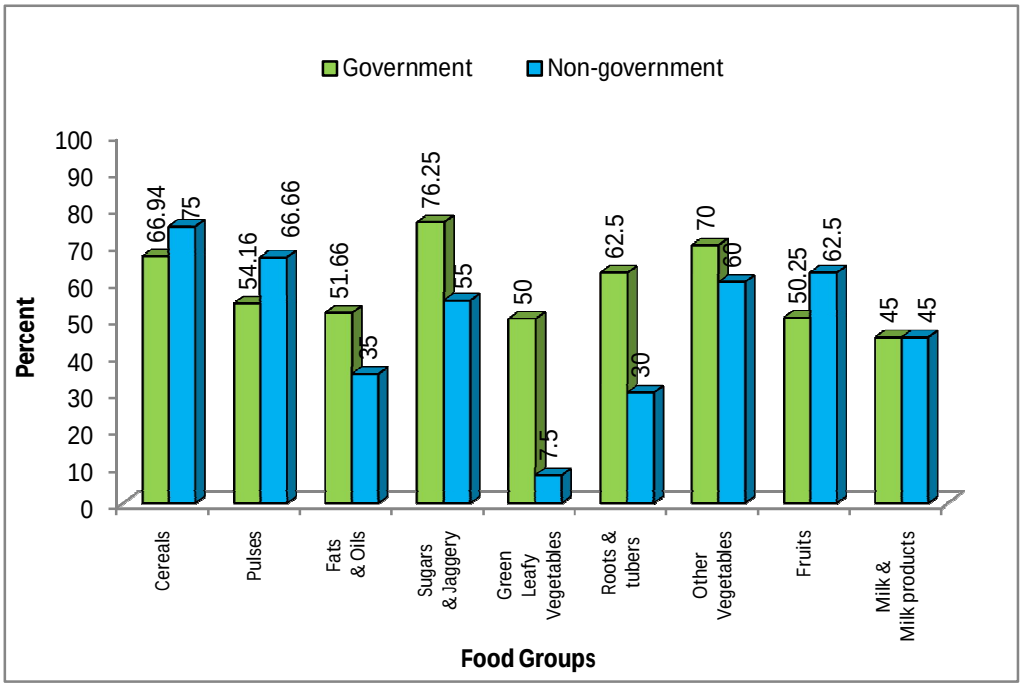

Fig. 4.6: Percentage comparison of daily food intake of school girls from government and non- government shelter home

Roots and tubers : Analysis of Table 4.10 and figure 4.6 indicates the mean intake of roots and tubers was found to be 30±2.01g/d, which was 30 per cent of RDI. It was found that consumption of root and tubers was significantly lower ($p<0.05$) than RDI. Consumption of potato was higher than onion as it was cheaper than other vegetables and thus affordable.

Other vegetables: Vegetables other than green leafy vegetables and root- tubers are categorized as other vegetables. This group of vegetables not only adds Variety to the diet, but also provides vitamin, minerals and dietary fiber. In Other vegetables frequently consumed vegetables by girls included ladyfinger, lauki, arbi, tomato. Perusal of Table 4.10 and figure 4.6 indicates that mean intake of other vegetables was 60±5.04 g/d which was significantly ($p<0.05$) lower than RDI with 60 per cent of RDI

Fruits: Table 4.10 and figure 4.6 reveals that mean intake of fruits was 62.5±2.52 g/d. The consumption of fruits was found significantly ($p<0.05$) lower than RDI and the factor leading to this may be that the respondents were living in shelter home and

were not able to buy fruits for daily consumption. The fruits that were consumed mostly were apple and banana as it was cheaper than other fruits.

Sugar: The mean intake of sugar was 11±1.00 g/d which was 55 per cent of RDI. The consumption of sugar was significant ($p<0.05$) when compared with RDI among non-government shelter home.

Fat and oils: The mean intake of fat was 10.5±0.50 g/d (visible) which was 35 per cent of the RDI. The mean intake was significantly ($p<0.05$) lower than RDI, since respondents consumed oil on daily basis but ghee was consumed only occasionally by girls in shelter home. This is may be attributed to unaffordability of ghee due to its high cost.

Table 4.11: Comparison between mean daily food intake of girls from government and non-government shelter home

(N=120)

Food group	RDI (g)	Mean ± SD		t value		Government / non-government t value
		Government (n=60)	Non-government (n=60)	Government	Non-government	
Cereals	180	120.5±0.50	135±15.126	921.77*	23.04*	7.42*
Pulses	60	32.5±2.52	40±5.04	84.52*	30.73*	10.30*
Fats & Oils	30	15.5±0.50	10.5±0.50	224.63*	302.09*	54.77*
Sugar & Jaggery	20	15.25±0.25	11±1.00	147.17*	69.71*	31.93*
Milk & Milk products	500	225±25.21	225±25.21	84.49*	84.49*	0 NS
Green leafy vegetables	100	50±0.50	7.5±2.52	774.59*	284.32*	128.13*
Roots & tubers	100	62.5±2.52	30±2.01	115.26*	269.76*	78.09*
Other vegetables	100	70±10.08	60±5.04	23.05*	61.47*	6.87*
Fruits	100	50.25±0.25	62.5±2.52	1541.44*	115.26*	37.47*

RDI Recommended Dietary intake (NIN 2010)

* Significant at 5% level

NS-Non-significant

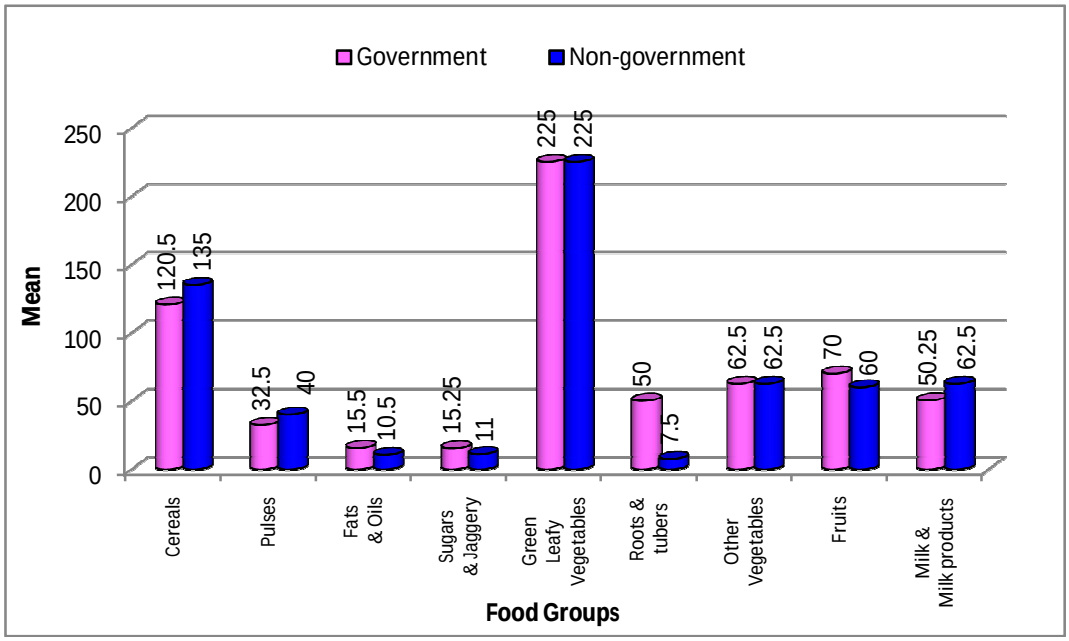

Fig. 4.7: Mean comparison between mean daily food intake of girls from government and non-government shelter home

Table: 4.11 and figure 4.7 indicates comparison between daily food intake of girls residing in government and non-government shelter homes. The mean per daily intake of cereals by school going girls of government and non-government shelter home was 120.5±0.50 g/d and 135±15.126 g/d respectively. Significant differences between RDI and individual intake of cereals was observed in girls of government and non-government shelter home however there is significant difference between cereal intake of girls from both shelter home was observed. The mean intake of pulses was 32.5±2.52 g/d and 40±5.04 g/d for girls from government and non-government, respectively. When compared to recommended dietary allowances some significant differences were observed in intake among girls of both shelter homes. Also intake of pulses of girls from different shelter home differed significantly. Regarding fats and oil consumption significant difference between the fat intake girls was found. The mean intake of sugar of girls was 15.25±0.25 g/d and 11±1.00 g/d from government and non-government shelter home respectively. Significant ($p<0.05$) difference was observed in the intake of sugar among girls from both shelter home. Intake of milk and milk products reveals that there is no significant difference between intake of milk and milk products in school going girls from both shelter homes but differ significantly when compared with RDI. Results shows that the consumption of green leafy vegetables and other vegetables was significant lower in both groups ($p<0.05$)

than the RDI and significant difference was observed in the intake of vegetables of girls. As results shows mean intake of roots and tubers in girls of government and non-government shelter home was 62.5±2.52g/d and 30±2.01 g/d respectively which reveals significant difference among them in terms of intake of roots and tubers. Table 4.11 and figure 4.7 depicts that the mean intake of fruits was 50.25±0.25 g/d and 62.5±2.52 g/d in girls of both shelter home respectively which further predicts significant difference between intake of girls.

(ii) Nutrient intake of school going girls from government shelter home: Mean nutrient intake of each subject was calculated by using food consumption Tables (Gopalan *et al.,* 1989) and compared with recommended dietary allowances (ICMR-2008) from a computer programme developed by Choudhary *et al.* (2001) in DBMS package. The overall intake of nutrients like protein, fat, carbohydrates, and energy was calculated. Further per cent adequacy was calculated by dividing mean nutrient intake of school going girls for each nutrient by the recommended dietary allowances given by ICMR (2010) for each nutrient and then multiplying the values by 100.

Energy: The energy requirement of an individual is the level of energy intake from food which is necessary for maintenance of economically necessary and socially desirable physical activity. Energy needs of school going girls are influenced by activity level, basal metabolic rate and increased requirement to support physical growth and development. Table 4.12 and figure 4.8 throws light on the mean daily nutrient intake of the school girls from government shelter home as observed from the figures in the Table that the mean intake of energy of the school girls from government and non-government shelter home was found to be 963.30 ± 36.98 kcal/d which was 57 per cent of RDA which reflects no significant difference between the energy intake of the school girls and the RDA at ($p<0.05$) among both the shelter homes.

Further the results are supported by the study conducted by Awasthi *et al.* (2000) regarding the assessment of nutritional status of school children of Sultanpur district of eastern Uttar Pradesh whose findings reveal that the dietary intake pattern of children studied was deficient in energy as compared to RDA which ultimately resulted in nutritional deficiency disorders among them.

Martorell *et al.* (2004) reported that low intake for energy, protein and other nutrients, together with high infection rates and poor socio-economic status may lead to linear growth retardation and impaired child development.

Protein: Proteins are vital to any living organism. Proteins are essential for life as they are the basic constituent of our body and involved in the structure of living cell and its functions. Protein keeps the body healthy by resisting disease that is common to malnourished people. Table 4.12 and figure 4.8 indicates that mean intake of protein of the school girls of government was found to be 29.95 ± 1.60 g/d which represents 101.52 per cent of RDA. Significant difference was observed in the mean intake of protein in government and non-government shelter home and the RDI at ($p<0.05$).

The results highlighted above are congruent with the findings of Rajbala (2010), which reveal that, mean daily intake of cereals and pulses was 75.4 and 47.0 per cent of RDI which was significantly lower than RDI and mean daily intake of protein was 81.5 per cent and energy was 82.6 per cent which were lower than RDA. Mean intake of iron (44.6%), zinc (65.8%) and vitamin A (25.2%) was also found to be significantly lower than RDI.

Table 4.12: Mean daily nutrient intake of school girls from government shelter home

(N=60)

Nutrients	Government shelter home			
	RDA	Government (n= 60)	Overall % intake of RDA	t value
Energy (Kcal/d)	1690	963.30±36.98	57	152.21*
Protein (g/d)	29.5	29.95±1.60	101.52	2.17*
Fat (g/d)	30	27.52±1.600	91.73	12.0*
β- carotene (ug/d)	4800	3740±87.05	77.91	94.32*
Thiamine(mg/d)	0.8	0.84±0.033	105	11.68*
Riboflavin(mg/d)	1.0	0.89±0.062	89	12.72*
Niacin (mg/d)	13.0	7.07±0.15	54.38	306.22*
Carbohydrate (g/d)	253.5	148.941±4.03	58.75	200.97*
Ascorbic acid (mg/d)	40	64.26±2.12	160.65	88.64*
Iron (mg/d)	16	17.22±0.27	107.62	35.0*

Calcium (mg/d)	600	449.31±36.58	74.88	31.56*

RDA- Recommended Dietary Allowances (ICMR 2010).
* Significant at 5% level

Fat : The human body requires dietary fat and essential fatty acids for normal growth and development. Fat is the most concentrated source of energy. Dietary fat provides essential fatty acids which are the functional components of membrane lipids and have important metabolic functions (Gopalan *et al.*, 1989).

Table 4.12 and figure 4.8 indicates that mean intake of fat for the school going girls from government shelter home was observed to be 27.52 ± 1.60 g/d which was 91.73 per cent of RDA. The intake was significantly lower ($p<0.05$) than the RDA. The intake of fat were somewhat similar in both the shelter home.

Carbohydrates: Carbohydrates provide a considerable part of energy in human diets and up to 60-65 per cent of the energy may come from this source (Gopalan *et al.*, 1989). Carbohydrates are consumed in various forms like starch, glucose, cane sugar, mik sugar etc. Carbohydrates- rich foods, such as fruit, vegetables, whole grains and legumes are also the main source of dietary fiber. Average dietary intake of carbohydrate by school girls was 148.94 ± 4.03 g/d as per the data showcased in Table 4.12 and figure 4.8 in government shelter home. It was 58.75 per cent of RDA which indicates that intake was significantly ($p<0.05$) less than RDA by the subjects.

Calcium: Calcium is most important divalent cation in the human body, making up to 1.5-2 per cent of its total weight. It performs various structural regulatory functions. Among the five group's milk and milk products form a major source of calcium in diet. The mean intake of calcium among school girls of government shelter home was found to be 449.31 ± 36.58 mg/d. It was 74.88 per cent of RDA respectively. Intake of calcium was significantly ($p<0.05$) similar in both shelter home but lower when compared to RDA. In context of the present study it may be due to low inclusion of calcium rich foods in daily diet among girls of shelter home.

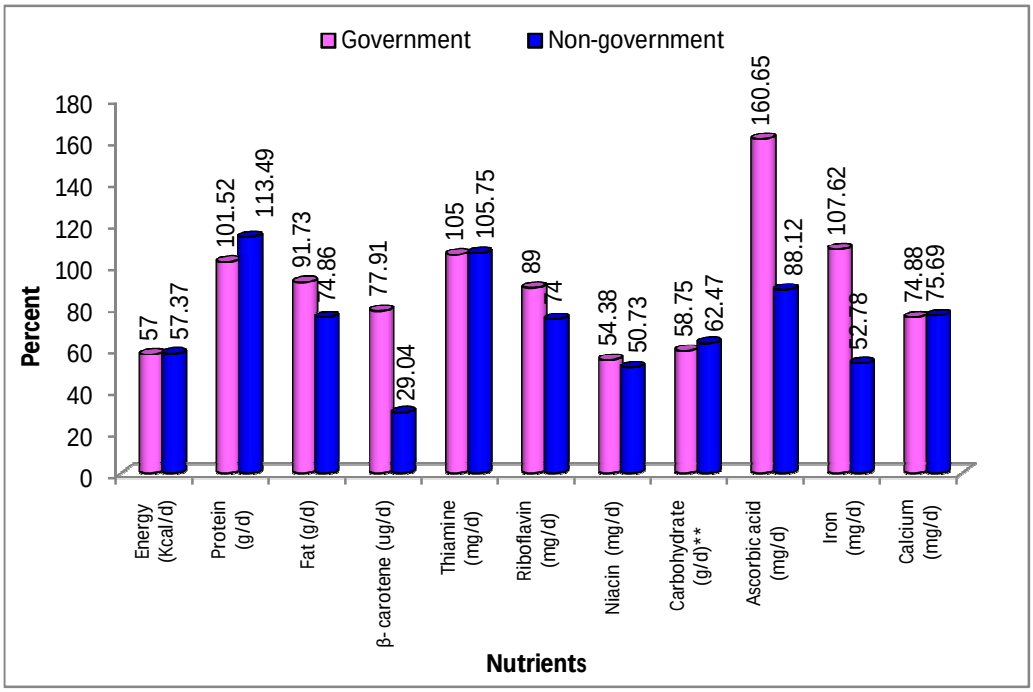

Fig. 4.8: Percentage comparison between mean daily nutrient intake of girls from government and non –government shelter home

Iron: Iron has several vital functions in the body as a carrier of oxygen to the tissue from lungs, as a transport medium electron, with in cells and an integral part of important enzyme reactions in various tissue (Gopalan *et al.*,1989) .The mean intake of iron among school girl of government shelter home was 17.22 ± 0.27 mg/d as per the data presented in Table 4.12 and figure 4.8.. The values were found lower as the observations of dietary survey revealed less consumption of green leafy vegetables, jaggery and other iron rich sources by the school going girls in their diets.

β- carotene: β- carotene is considered a provitamin because it can be converted to active vitamin A. Vitamin A serves biological functions including involvement in the synthesis of certain glycoproteins, which is a molecule, composed of a protein and a carbohydrates. Vitamin A leads to abnormal bone development, disorder of the reproductive system and ultimately death. Vitamin A deficiency leads to low vision abnormal bone development. Beta-carotene is also converted to retinol, which is essential for vision. The mean intake of carotene among school girls of government shelter home was found to be 3740±87.05 ug/d which was 77.91 per cent of RDA. The intake of vitamin A by the subjects was reported low among both shelter home because consumption of green leafy vegetables and fruits was very poor however the

main sources of carotene included in diet were spinach, tomato, milk, fenugreek leaves.

Ascorbic acid: Vitamin C is used by the body for many different functions including creating collagen, converting carbohydrates into energy and is use as an antioxidant. For the reason, vitamin C is an important nutrient during childhood growth and development. As observed from Table 4.12 and figure 4.8 the mean intake of ascorbic acid for school girls of government shelter home was 64.26 ± 2.12 mg/d which was 160.65 per cent of RDA.

Thiamine: Thiamine plays an essential role in the supply of energy to the tissue, in carbohydrates metabolism and in the metabolic links between carbohydrates, protein and fat metabolism. The mean intake of thiamine by the girls of government shelter home was found 0.84 ± 0.033 mg/d. which was 105 per cent of RDA which indicates that there is no significant difference in the intake of thiamine among both shelter home.

Riboflavin: Riboflavin is involved in vital metabolic process in the body and is necessary for energy production and normal cell functioning and growth thus it is required in adequate amount by children. The mean intake of riboflavin was found to be 0.89± 0.062 mg/d, which was 89 percent of RDA among government shelter home. Table 4.12 and figure 4.8 reveals that riboflavin intake was significantly ($p<0.05$) lower than RDA.

Niacin: Niacin is a generic descriptor for the closely related compounds, nicotinic acid and its amide nicotinamide, which act similarly as nutrients. Niacin is found in a wide range of foods. Important sources of preformed niacin include beef, pork, whole grain cereals, eggs and cow's milk. The mean intake of niacin among girls was found to be 7.07 ± 0.1 mg/d, which was 54.38 percent of RDA. The intake of niacin was found to be significantly ($p<0.05$) lower in both the shelter home than RDA.

(ii) Nutrient intake of school going girls from non- government shelter home: Mean nutrient intake of each subject was calculated by using food consumption Tables (Gopalan *et al.,* 1989) and compared with recommended dietary allowances (ICMR- 2008) from a computer programme developed by Choudhary *et al.* (2001) in DBMS package. The overall intake of nutrients like protein, fat, carbohydrates, and

energy was calculated. Further per cent adequacy was calculated by dividing mean nutrient intake of school going girls for each nutrient by the recommended dietary allowances given by ICMR (2010) for each nutrient and then multiplying the values by 100.

Energy: Table 4.13 and figure 4.8 throws light on the mean daily nutrient intake of the school girls from non-government shelter home as observed from the figures in the Table that the mean intake of energy of the school girls from non-government shelter home was found to be 969.68±85.28 kcal/d which was 57.37 per cent of RDA which reflects no significant difference between the energy intake of the school girls and the RDA at ($p<0.05$) among both the shelter homes.

Protein: Table 4.13 and figure 4.8 indicates that mean intake of protein of the school girls of government was found to be 33.48±3.78 g/d which represents 113.49 per cent of RDA. Significant difference was observed in the mean intake of protein in non-government shelter home and the RDI at ($p<0.05$).

Table 4.13: Mean daily nutrient intake of school girls from non- government shelter home

(N=60)

Nutrients	Non-Government shelter home			
	RDA	**Government (n= 60)**	**Overall % intake of RDA**	**t value**
Energy (Kcal/d)	1690	969.68±85.28	57.37	65.42*
Protein (g/d)	29.5	33.48±3.78	113.49	8.15*
Fat (g/d)	30	22.46±0.84	74.86	69.52*
β- carotene (ug/d)	4800	1394.275±86.58	29.04	304.70*
Thiamine(mg/d)	0.8	0.8465±0.098	105.75	3.63*
Riboflavin(mg/d)	1.0	0.74±0.079	74	25.19*
Niacin (mg/d)	13.0	6.595±0.719	50.73	69.05*
Carbohydrate (g/d)	253.5	158.37±15.63	62.47	47.14*
Ascorbic acid (mg/d)	40	35.25±2.00	88.12	18.39*
Iron (mg/d)	16	8.445±0.99	52.78	59.11*
Calcium (mg/d)	600	454.195±43.76	75.69	25.80*

RDA- Recommended Dietary Allowances (ICMR 2010).
* Significant at 5% level

Fat : Table 4.13 and figure 4.8 indicates that mean intake of fat for the school going girls from non- government shelter home was observed to be 22.46±0.84 g/d which was 74.89 per cent of RDA. The intake was significantly lower ($p<0.05$) than the RDA. The intake of fat were somewhat similar in both the shelter home.

Carbohydrates : Carbohydrates provide a considerable part of energy in human diets and up to 60-65 per cent of the energy may come from this source (Gopalan *et al.*, 1989). Average dietary intake of carbohydrate by school girls was 158.37 ± 15.63 g/d as per the data showcased in Table 4.13 and figure 4.8 in non-government shelter home. It was 62.47 per cent of RDA which indicates that intake was significantly ($p<0.05$) less than RDA by the subjects.

Calcium: The mean intake of calcium among school girls of government shelter home was found to be 454.195±43.76 mg/d. It was 75.69 per cent of RDA respectively. Intake of calcium was significantly ($p<0.05$) similar in both shelter home but lower when compared to RDA. In context of the present study it may be due to low inclusion of calcium rich foods in daily diet among girls of shelter home.

Iron: .The mean intake of iron among school girl of non-government shelter home was 8.445±0.99 mg/d as per the data presented in Table 4.13 and figure 4.8.. The values were found lower as the observations of dietary survey revealed less consumption of green leafy vegetables iron rich sources by the school going girls in their diets.

β- carotene: The mean intake of carotene among school girls of non-government shelter home was found to be 1394.275±86.58 ug/d which was 29.04 per cent of RDA. The intake of vitamin A by the subjects was reported low among both shelter home because consumption of green leafy vegetables and fruits was very poor however the main sources of carotene included in diet were spinach, tomato, milk, fenugreek leaves.

Ascorbic acid: As observed from Table 4.13 and figure 4.8 the mean intake of ascorbic acid for school girls of non-government shelter home was 35.25 ± 2.00 mg/d which was 88.12 per cent of RDA.

Thiamine: The mean intake of thiamine by the girls of non-government shelter home was found 0.8465 ± 0.098 mg/d. which was 105.75 per cent of RDA which indicates that there is no significant difference in the intake of thiamine among both shelter home.

Riboflavin: The mean intake of riboflavin was found to be 0.74± 0.079 mg/d, which was 74 percent of RDA among non-government shelter home. Table 4.13 and figure 4.8 reveals that riboflavin intake was significantly ($p<0.05$) lower than RDA.

Niacin: The mean intake of niacin among girls was found to be 6.595 ± 50.73 mg/d, which was 50.73 percent of RDA. The intake of niacin was found to be significantly ($p<0.05$) lower in both the shelter home than RDA.

Table 4.14: Comparison between mean daily nutrient intake of girls from government and non –government shelter home

(N=120)

Nutrients	Mean±SD			t- value		Government /Non-government t t-value
	RDA	Government (n= 60)	Non-government (n= 60)	Government	Non-government	
Energy (Kcal/d)	1690	963.30±36.98	969.68±85.28	152.21*	65.42*	0.53 NS
Protein (g/d)	29.5	29.95±1.60	33.48±3.78	2.17*	8.15*	6.66*
Fat (g/d)	30	27.52±1.600	22.46±0.84	12.0*	69.52*	21.68*
β- carotene (ug/d)	4800	3740±87.05	1394.275±86.58	94.32*	304.70*	147.99*
Thiamine(mg/d)	0.8	0.84±0.033	0.8465±0.098	11.68*	3.63*	0.53 NS
Riboflavin(mg/d)	1.0	0.89±0.062	0.74±0.079	12.72*	25.19*	12.60*
Niacin (mg/d)	13.0	7.07±0.15	6.595±0.719	306.22*	69.05*	5.12*
Carbohydrate (g/d)**	253.5	148.941±4.03	158.37±15.63	200.97*	47.14*	4.52*
Ascorbic acid (mg/d)	40	64.26±2.12	35.25±2.00	88.64*	18.39*	77.10*
Iron (mg/d)	16	17.22±0.27	8.445±0.99	35.0*	59.11*	66.27*

Calcium (mg/d)	600	449.31±36.58	454.195±43.76	31.56*	25.80*	0.66***

RDA- Recommended Dietary Allowances (ICMR 2010).
* Significant at 5% level
NS-non-significant

Table 4.14 throws light on the comparison between mean daily nutrient intake of the school girls from government and non- government shelter home as observed from the figures in the Table that the mean intake of energy of the school girls from government and non-government shelter home was found to be 963.30 ± 36.98 kcal/d and 969.68± 85.28 kcal/d , which was 57 and 57.37 per cent of RDA which reflects no significant difference between the energy intake of the school girls and the RDA at ($p<0.05$) among both the shelter homes. Mean intake of protein of the school girls of government and non-government shelter home was found to be 29.95 ± 1.60 g/d and 33.48 ± 3.78 g/d which represents 101.52 and 113.49 per cent of RDA. Significant difference was observed in the mean intake of protein in government and non-government shelter home and the RDA at ($p<0.05$). Mean intake of fat for the school going girls from government shelter home was observed to be 27.52 ± 1.60 g/d and non-government shelter home were 22.46±0.84 g/d which was 91.73 and 74.86 per cent of RDA. The intake was significantly lower ($p<0.05$) than the RDA. The intake of fat were somewhat similar in both the shelter home. Average dietary intake of carbohydrate by school girls was 148.94 ± 4.03 g/d as per the data showcased in Table 4.12 and figure 4.10 in government shelter home. It was 58.75 per cent of RDA which indicates that intake was significantly ($p<0.05$) less than RDA by the subjects. In Non-government shelter home the average dietary intake of carbohydrates by school girls was 158.37 ± 15.63 g/d and it was 62.47 percent of RDA which indicates that there was significant difference in the intake of the respondents among both shelter homes. The mean intake of calcium among school girls of both shelter home was found to be 449.31 ± 36.58 and 454.195 ± 43.76 mg/d . It was 74.88 and 75.69 per cent of RDA respectively. Intake of calcium was significantly ($p<0.05$) similar in both shelter home but lower when compared to RDA. The mean intake of iron among school girl of government and non-government shelter home was 17.22 ± 0.27 mg/d and 8.445±0.99 as per the data presented in Table 4.14. The results showed that intake was significantly lower in non- government shelter home ($p<0.05$) than

RDA. The mean intake of β- carotene among school girls of both shelter home was found to be 3740±87.05 and 1394.275± 86.58 ug/d which was 77.91 and 29.04 per cent of RDA. Mean intake of ascorbic acid for school girls of government and non-government shelter home was 64.26 ± 2.12 and 35.25± 2.00 mg/d which was 160.65 and 88.12 per cent of RDA. The mean intake of thiamine by the girls of both shelter home was found 0.84 ± 0.033 and 0.8465 ± 0.098 mg/d. which was 105 per cent of RDA which indicates that there is no significant difference in the intake of thiamine among both shelter home. The mean intake of riboflavin was found to be 0.89± 0.062 and 0.74± 0.079 mg/d, which was 89 and 74 percent of RDA among government and non-government shelter home. The mean intake of niacin among girls was found to be 7.07 ± 0.15 and 6.595± 0.719mg/d, which was 54.38 and 50.73 percent of RDA. The intake of niacin was found to be significantly ($p<0.05$) lower in both the shelter home than RDA.

4.3 IMPACT OF NUTRITION EDUCATION PROGRAMME ON NUTRITIONAL KNOWLEDGE OF WORKERS

Nutritional education is one of the effective intervention strategies for bringing about nutritional knowledge, attitudinal and behavioral change in the individual. Nutritional education is one of the effective means of alerting of individuals particularly women and communities of the need for nutrition improvement. It is the step towards improving food habits.

The ultimate goal of nutrition education is to aid individual to effectively apply nutritional knowledge, attitudes beliefs and practices and modify their diets. A well planned and well delivered nutrition education programme targeted at workers of shelter home may produce workers to be motivated, knowledgeable, and skilled and who can be empowered to make informed decisions on nutritional issues of girls. Workers of shelter home should be the important target group in nutrition education programmes because the maintenance of adequate health particularly of girls in shelter home is a critical maternal role of workers in shelter home. This is because workers in the shelter home are a crucial link between the health care system among girls and in addition, they produce, prepare and serve food and maintain the healthy diet of girls in shelter home. Nutritional status of girls in shelter home is associated

with the nutritional knowledge of workers in shelter home. This justifies the choice of worker as the primary target group for the present study.

A) Nutritional knowledge of respondents

To know the overall nutritional knowledge of respondents, three knowledge categories were made i.e. Inadequate, Marginally Inadequate and Adequate on the basis of the score obtained by respondents in the knowledge test. Nutritional knowledge of the respondents was assessed before and after delivery of nutrition education programme and change in knowledge scores were calculated.

Table 4.15: Overall knowledge of respondents of government shelter home

N=5

Levels	Score	Pre test		Post test		Paired t-value
		F	%	F	%	
Inadequate	Below 50%	5	100	0	0	9.35*
Marginally Inadequate	50-75%	0	0	1	20	
Adequate	76% and above	0	0	4	80	
Total score =40						

* Significant at 0.5 per cent

Table 4.15 gives a consolidated picture of the nutritional knowledge scores obtained by the respondents of government shelter home before and after delivery of nutrition education programme. As observed from Table 4.15 that initially or in pretest all the respondents had Inadequate level of overall nutritional knowledge. After the delivery of nutritional education package and from the post test scores it can be stated that majority of respondents (80%) shifted to adequate level of knowledge thus significant difference was found in the pre and post knowledge scores of respondents among government shelter home.

Table 4.16: Overall knowledge of respondents of non-government shelter home

N=5

Levels	Score	Pre test		Post test		Paired t-value
		F	%	F	%	
Inadequate	Below 50%	5	100	2	40	5.27*

Marginally Inadequate	50-75%	0	0	3	60	
Adequate	76% and above	0	0	0	0	
Total score =40						

* Significant at 0.5 per cent

As observed from Table 4.16 that initially or in pretest all the respondents had Inadequate level of overall nutritional knowledge. After the delivery of nutritional education package and from the post test scores it can be stated that majority of respondents (60%) shifted to marginally adequate level of knowledge thus significant difference was found in the pre and post knowledge scores of respondents among non- government shelter home as the workers of non-government shelter home were illiterate.

B) Knowledge of respondents in selected nutritional aspects

Seven aspects of nutrition were used to assess nutritional knowledge of workers i.e. food, food groups, functions of food, balance diet, nutrient deficiency disorders and their prevention and nutritional practices, cooking methods and knowledge of RDA.

Data presented in highlights the nutritional knowledge of the respondents in different aspects before and after nutrition education programme. Pre and Post test scores are depicted. The data from figure reveals that while only 40 and 8 per cent of respondents were having previous knowledge regarding aspects of food in government and non-government shelter home, after imparting nutrition education increase in knowledge was increased up to 88 and 70 per cent was witnessed. Data on knowledge regarding ‘food groups shows that initially only 85 and 28 per cent workers were aware regarding this aspect in government and non-government shelter home but after imparting nutrition education the percentage increased to 85 and 75 per cent.

Similarly in the aspect ‘functions of food’, initially or prior to nutrition education programme only 20 per cent respondents of government shelter home had knowledge whereas the zero percentage among non-government shelter home and increased to 100 and 50 per cent after the programme. Information regarding balanced

diet shows initially 33per cent respondents in government shelter home were aware regarding this concept but after nutrition education programme gain in percentage was observed to 100 and 47 per cent in government and non-government shelter home. Very few (22%) of respondents were aware in government shelter home about 'Nutritional deficiency disease but after imparting knowledge greater percentage of the respondents (86% and 61%) gained knowledge in this aspect. Similar observation was recorded for cooking methods where the respondents initial knowledge was 50 and 20 per cent which was increased to 84 and 64 per cent was found. There is negiligible knowledge of RDA among respondent of both shelter home and it was increased upto (60 and 50%) among workers of both shelter home.

Table: 4.17: Nutrition Aspects wise mean knowledge score of workers's regarding nutrition among government and non-government shelter home

(N=10)

S. No.	Aspects	Mean score ±SD	
		Government n=5	Non-Government n=5
1.	**Food**	48±22.80	62±24.90
2.	**Food groups**	40±31.12	47.50±43.66
3.	**Functions of food**	80±29.81	49.99±23.57
4.	**Balanced diet**	66.67±0.00	46.66±21.73
5.	**Nutritional deficiency disease**	48±13.03	39.16±31.08
6.	**Cooking methods**	34±18.16	44±26.07
7.	**Knowledge of RDA**	60±54.77	50±50

Data presented in Table 4.17 depicts the mean scores of respondents on the selected aspects of nutrition among government and non-government shelter home.

Thus from the results highlighted above it can be concluded that the respondents had very little knowledge regarding aspects of food groups, Nutritional deficiency disease and nutritional practices, balanced diet and knowledge of RDA before the Nutrition Education Programme and this may be due to lack of knowledge

and awareness regarding nutrition and its importance in non-government shelter home. Low literacy level of the Scan also be considered as another factor contributing to low levels of nutritional knowledge.

Table 4.18: Mean per cent score of the workers regarding knowledge of nutrition during pre and post-test among government shelter home.

(N=5)

S. No.	Aspects	Pre test (MPS)	Post test (MPS)	Gain in knowledge (%)	Paired t-values
1.	**Food**	40	86	46	4.71*
2.	**Food groups**	45	85	40	2.87*
3.	**Functions of food**	20	100	80	6*
4.	**Balanced diet**	33	100	67	0.001*
5.	**Nutritional deficiency disease**	38	86	48	6.15*
6.	**Cooking methods**	50	84	34	4.19*
7.	**Knowledge of RDA**	0	60	60	2.45 NS

MPS- Mean per cent score
* Significant at 0.5 percent
NS-non- significant

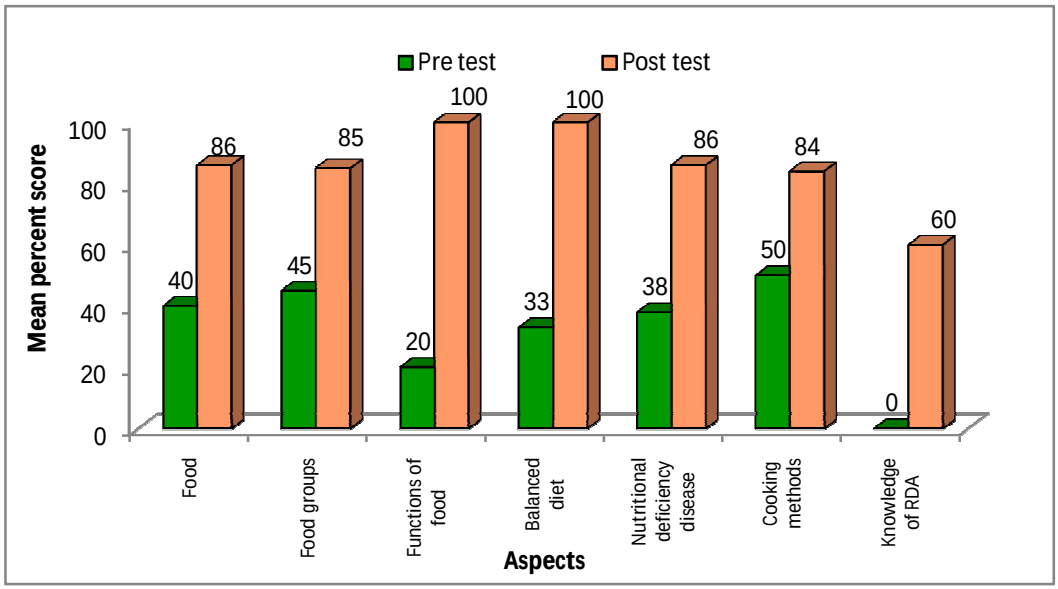

Fig. 4.9: Mean per cent score regarding gain in knowledge of nutrition during pre and post-test among government shelter home

Table 4.18 and figure 4.9 and presents the MPS scores on selected aspects of nutrition among government shelter home both before and after nutrition education programme. The findings presented in the Table clearly reveal that in all the selected

aspects significant difference was observed in the pre- test MPS scores and post -test MPS scores and gain in knowledge was observed in all these aspects except knowledge of RDA. The maximum gain in knowledge percentage was observed in the aspects of functions of foods, balanced diet and knowledge of RDA and it was found 80 per cent, 67 per cent and 60 per cent respectively.

Table 4.19: Mean per cent score of the workers regarding knowledge of nutrition during pre and post-test among non-government shelter home

(N=5)

S.No.	Aspects	Pre test (MPS)	Post test (MPS)	Gain in knowledge (%)	Paired t-values
1.	**Food**	8	70	62	5.57*
2.	**Food groups**	28	75	47	2.43 NS
3.	**Functions of food**	0	50	50	4.74*
4.	**Balanced diet**	0	47	47	4.80*
5.	**Nutritional deficiency disease**	22	61	39	2.82*
6.	**Cooking methods**	20	64	44	3.77*
7.	**Knowledge of RDA**	0	50	50	2.24 NS

MPS- Mean per cent score
* Significant at 0.5 percent
NS- non- significant

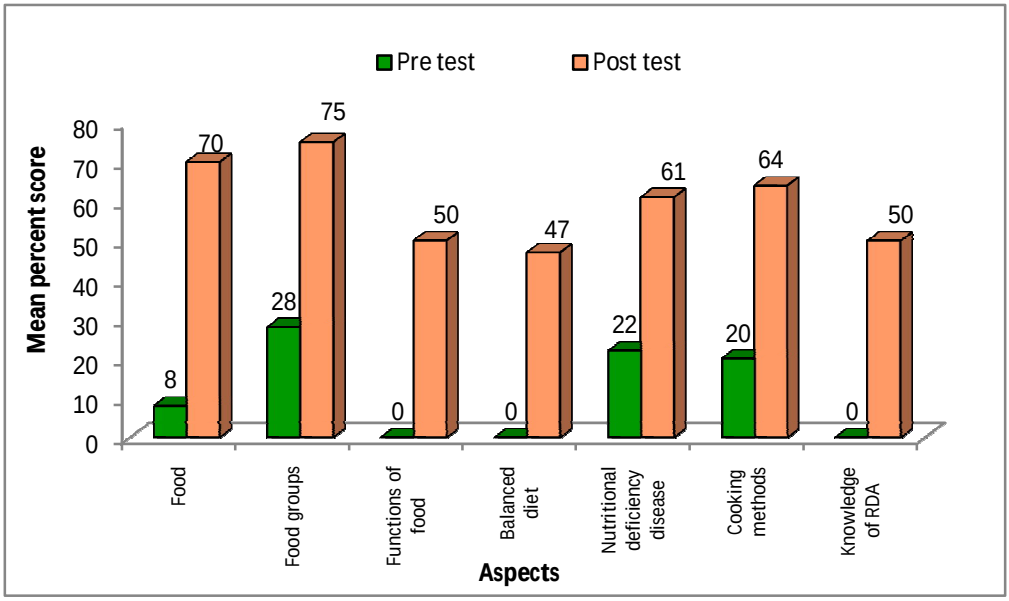

Fig. 4.10: Mean per cent score regarding knowledge gain of nutrition during pre and post-test among non-government shelter home

Table 4.19 and figure 4.10 presents the MPS scores on selected aspects of nutrition among non-government shelter home both before and after nutrition education programme. The findings presented in the Table clearly reveal that in all the selected aspects significant difference was observed in the pre- test MPS scores and post -test MPS scores and gain in knowledge was observed in all these aspects except food groups and knowledge of RDA. The maximum gain in knowledge percentage was observed in the aspects of foods and functions of foods and it was found 62 percent and 50 percent respectively.

Institutional care: this entails keeping orphans and vulnerable children in institutions such as orphanages and children's homes. The children live in the institution and are provided with their basic needs such as food, clothing and shelter, while some institutions offer education. The traditional welfare provision for orphans and vulnerable children outside families and the kinship system has been containment in institutions, largely financed through charitable donations (Ennew, 2005). The level and quality of care provided in institutions differs from one institution to another, depending on the type of internal organization (family-based or conventional dormitories), the size of the family or other internal unit, internal equipment, the number of qualified staff, the working hours of care-givers and the type of relationship they have with the children, management style, the overall atmosphere within the institution and financial resources (Cahajic et al., 2003). Although institutions are considered to be the last resort for the care of parentless children, they have a role to play in short-term, emergency placements for sibling groups (Sanou et al., 2009) and for children who may be too traumatized to be able to fit easily into a substitute family (Ansell and Young, 2004).

Children are educated within or outside of the shelter home. Shelter home provide an alternative to foster care or adoption by giving orphans and vulnerable children a community-based setting in which they live and learn. In the worst cases, orphanages can be dangerous and unregulated places where children are subject to abuse and neglect. Other alternative names are group home, children's home, rehabilitation center and youth treatment center (HACI, 2010).

SUMMARY AND CONCLUSION

The vulnerability of children living in shelter homes may be exacerbated by limited resources to provide adequate basic needs and lack of appropriate care. Many of the shelter homes might be impoverished with little or no outside assistance. The findings of this study will raise awareness about the nutritional status of the school going girls (7-9 years) residing in government and non-government shelter homes.

The comparison of girls nutritional status in government and non-government will provide evidence as to whether the girls in government shelter home are at increased risk of malnutrition and illness than the non-government shelter home girls. The outcome will also help governments, policy-making bodies, Non-Governmental Organizations and donors to formulate and design strategies tailored to address the needs of these girls. Health research institutions could also use the findings of this study to institute intervention programs that could improve the living conditions of these children so that they are not left vulnerable to preventable health hazards. Information from this study will serve as baseline data for future nutrition and hygiene intervention programs among girls in these shelter home. It will also help the shelter home and the workers in shelter home to improve their nutritional care practices. Finally it will enable the nutritionists understand the difficulties faced by girls in these shelter homes and be able to effectively monitor their nutritional status.

The school going girls is in a state of process of growing up from puberty to maturity. Adolescent account for 1/5 of the world'spopulation and in India they account for 22.8% of total population. They are tomorrow's adult. Their growth and development is closely linked to the diet they receive during childhood. They may represent a window of opportunity to prepare nutritionally for a healthy adult life. They have to encounter a series of serious nutritional challenges not only affecting their growth and development but also their livelihood as adults. Thus it is not surprising that girl population who are "mother to be" is considers as the most important section on which the future of nation depends. A large number of school based nutrition programmers have been implemented globally on obesity, the importance of activity and of vegetables & fruits in the diet. It is much more important to improve nutrition knowledge through nutrition education in order to have a positive influence on healthy food choices. Number of children in India particularly

girls live under suboptimal conditions marked by poor nutritional status and high level of morbidity and mortality. In developing countries, factors associated with under nutrition of girls are poor household economic condition, periodic food shortage, burden of diseases, poor knowledge about long term consequences of under nutrition, quantity & quality of food and access to health and nutrition services. Girls have mere easy access to health and nutritional information through schools, recreational activities and mass media than they have later in their lives. Particularly, health and nutrition education and healthy habits of female adolescents will have critical roles to play in maintaining future family health and nutrition.

Most of the researches on nutritional status have focused on infants and preschoolers and there is dearth of literature on school going girls particularly from shelter home. Therefore it is imperative that dietary patterns of school going girls are thoroughly assessed so that it can help in imbibing simple changes in their daily diet, thus improving their nutritional status and as the nutritional status of girls is also associated with the nutritional knowledge of the workers in the shelter home , so keeping this parameter in mind the present study attempts to assess and compare the nutritional status of school going girls (7-9 year) residing in government and non-government shelter home of Udaipur city and assess the knowledge of the workers in shelter home regarding various aspects of nutrition.

A study entitled **"Assessment of nutritional status of school going girls (7-9 years) residing in shelter home of Udaipur city"** was carried out with objective to assess nutritional status of school going girls of government and non-government shelter home and to compare the nutritional status of school going girls of government and non-government shelter home and to impart nutritional education to the workers in the shelter home and assess their gain in knowledge.

The study was conducted in Udaipur city of Rajasthan. A comprehensive list of shelter homes was obtained from Department of social welfare (Samaaj Kalyaan Vibhaag, residency campus). According to the comprehensive list of shelter homes from Samaaj Kalyaan Vibhaag there were 14 shelter homes in Udaipur city. From this list one government (Nirarshrit Balika Garh,Sector-14) and one non-government (Meera Nirarshrit Balika Garh, Udaipur) shelter home was selected purposively as these two homes were providing shelter to girls only whereas remaining 12 centers are for boys. Total of 120 girls (60 girls from government and 60 girls from non-government shelter homes) in the age group of 7-9 years enrolled in schools and

resident of shelter home were selected by random sampling. Permission was sought from shelter homes authority to consult the girls to assess their nutritional status. The sample was selected by way of Random Sampling.

After an extensive study of relevant of study relevant review of literature, an interview schedule was developed. General information about the respondents like name, age, class and food habits was collected. Nutritional status of school going girls of both shelter home was assessed by nutritional anthropometry (height, weight and BMI), dietary survey and clinical assessment. For imparting nutritional knowledge to workers different aspects were selected (Food, Food groups, Functions of food, Balanced diet, Nutrient deficiency disorders and their prevention, Cooking methods and Knowledge of RDA) after an extensive review of literature relevant and available on nutrition like text books. Knowledge test tool was developed different selected aspects of nutrition. For each selected aspects different audio visuals aids were developed. Conversely, impact of nutrition education programme was assessed by the changes in nutrition knowledge level of workers. The data thus collected was processed, tabulated and analyzed. Appropriate statistical analysis was applied to get the results.

The results revealed that majority (39.16%) of the respondents belonged to 8 years while (32.9%) belongs to the age group 9 and the remaining (28.33%) were in the age group 7. From the findings it could be stated that all the respondents (100%) were vegetarian of both the shelter home. 28.33 percent respondents were studying in class I and 39.16 percent were studying in class II and the rest 32.5 per cent of respondents were studying in class III.

Data regarding anthropometric measurement showed that the height and weight of respondents ($p<0.05$) was lower than reference value and for assess malnutrition gomez classification, waterlow classification, BMI for age was used. Maximum subjects (18.33%) were malnourished in the age of 9 years among girls according to Gomez classification in shelter homes and 11.66 per cent stunted 18.33 per cent wasted in the age group of 8 years according to waterlow classification among girls of shelter home. (9.16 %) subjects belonged to over-weight and (2.5%) obese grade category of both the shelter home. Data reveals that among both the shelter home 30.83 percent of respondents were in severe undernutrition range. According to BMI for age z- score of WHO (2007), 44.16 per cent of the respondents were in normal range among both shelter home.

Clinical findings indicates that 87.5 percent of subjects had normal appearance at the same 12.5 percent had fair appearance among both the shelter home. 11.66 per cent of respondents suffered from lack of luster in hair .9.16 per cent suffered from pale conjunctiva. 11.66 per cent suffered from cheilosis among both the shelter home. The haemoglobin estimation of girls among government and non-government shelter home in the age group of 7-9 years was conducted and results reveals that 3.33 percent girls from government and 1.66 percent girls from non-government shelter home were anaemic in the age of 8 years. In the age of 9 years 6.66 percent girls from government and 5 percent girls from non-government shelter home were anaemic. Few girls 1.66 percent in the age of 7 years were anaemic and majority 33.33 percent in the age group of 7-8 years were non-anaemic. Table 4.8 clearly shows that most of the girls were anaemic in the age group of 8-9 years due to inadequate iron intake among girls in the shelter home.

Dietary survey was conducted for one day by using 24 hours recall method. The results of dietary survey revealed that all the subjects were vegetarians. Recommended Dietary Intake (RDI) was substantially inadequate (<50%) in fruits, roots and tubers, green leafy vegetables and other vegetables among both shelter home, (<50%) in pulses, cereals and fat and oils whereas intake of milk and milk products were similar among both the shelter homes. The intake of cereals , pulses , fat and oil , roots and tubers, green leafy vegetable, other vegelable, fruits and sugar were lower than recommended daily intake except the intake of milk and milk products were found non- significant among both shelter home. Dietary intake of respondents showed that mean nutrients intake of protein, fat, carbohydrates and other nutrients were lower than the recommended intake and found significant difference in the intake among girls in both shelter home except the intake of cereals, thiamine and calcium were found non-significant among both shelter homes. Comparison between dietary intake and nutrient intake of school going girls residing in government and non-government shelter home was done and results revealed that for majority of food groups and nutrients, the mean intake of girls among government and non-government shelter home differ significantly.

For assessing the existing knowledge of workers of the selected sample pretesting was done and then based on their knowledge scores, areas of inadequate knowledge was recognized and based on those critical area nutrition education programme was planned for the workers and was conducted separately among both

shelter home. Pre and Post scores of workers revealed that initially respondents among both shelter home (100%) had inadequate level of knowledge. After exposure to nutrition education programme, a tremendous difference was observed in the knowledge of respondents among government shelter home as majority of them (80%) shifted to adequate knowledge and in non-government shelter home (60%) shifted to marginally inadequate level as majority of worker were illiterate among non-government shelter home.

Components wise knowledge data showed significant difference between pre-test and post-test. Regarding knowledge of 'food' respondent's knowledge was showed inadequate knowledge level with 40 MPS in government and 8 MPS among non-government shelter home. After exposure of respondents about concepts of food their knowledge regarding these increased significantly and majority were lying in adequate level of knowledge category with 86 and 70 MPS among government and non-government shelter home. About 'food group' at base line 45 and 28 MPS of respondents showed inadequate level of knowledge among government and non-government shelter home but after imparting nutrition knowledge level was shifted to adequate level of knowledge . Base line survey indicated that respondents were not able to tell about the aspect 'function of food' among both the shelter home. Respondents were lying in inadequate knowledge level knowledge category in the component at baseline. After providing nutrition education the MPS were 50 of respondents about the component of 'functions of food' in our body and shifted to marginally inadequate category. Knowledge level of respondents about 'balanced diet' were inadequate among workers of shelter home and after imparting nutrition knowledge the gain in knowledge was 47 per cent. Respondents had inadequate level of knowledge regarding the 'Nutritional deficiency disease' among both shelter homes. After the imparting nutrition knowledge level of respondents was shifted to adequate category with 86 and 61 MPS. There were negiligible knowledge of RDA among both the workers of shelter home after imparting knowledge the knowledge level of respondents shifted to 60 and 50 MPS. Gain in knowledge of the workers was observed after nutrition education intervention and the initial and final values of knowledge test were statistically significant.

Conclusion

It is clear that the problem of malnutrition in India is of alarming magnitude. A major part of this problem is contributed by vulnerable population. Tackling malnutrition in area requires a holistic approach, especially vulnerable children residing in shelter homes. From the finding of the present study it can be concluded that, even after the efforts of government the knowledge about nutrition has not reached to vulnerable children residing in shelter homes and workers up to desired level .The health and nutritional standards of school going girls among both the shelter home in this study were found to be quite satisfactory. The above results revealed that some of the respondents were lying in category of under nutrition among both the shelter homes. The mean intake of the food and nutrient was found to be lower than the reference values but some nutrients and food intake were found non-significant among both the shelter homes. The study illustrates that most school going girls among shelter home fail to meet dietary intake recommendations in most of the food groups. The mean intake of the nutrients i.e. protein, fat, carbohydrates, β-carotene, riboflavin, niacin, carbohydrate, ascorbic acid and iron was found to be inadequate except energy, thiamine and calcium which was found non-significant.

The overall knowledge of worker in general, about nutrition was marginally on an average side. They had very low knowledge about some of aspects such food, food groups, functions of food, balance diet, nutrient deficiency disorders and their prevention, cooking methods and knowledge of RDA. The results of the present investigation reveal that nutrition education was effective in increasing the level of nutrition knowledge of workers among both shelter home. Further because of their curiosity in learning new things and potential learning power, gain in knowledge was adequate in all aspects.

RECOMMENDATIONS

- A comparative study may be carried out on school going children between government and non-government, and also between girls and boys with same objectives.

- Similar study may be conducted among boys (7-9 years) residing in shelter homes and similar study may be conducted on adolescent girls and boys residing in government and non-government shelter home.

- As findings of the present study indicate that there is significant lack of nutritional knowledge among workers among shelter home of the school going girls hence workers can be counseled about nutrition and a monthly diet plan should be advised to the workers residing in shelter home according to the requirement of the child.

- The findings of the study may help the policy makers to plan policies and programme which addresses the nutritional needs of the vulnerable children and help them develop and reach their full potential.

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