Haemoglobin Status of Selected Rural and Urban Adolescents and the Impact of Intervention Programme

Karthika.S

(12PFD005)

Thesis Submitted to

Avinashilingam Institute for Home Science and Higher Education for Women,

Coimbatore-641043

In Partial Fulfilment of the Requirements for the

Degree of Master of Science in Food Service Management and Dietetics

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I INTRODUCTION

"Food is an important part of a balanced diet"

- Frances Ann "Fran" lebowitz

Food focuses on eating to achieve optimal health, makes body work, grow and repair itself. The kind of food affects the efficiency of these processes. Body functions and the food that sustains it is infinitely complex. Food is in fact one of the most complicated sets of chemicals imaginable.

Nutrition is the intake of food, considered in relation to the body's dietary needs. It is defined as diet, food, maintenance or nourishment. Good nutrition means an adequate, well balanced diet combined with regular physical activity and getting the right amount and high quality of nutrients from healthy foods in the right combinations to do a good job **(WHO, 2014).**

Good whole foods and good whole food supplements provide the nutritional diversity and density that lay the foundation for good health. Our body needs the right fuel (food) and regular maintenance (exercise, lifestyle and mental attitude) to achieve its true health potential. Nothing is more important than healthy eating **(Bernadine Healy, 2011).**

The child eats today will have a striking impact on her health throughout adolescence and adulthood. Consuming nutritious foods helps children and teens grow, develop, do well academically and feel good about themselves. Good nutrition also helps in preventing child and teen issues such as eating disorders, obesity, dental cavities and iron deficiency anemia. Teaching children the importance of good nutrition throughout childhood will lay the foundation n for a healthier more fulfilling life **(Kristy lee Wilson, 2014).**

Nutrition knowledge and making smart choices about the foods will help to achieve optimum health and prevents from obesity, illness, and many of today's most prevalent chronic diseases. Poor nutrition can lead to reduced immunity, increased susceptibility to disease, impaired physical and mental development and reduced productivity **(WHO, 2014).**

Proper nutrition promotes the optimal growth and development of children. Healthy eating prevents high cholesterol and high blood pressure and helps to reduce

the risk of developing chronic diseases such as cardiovascular disease, cancer, and diabetes. Also one's risk for developing obesity, osteoporosis, iron deficiency and dental caries (cavities) **(CDC, 2010).**

Adolescence is the period in human growth and development that occurs after childhood and before adulthood, from ages 10-19. It represents one of the critical transitions in the life span and is characterized by a tremendous pace in growth and change that is second only to that of infancy. Today, almost 1 in 5 persons in the world is an adolescent, that's 1.2 billion people between the ages 10-19 globally. The state of their health is important for their lives now and in the future; for this generation and the next **(WHO, 2013).**

Healthy eating during adolescence is important as body changes during this time affect an individual's nutritional and dietary needs. Adolescents are becoming more independent and making many food decisions on their own. Many adolescents experience a growth spurt and an increase in appetite and need healthy foods to meet their growth needs.

Adolescents tend to eat more meals away from home than younger children. They are also heavily influenced by their peers. Meal convenience is important to many adolescents and they may be eating too much of the wrong types of food (soft drinks, fast-food, or processed foods). Girls may feel pressure from peers to be thin and to limit what they eat. Both boys and girls may diet to "make weight" for a particular sporting or social event.

Adolescence is a "coming of age", as children grow into young adults. These teen years are a period of intense growth, not only physically, but also mentally and socially. During this time, 20% of final adult height and 50% of adult weight are attained. Because of this rapid growth adolescent is especially vulnerable to anemia. Proper nutrition, including adequate iron intake, plays an important part during teenager's growth and development. During adolescence, teenagers will acquire the knowledge and skills that will help them to become independent, successful young adults but parents can help their teenagers stay healthy by teaching them some easy ways to prevent iron deficiency **(Dimeglio, 2009).**

The period of adolescence is considered as crucial and significant period of an individual's life. Psychologically, adolescence is the age when the individual becomes

integrated into the society of the adults. It is the age when the child no longer feels that he is below of his elders but rather an equal with them, at least in rights. This integration into the adult society has many aspects, more or less linked with puberty. It also includes profound intellectual changes. These intellectual transformations, typical of an adolescents thinking, enable him to achieve his integration into the social relationships of the adults. This is the most general characteristic of this period of development **(Hurlock, 2011).**

Adolescence can be distinguished by three stages, each with markedly different development issues and experiences. Early adolescence is by the onset of puberty and the changes that transform the body of a child into that of an adult. In late adolescence, the focus shifts to discovering themselves and achieving mutuality and intimating in their relationships. The emerging adulthood stage finds them in continued exploration of the direction their life may take with respect to traditional adult commitments marriage, children and occupation **(Nancy, 2010).**

Adolescence is also a unique intervention point in the life cycle. It is a stage of receptivity to new ideas and a point at which life style choices may determine an individual's life course. It offers a chance to acquire knowledge about optimal nutrition during young adult hood that could prevent or delay adult onset diet related illness later on potentially, the inclusion of adolescent boys in nutrition and healthy life style programs will constitute to the improved nutrition and health of women during child bearing and for infants and young children in the critical early years of life **(Elder, 2004).**

Adolescence is a time of increased iron needs because of the expansion of blood volume and increase in muscle mass. The incidence of iron deficiency among adolescents appears to be rising and is a complex disorder **(Abrams, 2014).**

Iron deficiency is the most common cause for anemia in adolescents in the United States, and an adolescent girl is 10 times more likely to develop anemia than a boy. Teenagers are at the highest risk of anemia during their adolescent growth spurt. Among girls menstruation increases the risk for iron deficiency and child bearing years. Boys on the other hand, are at risk for anemia only during their adolescent growth spurt **(Dimeglio, 2009).**

Nutrition education intervention is one of the appropriate, effective and sustainable approaches to combat iron deficiency anemia.

Nutrition education might be of the important strategies to combat iron deficiency anemia in adolescent girls, stressing the importance of haemopoitic nutrients and consumption of green leafy vegetables which are excellent source of iron and micronutrients **(Sajian, et al., 2011).**

One of the keys to effective nutrition education and counseling of teenagers is a good understanding of normal adolescent psychosocial development. Health professionals need to give careful consideration to the types of nutrition messages that are presented to adolescents. More effective nutrition messages should convey the idea that eating well will help the teen to have the energy to do what s/he wants to do and to become the person s/he wants to become **(Mary Story, 2005)**

Imparting nutrition education is not simply to change the nutritional habits but also to assess their own eating behaviors and set goals for dietary change.

Thus the present study entitled **"Haemoglobin status of selected rural and urban adolescents and the impact of intervention programme"** was planned with following objectives: To

- Study nutritional status of adolescents
- Understand dietary pattern and life style practices
- Assess their nutritional knowledge
- Determinate the Impact of nutrition education

II REVIEW OF LITERATURE

The literature for the study entitled **"Haemoglobin Status of Selected Rural and Urban Adolescents and the Impact of Intervention Programme"** is reviewed under the following heads:

A. Adolescents-A vulnerable stage in life span
B. Nutritional status of selected rural and urban adolescents
C. Prevalence of anemia
D. Impact of nutrition education

A) ADOLESCENTS-A VULNERABLE STAGE IN LIFE SPAN

Vulnerable period has been focused by existing programmes it has to be constantly enhanced to offset the added burden like menstrual blood loss which precipitates the crisis often. In developing countries parasitic infections and other infectious diseases are more common which peak the requirement of iron in the human body (Premalatha et al., 2012).

Vulnerable period in the human life cycle for the development of nutritional anaemia, which has been constantly neglected by public health programs. Girls are more likely to be a victim due to various reasons. In a family with limited resources, the female child is more likely to be neglected. She is deprived of good food and education, and is utilized as an extra working hand to carry out the house hold chores. The added burden of menstrual blood loss, normal or abnormal, precipitates the crises too often (Chaudhary, 2008).

Anaemia is a global public health problem affecting both developing and developed countries with major consequences for human health as well as social and economic development. The most significant contributor to the onset of anaemia is iron deficiency, so that iron deficiency anaemia is often used synonymously. Adolescents are vulnerable to iron deficiency because of increased iron requirements related to rapid growth. Among adolescent girls, menstruation increases the risk for iron deficiency anaemia throughout their adolescent and child bearing years (Gupta, 2012).

Adolescent is the formative period of life when the maximum amount of physical, psychological and behavioral changes take place. This is a vulnerable period in the human life cycle for the development of nutritional anaemia, which has been constantly neglected by public health programs. Adolescents are at risk of iron deficiency and anaemia due to accelerated increase in requirements for iron, poor dietary intake of iron, high rate of infection and worm infestation as well as the social norm of early marriage and adolescent pregnancy **(**Verma, 2013).

Adolescence also constitutes a critical formative stage in life, marking as it does the passage from childhood to adulthood. Adolescence is also the period where mental disorder is more likely to develop or become apparent. The adverse experiences, conditions or environments that affect the mental well-being of younger children apply equally to adolescents. In addition, there are a number of other significant risks that have particular pertinence to this life stage.

B) NUTRITIONAL STATUS OF SELECTED RURAL AND URBAN ADOLESCENTS

Nutritional status was assessed by comparing anthropometric measurements to reference values according to WHO/NCHS current guidelines. Stunting was defined as a height for age <3 rd percentile, and thinness defined as a BMI $<5^{TH}$ percentile. Weight for age has been suggested to be an unreliable measure in assessment of nutrition in adolescents and was not analyzed (Thomas et.al, 2013).

Nutritional status was evaluated using anthropometric indicators recommended by WHO experts committee. Height for age below 3^{rd} percentile of 2007 NCHS/WHO reference values were classified as stunting. Prevalence of stunting was also estimated using Indian reference 3rd percentile height of Indian academy of pediatrics of reference data. Thinness was evaluated using WHO recommended age specific cut off points off BMI based on 2007 WHO reference data. Thinness o was defined as BMI for age $<5^{th}$ percentile of Indian academy of pediatrics reference data (Maiti, et.al, 2011)

For nutritional status of an individual, anthropometry is considered as a good tool, especially to study the malnutrition of individuals. Within anthropometry, some studies suggest the skin fold measures or waist /hip/arm circumference as an indicator

of malnutrition, while others suggest using the BMI as a measure to study the malnourishment in children (Navaneethan, et.al, 2011)

Adolescents are those between the ages of 10 to 19 years old and adolescence is a traditional phase between childhood and adulthood characterized by marked acceleration in growth. This period is known to be a second chance for growth or catch up growth for those children who have experienced a nutritional deficit in their early life. It is a period of increased nutritional requirements because it is during this time that they gain up to 50% of their adult height and skeletal mass. Since they are relatively healthy compared with other life cycle groups, they have received low priority. Adolescence is a phase that poses specific challenges for treating diseases and promoting health. Recent reports of the world health organization (WHO) suggest that in South East Asian Region a large number of adolescents, who constitute 20% of the population in these countries, suffer from of malnutrition and anemia, which adversely impacts their health and development and that anthropometry is a good indicator of nutritional status and health risks in this group. Several factors affect the nutritional status of adolescents. Among these, socio economic and demographic factors are associated with worldwide patterns of stunting and thinness (Haboubi, 2009)

Nutritional status among pre-adolescents is an important health indicator. The up to date information about nutritional status and food consumption pattern of pre adolescence, in the rural area is required for effective public health interventions. Hence the study entitled "nutritional status of selected rural pre-adolescents of Visakhapatnam" was carried out with the objective of studying the nutritional status of Visakhapatnam. The researchers collected the back ground information and set out of assess the nutritional status of the selected preadolescents and then sought to impart nutrition education to the selected rural pre-adolescents who were considered malnourished (Priyadharshini, 2011).

Nutrition is one of the most important factors influencing the quality of human life. Nutritional status is also an important health indicator to assess a country's health status and morbidity pattern. Studies of nutrition status are very important in the adolescent of child bearing age because of low to moderate prevalence of possible deficiency. A large number of adolescent girls are suffering from malnutrition both in urban and rural areas of Bangladesh (Islam 2004).

Adolescence is a period of rapid growth and maturation in human development. The nutritional status of adolescent girls, the future mothers contributes significantly to the nutritional status of the community (venkaiah et, .al 2002).

Nutritional status is now recognized to be a prime indicator of the health of individual. The world health organization believes that the ultimate objective of nutritional assessment is the improvement of human health (Mondal, 2010).

Nutritional status of adolescence girls, especially in rural India. Interview was conducted by using pretested questionnaire and the selected adolescent girls were examined clinically for their nutritional status (like height, weight, body mass index. Height (to the nearest 0.1 cm) and weight (to the nearest 0.5 kg) were measured. Body mass index were calculated by dividing the weight in kilograms by the square of height in meters (kg/m^2). Mean weight, height and body mass index were calculated for different age categories. The anthropometric nutritional status was assessed by 'Body mass index for age' and 'height for age' as per NCHS/WHO standard (Kumar, 2012).

Anthropometric has become a practical tool for evaluating the nutritional status for evaluating the nutritional status of populations, particularly of children in developing countries and nutritional status is the best indicator of the global well-being of children. One of the major global health problem faced by the developing countries, today is malnutrition of course, Nigeria too, is not an exception of this problem of malnutrition (Goon, 2011).

Anthropometric measurements help in the assessment of nutritional status and monitor changes in growth of adolescents. Research on anthropometric measurements of adolescents is an important determinant of a nation's health. Measurements of height, weight and nutrient intake are the reliable means to evaluate the nutritional status and it is very much in need. Hence the present study was undertaken to conduct the anthropometric measurements and to know the nutrient intake among adolescent girls (Khan,2004).

C) PREVALENCE OF ANEMIA

The world health organization has defined adolescence as the age period between 10-19 years of age for both the sexes. There are about 1.2 billion adolescents in the world which is equal to $1/5^{th}$ of the world's population and their numbers are

increasing out of these 5 million adolescents are living in developing countries. India's population has reached the 1billion mark, out of which 21% are adolescents (Mathur, 2007).

Adolescence is a vulnerable period in the human life cycle for the development of nutritional anemia. Anemia is widely prevalent in India, a developing country and affects both sexes and all age groups. Among adolescents, girls constitute a vulnerable group particularly in developing countries in a family with limited resources the female child is more likely to be neglected (Siddharam et.al 2011)

Anemia is the most widespread nutrition problem in the world and has predominance in developing countries like India, particularly in children and women. The magnitude of the anemia has been well-documented in pregnant women and infants; however, there is no data on the prevailing occurrence of anemia in school children. The main objective of this was to estimate the prevalence of anemia and its correlation to variables such as age, gender and BMI in school children of kattangulathur, Tamilnadu, India. Prevalence of anemia as per the world health organization recommended cut off value of hemoglobin, among these children was 52.88%.The frequency of the prevalence of anemia was significantly higher amongst girls as compared to the boys. Results of the study population reveal that 52.88% were anemic, girls (67.77%) were32%higher than the boys (35.55%) and anemic children were underweight. Therefore our study results suggest that all the school children should be screened periodically and appropriate measures should be taken (Sudhagandhi, et al., 2011).

In India Prevalence of anemia is higher among preschool children and pregnant women. Even among higher income educated segments of population about 50% of children, Adolescents girls and pregnant women are anemic. Inadequate dietary iron folate intake, due to low vegetables consumption, perhaps low B_{12} intake and poor bioavailability of dietary iron from the fiber are the major factors responsible for high prevalence of anemia (Kalaivani, 2009).

The prevalence of anemia in female's 5-30years was 89.5%, which included 49.8% of mild, 38.2% of moderate and 1.5% severe anemia cases. The prevalence of anemia in male 5-20%suffering from mild, 38% from moderate and 0.7% from severe anemia. Both males and females who were in the younger age group who were under

weight, who belonged to a lower socio-economic status and who had a low activity life style, had a higher prevalence of anemia (Gupta et.al, 2010).

Anemia is the most prevalent nutritional problem worldwide and it is mainly caused due to iron deficiency. Its prevalence is highest among young children and women of child bearing age, particularly in pregnant women. The world's adolescent population is facing a series of serious nutritional challenges which are not only affecting their growth and development but also their livelihood as adults. There are about 1.2 billion adolescents in the world, which is equal to$1/5^{th}$ of the world's population and their numbers are increasing. Out of these 5 million adolescents are living in developing countries. India's Population has reached the 1 billion mark, out of which 21% are adolescents **(Biradar, 2012).**

Anemia is one of the most important health problems throughout the world. Adolescent children are one of the major risk groups for anemia. The prevalence of anemia among adolescents is 27% in developing countries. In turkey, the prevalence ranges from 1.5% to 12.5% iron deficiency anemia constitutes the major anemia during adolescent period (Balci, 2012).

Iron deficiency is the most common nutritional deficiency in children. The world health organization estimates that anemia affects one quarter of the world's population and is concentrated with in preschool age children and women. Iron deficiency is a particularly challenging problem for developing nations in Asia and Africa. The United States department of health and human services has set a target of reducing iron deficiency by 10 percent by 2020. In the united states about 9 percent of toddlers one to three years old have iron deficiency and 2 to 3 percent have iron deficiency anemia. Rates decrease with advancing age until adolescence, when up to 16 percent of girls develop iron deficiency and 3 percent have iron deficiency anemia (Mahoney, 2013).

Globally, anaemia affects 1.62 billion 24.8 percent of the population and an estimated 36 percent of developing world's population suffers from the disease. Anaemia is known to be a significant global problem affecting 305 million 25.4 percent school age children. In developing countries, the prevalence of anaemia among school age children is 40 percent and it is classified as severe public health problem. The problem is alarming in sub-Saharan African countries such as Kenya

48.9 percent, Mali 55.8 percent and Tanzania 79.6 percent. Lack of awareness among the mothers about the problem coupled with their low educational status, poor nutritional practices and unhealthy food habits, low iron bioavailability of the diet, decreased physical activities. Malaria and parasitic infestations are additional factors associated with lower haemoglobin level in children (Assefa, 2014).

Anemia is one of the most common public health problem worldwide and especially in developing countries. Based on the world health organization criteria, more than two billion people globally 149 million people in the eastern Mediterranean region are estimated to the anemic. The most common type of nutritional anemia is iron deficiency anemia which is approximately responsible for 50 percent of all anaemia. The major consequences of anemia are increased risk of maternal and child mortality followed by negative effects on physical and mental development of children and decreased learning and work capacity and influencing on reproductive health in adolescents and adults (Ramzi et al, .2010).

Nutritional iron deficiency anaemia has declined in industrialized nations, it affects an estimated 2 billion people worldwide. Even in the U.S, iron deficiency is the most prevalent nutritional deficiency. It is highly associated with poverty people in lower socio economic groups have double risk of those who or middle or upper class. Among Americans with iron deficiency anaemia, young children have the highest risk followed by pre menopausal women. Adolescent, adult men and post menopausal women have the lowest risk. Men, in fact are at risk for iron overload, probably because of their higher meat intake and their reduced iron loss (Simon, 2013).

Iron deficiency is the most common cause of anaemia in adolescents in the United States, and an adolescent girl is 10 times more likely to develop anaemia than a boy. Teenagers are the highest risk of anaemia during their adolescent growth spurt. Among girls, however menstruation increases the risk for iron deficiency anaemia throughout their adolescent and child bearing years. Boys on the other hand are at risk for anaemia only during their adolescent growth spurt (CDC, 2009).

Anaemia is one of the most common and intractable nutritional problems globally, affecting both developing and developed countries with major consequences for human health as well as social and economic development. Iron deficiency

anaemia occurs at all stages of the life cycle, but is more prevalent in pregnant women and young children adolescents, especially girls, are particularly vulnerable to iron deficiency. The highest prevalence is between the ages of 12-15 years when requirement are at a peak. In all member states of the south- east region, except Thailand more than 25% of adolescent girls are reported to be anaemic in some countries the prevalence is as high as 50% (WHO,2011

Adolescence, a period of transition between childhood and adulthood, occupies crucial position in the life of human beings. Adolescence is second to infancy, as the period of most rapid growth. During this period with inadequate and improper dietary habits, one is vulnerable to all kinds of nutritional morbidities. Adolescence is considered most appropriate time to intervene, and behavior change messages embraced by this group can contribute to sustained health impacts. India has high prevalence of iron-deficiency anemia among women. Between 60-70% adolescent girls are anemic, a condition that can result in adverse pregnancy outcomes or even maternal death, as well as reduced work productivity and impaired physical capabilities (Saratha, 2010).

Globally, anaemia affects 1.62 billion people, which corresponds to 24.8% of the population. The highest prevalence is in preschool-age children (47.4%, 95% CI: 45.7–49.1), and the lowest prevalence is in men (12.7%, 95% CI: 8.6–16.9%). However, the population group with the greatest number of individuals affected is non-pregnant women (468.4 million, 95% CI: 446.2–490.6) (WHO, 2008).

The main consequence of iron deficiency is the population indirectly by red blood cell counting. However, this approach has the limitation of including other a etiologies. The world wide prevalence of iron deficiency is approximately30 % resulting ion close to 2 billion people with anaemia of this cause in developing countries, the prevalence of anaemia among pregnant women and children under two years exceeds (Sierra, 2012).

Adolescent girls are at a high risk for anaemia and malnutrition. Inadequate nutrition during adolescence can have serious consequences throughout the reproductive years of life and beyond. Very often, in India, girls get married and pregnant even before the growth period is over, thus doubling the risk for anaemia .The nutritional anaemia in adolescent girls attributes to the high maternal mortality

rate, the high incidence of low birth weight babies, high perinatal mortality and the consequent high fertility rates. This phase of life is also important due to the ever-increasing evidence that the control of anaemia in pregnant women can be more easily achieved if a satisfactory iron status can be ensured during adolescence. About 43% of the adolescent deaths are related to pregnancy. Pregnancy during adolescence deprives the girls from achieving their full growth according to their genetic potential (Shilpa, 2012).

D) Impact of Nutrition Education

Health and nutrition education play an important role in addressing malnutrition. During their school years, children develop major cognitive, physical and social skills. The cognitive maturity level of a child particularly influences his or her ability to gain from nutrition education. Research has proved that a behaviorally focused approach with active methods, including food based activities, will enhance the effectiveness of nutrition education programmes and, thus, the knowledge of nutrition of children (Contento, 2007).

Nutrition education involves teaching the client about the importance of nutrition, providing educational materials that reinforce messages about healthy eating, teaching adolescents skills essential for making dietary change, and providing information on how to sustain behavior change. Information gathered during nutrition screening or assessment will provide the necessary information on which nutrition issues need to be addressed during nutrition education and counseling sessions. Prior to beginning the education process, it is helpful to assess what the adolescent already knows about nutrition, how ready they are to adopt new eating behaviors, and if there are any language or learning barriers that may need to be addressed in order to facilitate the nutrition education process (Mary story 2005).

"School nutrition education should focus not only on the provision of nutrition information, but also on the development of skills and behavior related to areas such as food preparation, food preservation and storage; social and cultural aspects of food and eating; enhanced self esteem and positive body image and other consumer aspects" (Stojan kostanjevee,et.al,2011)

Nutrition can play a role in the prevention of several chronic disease, including obesity, coronary heart disease, certain type of cancer, stoke and Type II

diabetes for this reason. Nutrition was a priority area for the healthy people 2010, and remains an important objective for healthy people 2020. To help prevent diet related chronic diseases, researches have proposed that healthy eating behaviors should be estimated in childhood and maintained during adolescence (Mothil, 2014).

Nutrition education in schools helps to prepare students for life. Students who graduate from high school with a strong back ground in nutrition education will have the skills to make informed nutrition and health decisions. As with any subjects, students will succeed if they begin building basic skills early, so that by the time they graduate from high school, they can make healthy food choices for themselves. And most important, students who have developed competency in nutrition education will begin adulthood with an appreciation and healthy enjoyment of food, as well as a positive body image. Children who develop healthy habits at an early age are more likely to be well, stay well and do well in school (Sacramento, 2011).

Adolescents often enter nutrition education and counseling at the precontemplation stage. They are often not aware of the potential health risks associated with poor eating habits and have not thought about making dietary changes. The initial goal of nutrition education and counseling therefore will be to increase the clients awareness of risks associated with current eating habits. In situation such as the diagnosis of diabetes mellitus, adolescents may be aware of the need to change dietary habits but may show resistance toward change. Identifying potential barriers to change and providing small, achievable goals along with concrete strategies to facilitate necessary dietary modifications are often the initial stage of nutrition education (Story, 2005).

Nutrition education offers a great opportunity to individuals to learn about the essentials of nutrition for health and to take steps to improve the quality of their diets, thus their well-being (Robinson et al., 2003).

III METHODOLOGY

The methodology followed for the present study entitled, **"Haemoglobin Status of Selected Rural and Urban Adolescents and the Impact of Intervention Programme"** was carried out under the following headings.

A. Selection of area
B. Selection of the samples
C. Conduct of socio-economic survey
D. Assessment of nutritional status
    I. Anthropometric measurements
    II. Estimation of haemoglobin level
    III. Clinical examinations
    IV. Dietary assessment
E. Imparting nutrition education
F. Impact of nutrition education
G. Analysis of data

A) SELECTION OF AREA

The area chosen for the conduct of the present study was K.N.palayam and S.M.Palayam at Coimbatore district. The school selected was Nagini vidyalaya matriculation higher secondary school located in K.N.palayam (Rural area) and Violet matriculation higher secondary school located in S.M palayam (Urban area) respectively. This area was selected due to the consent given by the headmistress, staff members of the respective schools and the willingness of the students to participate in the study. So far no study was carried out in these schools.

B) SELECTION OF THE SAMPLES

The investigator approached the headmistress of both the schools to seek their permission for the conduct of the study. Three hundred and ten samples of 155 in each school in the age group of 10-15years studying from V to IX standard of both sexes were selected respectively by purposive sampling method. The world health organization has defined adolescence as the age period between 10-19 years of age for both sexes **(Mathur, 2007).**

"A form of non-probability sampling in which decisions concerning the individuals to be included in the sample are taken by the researcher, based upon a variety of criteria which may include specialist knowledge of the research issue, or capacity and willingness to participate in the research" **(Oliver, 2013).**

C. CONDUCT OF SOCIO-ECONOMIC SURVEY

Socio economic is a measure of an individual's family's economic and social position based on education, income and occupation. These include measures of income (median family and median household income and poverty levels) and measures associated with income status (educational level and employment levels) **(Bradley, 2009).**

A well structured interview schedule was formulated (appendix1) to gather information on socio-economic aspects like type of family, age, sex, education, family income, dietary pattern, and life style practices of the selected adolescents by direct interview method. The investigators put forth the questions to the subjects and recorded the answers (Plate I).

Interviewing is one of the chief means through which most of the information used in social diagnosis is secured from the interviewee **(Sachan et al., 2012).**

D. ASSESSMENT OF NUTRITIONAL STATUS

The assessment of nutritional status is commonly summarized by the mnemonic "ABCD", which stands for anthropometry measurement, Biochemical or laboratory tests, clinical indicators and dietary assessment **(Elamin, 2013).**

I. Anthropometry Measurements

Nutritional anthropometry is the measurement of human body at various ages and levels of nutritional status and it is based on the concept that an appropriate measurement should reflect any morphological variation occurring due to a significant functional physiological change. In the study, height, weight, mid upper arm, waist and hip circumference were measured. Body mass index from weight and height measurements and waist /hip ratio were calculated from the waist and hip circumference **(Unnithan and Syamakumari, 2007).** Hence anthropometric measurements like height, weight, Body mass index, head and chest circumference and waist to hip ratio were calculated.

Plate 1

a) Height

For the present study, the height of the subjects was measured using the stretchable measuring tape with the absence of their foot wear and nothing on their head which may inflate their height. Subjects were asked to stand straight with their feet together. The heel, shoulder, and back of the head were touching the wall. The scale was placed on the top of the head and position was marked with the pencil. The measuring tape was used from the ground up to the figure and reading was taken for the selected subjects (N-310) (Plate II).

Height in centimeters was marked on a wall with the help of a measuring tape. All girls were measured against the wall without foot wear and with heels together and their heads positioned so that the line of vision was perpendicular to the body. A glass scale was brought down to the topmost point on the head. The height was recorded to the nearest 1cm **(Soumyajit et al., 2005).**

b) Weight

Weight of the subjects was taken with the help of a weighing machine. The subjects were asked to stand straight on the weighing machine without foot wear and heavy garments and reading was noted accurately (Plate II).

The weight was recorded for all the selected subjects using a weighing machine with an accuracy of ± 100g. The subjects were asked to remove their foot wear before measuring their weight. The scales were recalibrated after each measurement. Accuracy of the weighing scale was verified from time to time against known weight **(Gupta et al., 2009)**.

c) Body mass index

Body mass index as a screening tool to identity possible weight problems. Body mass index is a number calculated from a person's weight and height. Body mass index is a fairly reliable indicator of body fatness for most people. Body mass index can be considered an alternative for direct measures of body fat. Additionally, body mass index is an inexpensive and easy-to-perform method of screening for weight categories that may lead to health problems **(CDC, 2013).**

The body mass index was calculated for all the selected subjects by using the following formula,

$$\textbf{BMI} = \frac{\textbf{Weight in kg}}{\textbf{Height in m}^2}$$

Plate 2

PERCENTILE VALUES

Under weight –BMI for age < 5th percentile

Healthy weight –BMI for age between 5th percentile and 90 percentile

Overweight – BMI for age between 90th percentile and 95th percentile

Obese - BMI for age 95 percentile **(CDC and IOFT, 2007).**

d) Head circumference

The maximum circumference of the head above the attachment of the ears was measured with a tape passing just above the eyebrows and around the back of the head (Plate II).

Head circumference is a measurement of a child's head around its largest area. It measures the distance from above the eyebrows and ears and around the back of the head **(Kimmel, 2011).** For all the selected subjects the head circumference was measured.

e) Chest circumference

Chest circumference is measured with a flexible non stretchable measuring tape. The horizontal circumference taken just above the nipples during the period of quiet breathing with the tape passing under the arms (accurate to 1 mm) chest circumference was noted for all the selected subjects (Plate II).

f) Waist circumference

The horizontal circumference of the waist at the level of the center of the navel measured with a tape. The subject was asked to stand erect looking straight ahead. The heels were together with the weight distributed equally on both feet.

Waist circumference refers to a numerical measurement of the waist. If the fat is mainly round the waist, development of health problems is greater though the body mass index falls within the normal range **(Jennifer, 2014).** Waist circumference was measured for all the selected subjects.

g) Hip circumference

Hip circumference should be measured around the widest portion of the buttocks, with the tape parallel to the floor **(WHO, 2008).** Hip circumference was measured for all the selected subjects (Plate II).

h) Waist to hip ratio

Waist to hip ratio is a measurement that compares the size of the waist in inches to that of the hips. Risk for developing heart disease is typically measured by waist to hip ratio **(Jennifer, 2014).** Waist to hip ratio was calculated for all the selected subjects.

II. ESTIMATION OF HAEMOGLOBIN LEVEL

The blood sample (0.02ml) was drawn for all the subjects by finger prick and blood haemoglobin was estimated by cyanmethaemoglobin method (Appendix II) (Plate III).

In the cyanmethaemoglobin method, a fixed quantity of blood was diluted with a reagent and haemoglobin concentration was determined after a fixed time interval in an accurate, well calibrated photometer. The cyanmethaemoglobin measurement is the reference laboratory method for the quantitative determination of haemoglobin and is used for comparison and standardization of other methods **(WHO, 2011).**

III. CLINICAL EXAMINATIONS

An evaluation of a patient's physical condition and prognosis based on information gathered from physical and laboratory examinations and the patient's medical history **(Elsevier, 2009).**

Clinical examination was done for all the selected subjects by a physician to evaluate their health status and to diagnose, followed by suggestions for individual treatments (Appendix III) (Plate IV).

IV. 3 DAY 24 HOUR RECALL METHOD

Dietary assessment was done by 24hrs recall method for 3 consecutive days for selected sub sample of 15 in rural boys and girls and urban boys and girls aged between 10-15years respectively. Interview method was used for the collection of data (Appendix IV).

E. IMPARTING NUTRITION EDUCATION

Nutrition education is any combination of educational strategies, accompanied by environmental supports, designed to facilitate voluntary adoption of food choices and other food-nutrition related behaviors conductive to health and well-

Plate 3 and 4

being. Nutrition education is delivered at the individual, community, and policy levels. **(Jones and Bartlett, 2007).**

In order to assess their existing nutrition knowledge a questionnaire was distributed to the selected sub sample of 30 in each school, 15 boys and 15 girls respectively. Three hours per week for a period of eight weeks the nutrition education was imparted at school premises. The aspects concentrated were on Importance of foods in our daily life. Basic five food groups and nutrients for growth and development during adolescents with special reference to iron rich foods. General education and nutrient content of cereals, pulses, milk, meat, green leafy vegetables. Personal hygiene. Significance of raising a kitchen garden. Nutrition education was imparted with the help of audio visual aids Charts, models (food pyramid), pamphlets, lecture method and demonstration and nutrition snake and ladder game board.

F. IMPACT OF NUTRITION EDUCATION

Nutrition education is to motivate participants to eat a healthy diet. Children are very important audience for nutrition education because a healthy diet is essential for their normal growth and development and children are establishing food patterns that carry into adulthood (Plate V). Good nutrition promotes not only better physical health and reduced susceptibility to disease, but has also been demonstrated to contribute to cognitive development and academic success **(Medford, 2002).**

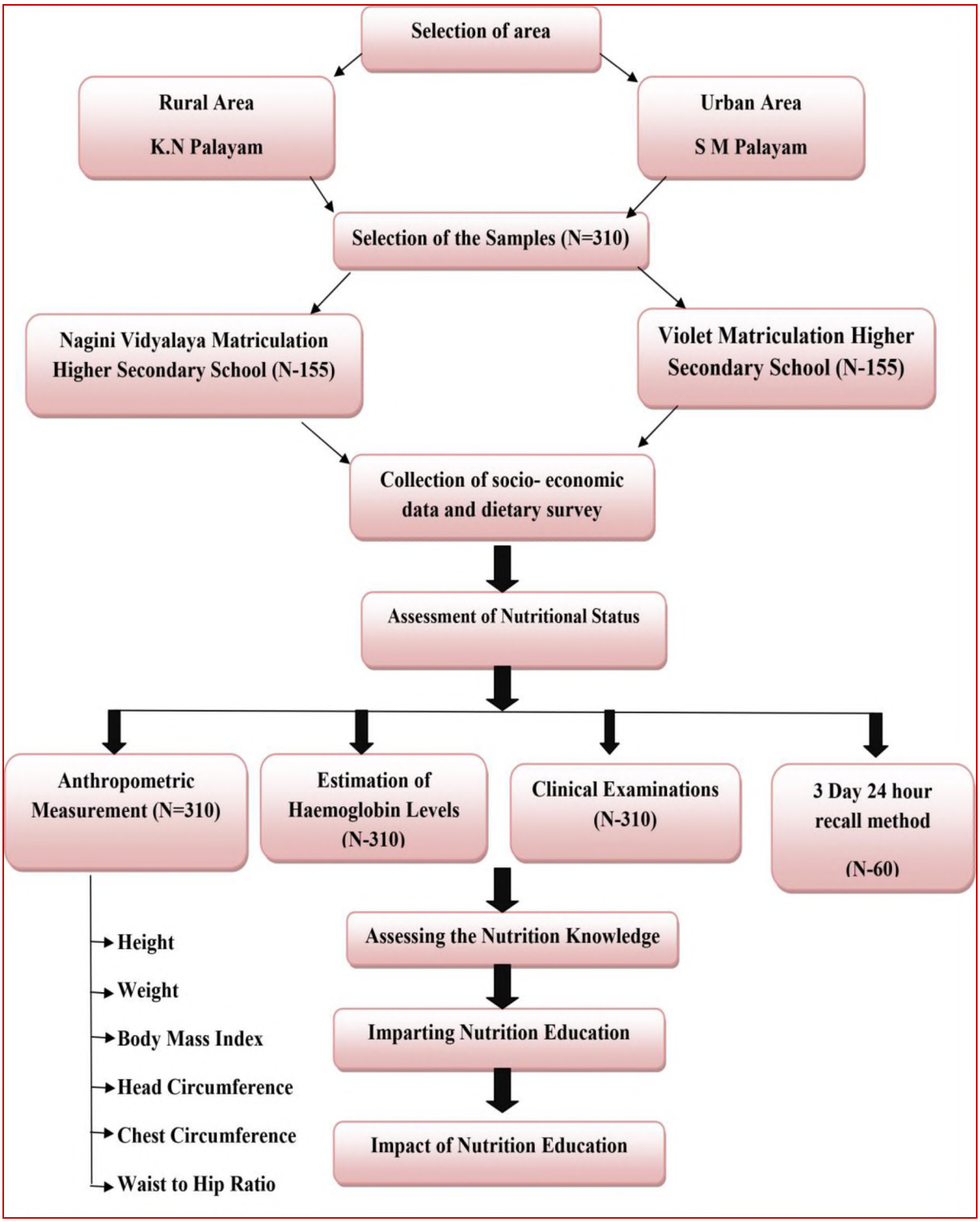
After the completion of the conduct of nutrition education programme the impact was studied by distributing the same questionnaire to the same selected sub samples and the scores were awarded and compared with the previous scores. Similarly before and after imparting nutrition education their anthropometric measurement were measured, haemoglobin levels were estimated, and their mean food nutrients intake was also calculated and compared with the previous value to find out the impact.

The institutional human ethics committee of Avinashilingam University as granted the approval for this research work and the approval number for the same is AUW/IHEC-13-14/XPD-18.

G. ANALYSIS OF DATA

The data collected was consolidated, tabulated, analyzed and interpreted using appropriate statistical methods.

Plate 5



RESEARCH DESIGN

FIGURE 1

IV RESULTS AND DISCUSSION

The results of the study entitled **"Haemoglobin Status of Selected Rural and Urban Adolescents and the Impact of Intervention Programme"** are discussed under the following headings.

A. Socio-economic information
B. Dietary pattern and life style practices
C. Assessment of nutritional status
D. Impact of nutrition education

A) SOCIO ECONOMIC BACK GROUND INFORMATION

The socio-economic back ground information like type of family, age, sex, education, family income and other items of the selected subjects were collected, presented and discussed under the following tables.

1. Gender

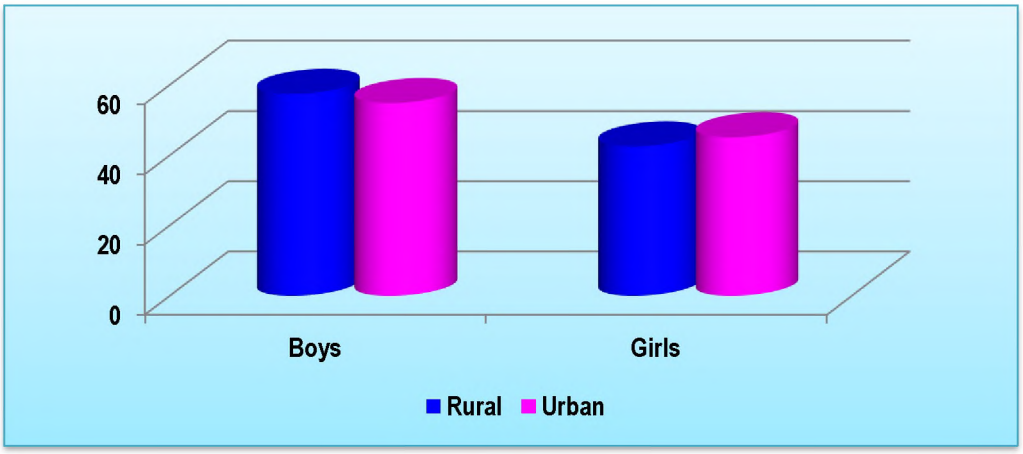
Sex of the selected subjects were categorized and showed in Table I and Figure 2.

TABLE I

SEX OF THE SELECTED SUBJECTS

(N=310)

Sex	Rural (N = 155)		Urban (N =155)	
	Number	Percent	Number	Percent
Boys	89	57.4	85	54.8
Girls	66	42.5	70	45.1



SEX OF THE SELECTED SUBJECTS

FIGURE 2

From the above table I 57.4 percent and 42.5 percent were rural boys and girls respectively. Urban boys were 54.8 percent followed by 45.1 percent urban girls.

2. Age

Table II shows according to their age group wise distribution of the selected subjects.

TABLE II

AGE OF THE SELECTED SUBJECTS

(N=310)

Age years	Rural (N=155)						Urban (N=155)					
	Boys		Girls		Total		Boys		Girls		Total	
	N	P	N	P	N	P	N	P	N	P	N	P
10-11	15	9.6	12	7.7	27	17.4	17	10.9	14	9	31	20
11-12	18	11.6	14	9.0	32	20.6	16	10.3	13	8.3	29	18.7
12-13	16	10.3	12	7.7	28	18.2	16	10.3	14	9	30	19.3
13-14	18	11.6	12	7.7	30	19.3	17	10.9	14	9	31	20
14-15	24	15.4	14	9.0	38	24.5	19	12.2	15	9.6	34	21.9

From the above table II it was noted that 15.4 percent and 9 percent of rural boys and girls were in the age group of 14-15 years respectively. In the age group of 10-11 years the percentages of rural boys were 9.6 followed by rural girls 7.7 percent. With regard to urban boys 12.2 percent were of 14-15 years and 10.3 percent were of 11-12 and 12-13 years respectively. In the age group of 14-15 years the percentage of urban girls was 9.6 and 8.3 percent were in the age group of 11-12 years.

3. Type of family

Type of family of the selected subjects shown in Table III and Figure 3.

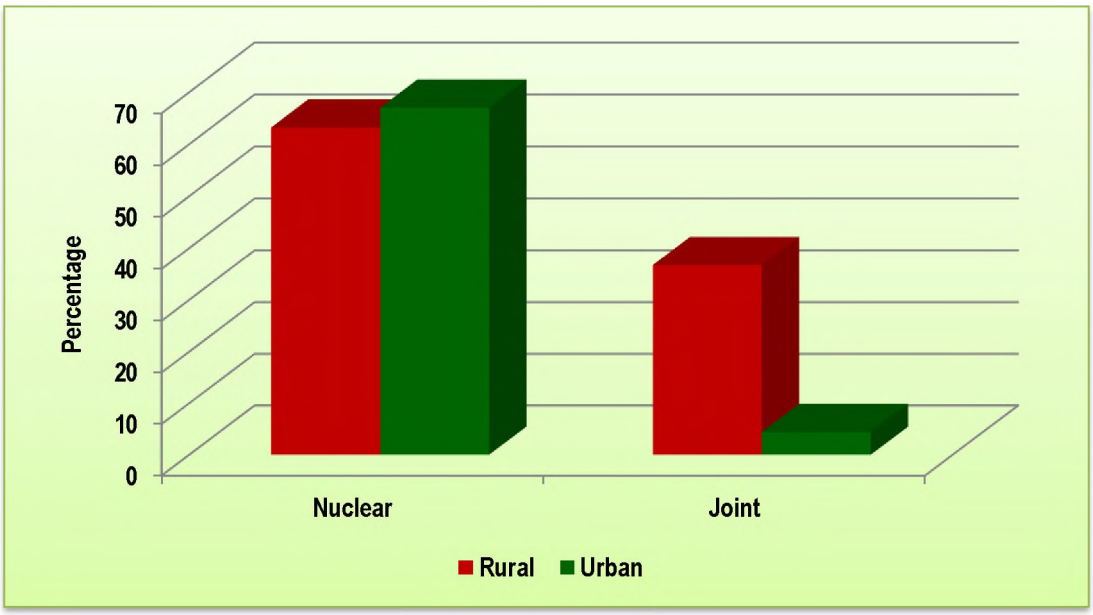
TABLE III

TYPE OF FAMILY

(N=310)

Type of Family	Rural (N =155)						Urban (N=155)					
	Boys		Girls		Total		Boys		Girls		Total	
	N	P	N	P	N	P	N	P	N	P	N	P
Nuclear	59	38	39	25.1	98	63.2	58	37.4	46	29.6	104	67
Joint	30	19.3	27	17.4	57	36.7	28	18	24	15.4	51	32.9

From the above Table III it was clear that the percentage of joint family were higher in rural areas 36.7 percent when compared to urban areas 32.9 percent. The percentage of nuclear family were higher in urban areas than rural areas 67 percent and 63.2 percent respectively.



TYPE OF FAMILY

FIGURE 3

4. Composition of the Family

Composition of family of selected subjects shown in Table IV

TABLE IV

COMPOSITION OF THE FAMILY

(N=310)

Family members	Rural (N=155)				Urban (N=155)			
	Boys (N=89)		Girls (N =66)		Boys (N =85)		Girls (N =70)	
	N	P	N	P	N	P	N	P
3 – 4	42	27	28	18	58	37.4	32	20.6
4 – 6	19	12.2	16	10.3	15	9.6	21	13.5
6 – 8	28	18	22	14.1	12	7.7	17	10.9

From the above table it was observed that 18 percent, 14.1 percent, 7.7 percent and 10.9 percent of the family had a large size of 6-8 members of selected rural and urban family respectively. Maximum of 27percent, 18 percent, 37.4 percent and 20.6 percent had less than 3 to 4 members in the families of selected rural and urban boys and girls respectively. Only 12.2 percent of rural boys and 13.5 percent of urban girls had 4 to 6 members consisting joint family system.

5. Educational status of the family

Educational status of the selected subjects shown in Table V.

TABLE V

EDUCATIONAL STATUS OF THE FAMILY

(N=1489)

Educational qualification	Rural (N=664)		Urban (N=825)	
	Number	Percent	Number	Percent
Primary	126	18.9	182	22
High School	184	27.7	210	25.4
Higher Secondary	105	15.8	174	21
Graduate	138	20.7	177	21.4
Illiterate	111	16.7	82	9.9

From the above it is clear that 27.7 percent of rural and 25.4 percent of urban families completed their high school level education. 15.8 percent and 21 percent of rural and urban family completed their higher secondary education level. Graduate level education were rural 20.7 percent and 21.4 percent urban respectively. Primary school level educations were 18.9 percent and 22 percent of rural and urban families. Illiterate levels of rural and urban were 16.7 percent and 9.9 percent respectively.

6. Occupation status of the family

Occupation status of the selected subjects shown in Table VI.

TABLE VI

OCCUPATION STATUS OF THE FAMILY

(N=403)

Occupation status	Rural (N=193)		Urban (N=210)	
	Number	Percent	Number	Percent
Agriculture	41	21.2	23	10.9
Government Job	19	9.8	37	17.6
Private	34	17.6	44	20.9
Construction Workers	46	23.8	38	18
Teachers	6	3	16	7.6
Own Business	39	20.2	47	22.3
Brick	8	4.1	5	2.3

Occupational status of rural and urban families showed that 23.8 percent and 18 percent were employed in construction workers, 20.2 percent and 22.3 percent were having their own business respectively. As agriculturist families the percentages were

21.2 percent and 10.9 percent. Three percent and 7.6 percent were teachers and 9.8 percent, 17.6 percent were employed in government job and the remaining 4.1 percent and 2.3 percent were bricking workers of selected rural and urban families respectively.

7. Monthly income of the family

Details regarding the monthly income of the selected subjects presented in Table VII.

TABLE VII

MONTHLY INCOME OF THE FAMILY

(N=403)

Monthly income	Rural (N=193)		Urban (N=210)	
	Number	Percent	Number	Percent
Below 3000	8	4.14	11	5.2
3000-5000	39	20.2	18	8.5
5000-10000	53	27.4	59	28
above 10000	93	48.1	122	58

HUDCO classification of income, 2007

The monthly income of the families were tabulated according to the HUDCO (2007) classification. Among the families studied 48.1 percent and 58 percent earned a monthly income of greater than Rs. 10,000 and 27.4 percent and 28 percent of the families had a income of Rs 5,000-10, 000 and 20.2 percent and 8.5 percent earned a monthly income of 3,000-5,000, and the remaining 3.1 percent and 5.2 percent earned a monthly income of less than 3,000 of selected rural and urban families respectively.

8. MONTHLY FOOD EXPENDITURE

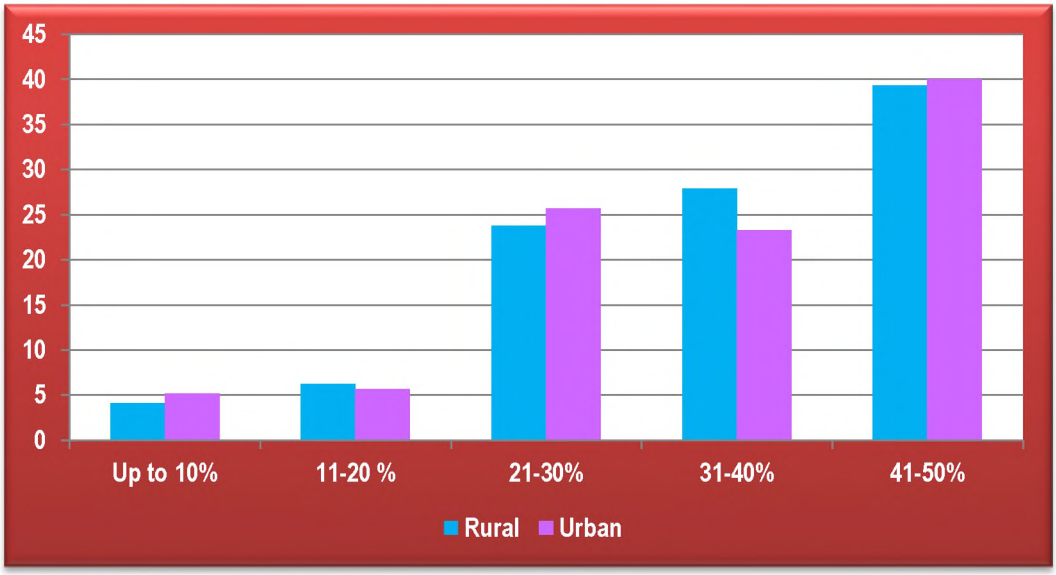
Details regarding the monthly food expenditure on food of the selected subjects shown in Table VIII and Figure 4.

TABLE VIII

MONTHLY FOOD EXPENDITURE

(N=310)

Expenditure on food	Rural (N=155)		Urban (N=155)	
	N	P	N	P
Up to 10%	8	4.08	11	5.2
11-20 %	12	6.2	12	5.7
21-30%	46	23.8	54	25.7
31-40%	54	27.9	49	23.3
41-50%	76	39.3	84	40



MONTHLY FOOD EXPENDITURE

FIGURE 4

From the total income of the family the food expenditure percentage ranged from 10 percent to 50 percent. Among rural 39.3 percent and from urban 40 percent were in the range of 41-50 percent up to 10% the percentage was 4.9 percent and 5.2 percent of rural and urban respectively.

B) DIETARY PATTERN AND LIFE STYLE PRACTICES

The dietary pattern of the selected subjects like type of diet, meal pattern, meals skipped, consumption of snacks, food allergy, supplements, food frequency pattern were collected and the corresponding results shown below.

1. Type of diet

Information regarding the type of diet consumed by the selected subjects presented in Table IX.

TABLE IX

TYPE OF DIET

(N=310)

Criteria	Rural (N=155)						Urban (N=155)					
	Boys (N =89)		Girls (N =66)		Total		Boys (N =85)		Girls (N =70)		Total	
	N	P	N	P	N	P	N	P	N	P	N	P
vegetarian	8	5.1	13	8.3	21	13.5	11	7.0	14	9.0	25	16.1
Non vegetarian	77	49.6	48	30.9	125	80.6	67	43.2	47	30.3	114	73.5
Ovo vegetarian	4	2.5	5	3.2	9	5.8	7	4.5	9	5.8	16	10.3

From the table IV, 49.6 percent of rural boys, 30.9 percent of rural girls and 43.2 percent of urban boys, 30.3 percent of urban girls were non vegetarian followed by 2.5 percent, 3.2 percent rural boys and girls and 4.5 percent , 5.8 percent urban boys and girls were ovo vegetarians respectively.

2. Meal pattren

Meal pattern of the selected subjects was presented in Table X.

TABLE X

MEAL PATTERN

(N=310)

Criteria	Rural (N=155)						Urban (N=155)					
	Boys (N =89)		Girls (N =66)		Total		Boys (N =89)		Girls (N =66)		Total	
	N	P	N	P	N	P	N	P	N	P	N	P
Less than 3 Meals	33	21.2	23	14.8	56	36.1	24	15.4	18	11.6	42	27
3 Meals	37	23.8	28	18	65	41.9	39	25.1	32	20.6	71	45.8
Above 3 Meals	19	12.2	15	9.6	34	34	22	14.1	20	12.9	42	27

From the table 23.8 percent of rural boys, 18 percent of rural girls and 25.1 percent of urban boys, 20.6 percent urban girls were 3 meals per day followed by 21.2 percent ,14.8 percent rural boys and girls and 15.4 percent ,11.6 percent urban boys and girls were less than 3 meals per day respectively.

3. Meals skipped

The meals skipped by the selected subjects shown in Table XI.

TABLE XI

MEALS SKIPPED

(N=310)

Criteria	Rural (N=155)						Urban (N=155)					
	Boys (N =89)		Girls (N=66)		Total		Boys (N =85)		Girls (N =70)		Total	
	N	P	N	P	N	P	N	P	N	P	N	P
Break Fast	2	1.2	3	1.9	5	3.2	6	3.8	4	2.5	10	6.4
Lunch	2	1.2	1	0.6	3	1.9	9	5.8	5	3.2	14	9.0
Dinner	1	0.6	1	0.6	2	1.2	2	1.2	6	3.8	8	5.1
Nil	84	54.1	61	39.2	145	93.5	68	43.8	55	35.4	123	79.3

From the above table IX It was found that only 1.2 percent, 1.9 percent of rural boys and girls followed by 3.8 percent, 2.5 percent of urban boys and girls skipped breakfast respectively. Regarding lunch 1.2 percent, 0.6 percent of rural boys and girls and 5.8 percent, 3.2 percent urban girls were found to skip. Three meal patterns were followed by 54.1 percent, 39.2 percent of rural boys and girls and 43.8 percent, 35.4 percent of urban boys and girls respectively.

4. Consumption of snacks and fruits

The consumption of snacks and fruits of the selected subjects shown in Table IX.

TABLE XII

CONSUMPTION OF SNACKS AND FRUITS

(N=310)

Criteria	Rural (N=155)						Urban (N=155)					
	Boys (N =89)		Girls (N =66)		Total		Boys (N =85)		Girls (N =70)		Total	
	N	P	N	P	N	P	N	P	N	P	N	P
Processed Foods	15	9.6	9	5.8	24	15.4	14	9.0	7	4.5	21	13.5
Baked Foods	19	12.2	15	9.6	34	21.9	22	14.1	34	21. 9	56	36.1
Fried Foods	26	16.7	18	11.6	44	28.3	19	12.2	13	8.3	32	20.6
Fruits	29	18.7	24	15.4	53	34.1	30	19.3	16	10.3	46	29.6

It was found that 18.7 percent, 15.4 percent of rural boys and girls and 19.3 percent, 10.3 percent of urban boys and girls consume fruits respectively. Processed foods were consumed by 9.6 percent and 5.8 percent of rural boys and girls respectively.

In the case of urban boys and girls it was 9 percent and 4.5 percent respectively. Fried foods were consumed by 16.7 percent, 11.6 percent, 12.2 percent and 8.3 percent of rural boys and girls and urban boys and girls respectively.

5. Food allergy

Details regarding the food allergy of the selected subjects shown in Table XIII.

TABLE XIII

FOOD ALLERGY

(N=310)

Criteria	Rural (N=155)						Urban (N=155)					
	Boys (N =89)		Girls (N =66)		Total		Boys (N =85)		Girls (N =70)		Total	
	N	P	N	P	N	P	N	P	N	P	N	P
Green leafy vegetables	2	1.2	3	1.9	5	3.2	9	5.8	5	3.2	14	9
Brinjal	3	1.9	4	2.5	7	4.5	7	4.5	3	1.9	10	6.4
Chicken	1	0.6	3	1.9	4	2.5	2	1.2	1	0.6	3	1.9
Bitter Gourd	6	3.8	2	1.2	8	5.1	5	3.2	8	5.1	13	8.3
Nil	77	49.6	54	34.8	131	84.5	62	40	53	34	115	74.1

With regard to bitter gourd 5.1 percent of rural boys and girls expressed their allergy followed by 4.5 percent, 3.2 percent, and 2.5 percent, for brinjal, green leafy vegetables and chicken. In case of urban boys and girls 9 percent were allergic to green leafy vegetables followed by 8.3 percent, 6.4 percent, and 1.9 percent towards bitter gourd, brinjal and chicken.

6. Vitamin / mineral supplements

Vitamin/mineral supplements consumed by the selected subjects shown in Table XIV.

TABLE XIV
VITAMIN/MINERAL SUPPLEMENTS

(N=310)

Criteria	Rural (N=155)						Urban (N=155)					
	Boys (N =89)		Girls (N =66)		Total		Boys (N =85)		Girls (N =70)		Total	
	N	P	N	P	N	P	N	P	N	P	N	P
Calcium Tablets	6	3.8	3	1.9	9	5.8	19	12.2	11	7	30	19.3
Vitamin Tablets	9	5.8	9	5.8	18	11.6	18	11.6	9	5.8	27	17.4
Iron Tablets	5	3.2	8	5.1	13	8.3	14	9	13	8.3	27	17.4
Nil	69	44.5	46	29.6	115	74.1	34	21.9	37	23.8	71	45.8

From the above Table XII it was noted that both rural and urban boys and girls were having medicinal supplements. Vitamin tablets were consumed by 5.8 percent in the case of rural boys and girls and urban girls. The urban boys' percentage was 11.6. Total of 8.3 percent of rural boys and girls and 17.4 percent of urban boys and girls had iron tablets. Calcium tablets were consumed by 3.8 percent, 1.9 percent of rural boys and girls respectively followed by 12.2 percent, 7 percent with regard to urban boys and girls. Total of 74.1 percent, 45.8 percent of rural and urban boys and girls did not have any supplement.

7. Habit of taking foods from outside

Details regarding the habit of taking foods from outside shown in Table XV

TABLE XV

HABIT OF TAKING FOODS FROM OUTSIDE

(N=310)

Criteria	Rural (N=155)						Urban (N=155)					
	Boys (N =89)		Girls (N =66)		Total		Boys (N =85)		Girls (N =70)		Total	
	N	P	N	P	N	P	N	P	N	P	N	P
Daily	6	3.8	-	-	6	3.8	19	12.2	6	3.8	25	16.1
Weekly	24	15.4	18	11.6	42	27	29	18.7	30	19.3	59	38
Monthly	30	19.3	26	16.7	56	36.1	37	23.8	31	20	68	43.8
Occasionally	29	18.7	22	14.1	51	32.9	-	-	3	1.9	3	1.9

It was found that 15.4 percent, 11.6 percent of selected rural boys and girls and 18.7percent, 19.3 percent of selected urban boys and girls consumed outside food weekly, followed by 19.3 percent, 16.7 percent, 23.8 percent, 20 percent of selected rural and urban boys and girls consumed foods from outside once in a month.

9. Food frequency pattern

Frequency of consumption of various food stuffs consumed by the selected subjects were collected and categorized according to daily, weekly, monthly, occasionally and were tabulated and discussed.

a) Cereals

The frequency of consumption of cereals were categorized and tabulated in Table XVI.

TABLE XVI

CEREALS

(N=310)

Food Stuffs	Rural (N=155)								Urban (N=155)							
	Daily		Weekly		Monthly		Occasionally		Daily		Weekly		Monthly		Occasionally	
	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
Parboiled Rice	152	98	3	1.9	-	-	-	-	118	76.1	12	7.7	14	9	11	7
Raw Rice	124	80	16	10.3	11	7.0	4	2.5	141	90.9	8	5.1	4	2.5	2	1.2
Wheat	32	20.6	54	34	21	13.5	48	31	34	21.9	48	30.6	23	14.8	50	32.2
Ragi	18	11.6	34	21.9	65	41.9	38	24.5	3	1.9	18	11.6	23	14.8	111	71.6
Samai	86	55.4	23	14.8	21	13.5	25	16.1	54	34.8	8	5.16	13	8.3	80	51.6
Bajra	78	50.3	18	11.6	2	1.2	38	24.5	49	31.6	13	8.3	8	5.1	85	54.8
Rice Flakes	11	7	49	31.6	63	40.6	32	20.6	13	8.3	24	15.4	49	31.6	69	44.5
Vermicelli	28	18	44	28.3	67	43.2	16	10.3	26	16.7	49	31.6	21	13.5	59	38
Semolina	34	21.9	59	38	45	29	17	11	38	24.5	23	14.8	41	26.4	53	34.1

From the above table daily consumption of parboiled rice of total rural selected subjects were 98 percent and that of total urban selected subjects were 76.1. Daily consumption of raw rice, Samai, Bajra of rural selected subjects were of 80 percent, 55.4 percent and 50.3 percent respectively, and of urban selected subjects the percentage were 90.9, 34.8, and 31.6 respectively. Weekly consumption of wheat, semolina, rice flakes and vermicelli were 34 percent, 38 percent, 31.6, 28.3 in the case of rural selected subjects and the percentage were 30.6, 14.8, 15.4, and 31.6 of urban selected subjects respectively. Monthly consumption of Ragi, of rural selected subjects was 41.9 and that of urban selected subjects was 14.8 respectively. The rural selected subjects it was found that occasion consumption of wheat, Ragi, Bajra and rice flakes were 31 percent, 24.5 percent, and 20.6 percent respectively. In the Case of urban selected subjects occasion consumption of Ragi was 71.6 percent and of raw rice was 1.2 percent respectively.

b) Pulses

The frequency of consumption of pulses were categorized and tabulated in Table XVII.

TABLE XVII

PULSES

(N=310)

Food Stuffs	Rural (N=155)								Urban (N=155)							
	Daily		Weekly		Monthly		Occasionally		Daily		Weekly		Monthly		Occasionally	
	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
Red Gram Dhal	124	80	16	10.3	12	7.7	3	1.9	112	72.2	31	20	5	3.2	7	4.5
Bengal Gram Dhal	16	10.3	74	47.7	28	18	37	23.8	5	3.2	11	7	19	12.2	120	77.4
Bengal Gram Roasted	16	10.3	66	42.5	24	15.4	49	31.6	42	27	39	25.1	21	13.5	53	34.1
Peas Green	8	5.1	73	47	15	9.6	59	38	9	5.8	62	40	41	26.4	43	27.7
Green Gram Whole	12	7.7	54	34.8	42	27	47	30.3	3	1.9	44	28.3	84	54.1	24	15.4

From the above table XIV The daily consumption of red gram dhal of total selected rural subjects was 80 percent daily 10.3 percent weekly 7.7 percent monthly and 1.9percent occasionally. Bengal gram was 10.3 percent daily, 47.7 percent weekly, monthly 18 percent and occasionally 23.8 percent respectively. The daily, weekly, monthly and occasionally consumption of green gram whole of total urban selected subjects were 1.9 percent, 28.3 percent, 54.1 percent, 15.4 percent respectively.

c) Green leafy vegetables

The frequency of consumption of green leafy vegetables were categorized and tabulated in Table XVIII.

TABLE XVIII

GREEN LEAFY VEGETABLES

(N=310)

Food Stuffs	Rural (N =155)								Urban (N =155)							
	Daily		Weekly		Monthly		Occasionally		Daily		Weekly		Monthly		Occasionally	
	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
Drumstick Leaves	6	3.8	28	18	56	36	65	41.9	7	4.5	52	33.5	21	13.5	75	48.3
Coriander Leaves	51	32.9	54	34.8	23	14.8	27	17.4	32	20.6	46	29.6	31	20	46	29.6
Curry Leaves	72	46.4	56	36.1	22	14.1	5	3.2	69	44.5	53	34.1	21	13.5	12	7.7
Cabbage	11	7	88	56.7	31	20	36	23.2	2	1.2	67	43.2	39	25.1	49	31.6
Spinach	4	2.5	50	32.2	63	40.6	38	24.5	1	0.6	43	27.7	28	18.0	83	53.5

Consumption of drumstick leaves of total rural selected subjects was 3.8 percent 18 percent 36 percent 41.9 percent daily, weekly, monthly and occasionally respectively, whereas of total urban selected subjects consumption was 4.5 percent, 33.5 percent, 13.5 percent and 48.3 percent respectively. Daily consumption of curry leaves was 46.4 percent, 44.5 percent of total rural and urban selected subjects.

d) Other Vegetables

The frequency of consumption of other vegetables were categorized and tabulated in Table XIX.

TABLE XIX

OTHER VEGETABLES

(N=310)

Food Stuffs	Rural (N=155)								Urban (N=155)							
	Daily		Weekly		Monthly		Occasionally		Daily		Weekly		Monthly		Occasionally	
	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
Beans	7	4.5	73	47	32	20.6	43	27.7	3	1.9	81	52.2	41	26.4	30	19.3
Ladies Finger	4	2.5	77	49.6	26	16.7	48	30.9	9	5.8	79	50.9	28	18	39	25.1
Snake Gourd	4	2.5	50	32.2	63	40.6	38	24.5	8	5.1	30	19.3	68	43.8	49	31.6
Ash Gourd	3	1.9	40	25.8	58	37.4	54	34.8	4	2.5	40	25.8	71	45.8	40	25.8
Pumpkin	5	3.2	20	12.9	12	7.7	118	76.1	1	0.6	30	19.3	8	5.16	116	74.8

From the above table XVI it was found that the daily consumption of ash gourd was 1.9 percent and 2.5 percent of the total rural and urban selected subjects. Weekly consumption of beans, ladies finger, snake gourd and pumpkin were 47 percent, 49.6 percent, 32.2 percent,12.9 percent and 52.2 percent, 50.9 perceny,19.3 percent respectively of the total rural and urban selected subjects.

e) Roots and Tubers

The frequency of consumption of roots and tubers were categorized and tabulated in Table XX.

TABLE XX

ROOTS AND TUBERS

(N=310)

Food Stuffs	Rural (N =155)								Urban							
	Daily		Weekly		Monthly		Occasionally		Daily		Weekly		Monthly		Occasionally	
	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
Beet Root	5	3.2	49	31.6	23	14.8	78	50.3	9	5.8	61	39.3	29	18.7	56	36.1
Carrot	11	7	53	34.1	34	21.9	57	36.7	18	11.6	71	45.8	19	12.2	47	30.3
Onion	72	46.4	27	17.4	30	19.3	26	16.7	83	53.5	21	13.5	12	7.7	39	25.1
Potato	3	1.9	56	36.1	41	26.4	55	35.4	7	4.5	45	29	21	13.5	82	52.9
Radish	2	1.2	10	6.4	25	16.1	118	76.1	4	2.5	15	9.6	32	20.6	104	67

Daily consumption of onion was 46.4 percent, 53.5 percent of total rural and urban selected subjects respectively. Consumption of radish occasionally was 76.1 percent and 67 percent respectively of the total rural and urban selected subject.

f) Fruits

The frequency of consumption of pulses were categorized and tabulated in Table XXI.

TABLE XXI

FRUITS

(N=310)

Food Stuffs	Rural (N=155)								Urban (N=155)							
	Daily		Weekly		Monthly		Occasionally		Daily		Weekly		Monthly		Occasionally	
	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
Apple	17	10.9	53	34.1	38	24.5	47	30.3	32	20.6	67	43.2	13	8.3	43	27.7
Banana	81	52.2	48	30.9	16	10.3	10	6.4	68	43.8	34	21.9	18	11.6	35	22.5
Grapes	-	-	22	14.1	31	20	102	65.8	5	3.2	56	36.1	34	21.9	60	38.7
Guava	-	-	18	11.6	29	18.7	108	69.6	7	4.5	20	12.9	29	18.7	99	63.8
Orange	8	5.1	19	12.2	34	21.9	94	60.6	18	11.6	39	25.1	16	10.3	82	52.9

Daily consumption of banana of total selected rural and urban subjects were 52.2 percent and 43.8 percent respectively and that of apple the percentage were 10.9 and 20.6. Consumption of guava and orange by the total selected rural and urban subjects were 69.6percent and 63.8 percentages, 60.6 percent and 52.9percent occasionally.

g) Milk And Milk Products

The frequency of consumption of milk and milk products were categorized and tabulated in Table XXII.

TABLE XXII

MILK AND MILK PRODUCTS

(N=310)

Food Stuffs	Rural (N=155)								Urban (N=155)							
	Daily		Weekly		Monthly		Occasionally		Daily		Weekly		Monthly		Occasionally	
	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
Curd	18	11.6	42	27	26	16.7	69	44.5	21	13.5	37	23.8	17	10.9	80	51.6
Ghee	-	-	7	4.5	11	7.0	137	88.3	3	1.9	14	9	23	14.8	115	74.1
Butter	-	-	2	1.2	9	5.8	144	92.9	1	0.6	9	5.8	34	21.9	111	71.6

Daily consumption of curd of total selected rural and urban subjects were 11.6 percent and 13.5 percent respectively. Consumption of ghee by the total selected rural and urban subjects were 4.5 percent and 9 percent weekly. Monthly consumption of butter 5.8 percent and 21.9 percent of the selected rural and urban boys and girls respectively.

h) Fats and oils

The frequency of consumption of fats and oils were categorized and tabulated in Table XXIII.

TABLE XXIII

FATS AND OILS

(N=310)

Food Stuffs	Rural (N=155)								Urban (N=155)							
	Daily		Weekly		Monthly		Occasionally		Daily		Weekly		Monthly		Occasionally	
	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
Vanaspathy	4	2.5	14	9	23	14.8	114	73.5	19	12.2	23	14.8	35	22.5	78	50.3
Gold winner	23	14.8	19	12.2	32	20.6	81	52.2	21	13.5	32	20.6	29	18.7	82	52.9
Cooking oil	81	52.2	16	10.3	22	14.1	36	23.2	95	61.2	23	14.8	30	19.3	7	4.5
Coconut oil	17	10.9	10	6.4	27	17.4	101	65.1	46	29.6	19	12.2	21	13.5	69	44.4

Consumption of cooking oil of total rural selected subjects were 52.2 percent, 10.3 percent, 14.1 percent and 23.2 percent daily, weekly, monthly, occasionally respectively. Whereas of total urban selected subjects' consumption were 61.2 percent, 14.8 percent, 19.3 percent and4.5 percent respectively. Daily consumption of coconut oil were 10.9 percent, 29.6 percent of total rural and urban selected subjects respectively.

i) Fleshy foods

The frequency of consumption of fleshy foods were categorized and tabulated in Table XXIV.

TABLE XXIV

FLESHY FOODS

(N=310)

Food Stuffs	Rural (N=155)								Urban (N=155)							
	Daily		Weekly		Monthly		Occasionally		Daily		Weekly		Monthly		Occasionally	
	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
Mutton	-	-	23	14.8	46	29.6	86	55.4	4	2.5	29	18.7	51	32.9	71	45.8
Chicken	19	12.2	34	21.9	48	30.9	54	34.8	22	14.1	41	26.4	52	33.5	40	25.8
Fish	-	-	29	18.7	31	20	95	61.2	3	1.9	33	21.2	48	30.9	84	54.1
Egg	22	14	33	21.2	26	16.7	81	52.2	35	22.5	37	23.8	43	27.7	40	25.8
Others	14	9	8	5.1	17	10.9	116	74.8	18	11.6	12	7.7	19	12.2	106	68.3

Weekly consumption of chicken of total selected rural and urban subjects were 21.9 percent, 26.4 percent respectively and that of mutton the percentage were 14.8 percent 18.7 percent. Consumption of egg and fish by the total selected rural and urban subjects were 52.2 percent and 25.8 percentages, 61.2 percent and 54.1 percent occasionally.

j) Sugar and jaggery

The frequency of consumption of sugar and Jaggery were categorized and tabulated in Table XXV.

TABLE XXV

SUGAR AND JAGGERY

(N=310)

Food Stuffs	Rural (N=155)								Urban (N=155)							
	Daily		Weekly		Monthly		Occasionally		Daily		Weekly		Monthly		Occasionally	
	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
Sugar	155	100	-	-	-	-	-	-	155	100	-	-	-	-	-	-
Jaggery	-	-	-	-	37	23.8	118	76.1	-	-	6	3.8	26	16.7	123	79.3
Honey	-	-	10	6.4	15	9.6	130	83.8	3	1.9	9	5.8	18	11.6	125	80.6

Above table showed that all the selected subjects consumed sugar. With regard to honey 9.6 percent and 11.6 percent consumed monthly, whereas 76.1 percent, 79.3 percent consumed occasionally and Jaggery was consumed monthly by 23.8 percent and 16.7 percent of the selected rural and urban boys and girls respectively.

k) Beverages

The frequency of consumption of beverages were categorized and tabulated in Table XXVI.

TABLE XXVI

BEVERAGES

(N=310)

Food Stuffs	Rural (N=155)								Urban (N=155)							
	Daily		Weekly		Monthly		Occasionally		Daily		Weekly		Monthly		Occasionally	
	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
Tea	58	37.4	13	8.3	2	1.2	9	5.8	71	45.8	12	7.7	4	2.5	68	43.8
Milk	39	25.1	38	24.5	4	2.5	-	-	61	39.3	47	30.3	6	3.8	41	26.4
Soft Drinks	16	10.3	21	13.5	-	-	32	20.6	23	14.8	15	9.6	8	5.1	46	29.6

From the above table it was found that daily consumption of milk were 25.1 percent and 39.3 percent of the selected rural and urban boys and girls. Weekly consumption of soft drinks and tea were 13.5 percent, 8.3 percent, 9.6 percent and 7.7 percent of selected rural and urban boys and girls respectively.

2. LIFE STYLE PRACTICES

The life style practices of the selected subjects included habit of exercise, sleeping hours, leisure time and stress.

1. The habit of doing exercise/yoga/meditation

Details regarding the habit of doing exercise/yoga/meditation of the selected subjects shown in Table XXVII.

TABLE XXVII

THE HABIT OF DOING EXERCISE/YOGA/MEDITATION

(N=310)

Criteria		Rural (N=155)				Urban (N =155)			
		Boys (N=89)		Girls (N =66)		Boys(N =85)		Girls(N =70)	
		N	P	N	P	N	P	N	P
Exercise	½ hour	22	14	15	9.6	31	20	24	15.4
1- 1 ½ hour		7	4.5	9	5.8	5	3.2	11	7
Yoga	½ hour	19	12.2	19	12.2	12	7.7	8	5.1
1-1 ½ hour		9	5.8	11	7	13	8.3	14	9
Meditation	½ hour	11	7	8	5.1	10	6.4	4	2.5
1-1 ½ hour		21	13.5	4	2.5	14	9	9	5.8

Fourteen percent, 9.6 percent of rural boys and girls and 20 percent, 15.4 percent urban boys and girls did exercise every day for half an hour. Whereas 13.5 percent, 2.5 percent, 9 percent, 5.8 percent of rural and urban boys and girls observed 1 ½ hour meditation every day respectively. Yoga was performed for half an hours every day by rural boys and girls 12.2 percent respectively and urban boys and girls the percentage was 7.7 and 5.1 accordingly.

2. Sleeping hours

Details regarding the sleeping hours of the selected subjects shown in Table XXVIII.

TABLE XXVIII

SLEEPING HOURS

(N=310)

Criteria	Rural (N=155)						Urban (N =155)					
	Boys (N =89)		Girls (N=66)		Total		Boys (N=85)		Girls (N=70)		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
6-8 Hours	11	7.0	15	9.6	26	16.7	19	12.2	22	14.1	41	26.4
8-10 Hours	78	50.3	51	32.9	129	83.2	66	42.5	48	30.9	114	73.5

Seven percent, 9.6 percent of rural boys and girls 12.2 percent, 14.1 percent urban boys and girls were had 6-8 hours of sleep every day whereas 50.3 percent, 32.9 percent,42.5 percent, 30.9 percent of rural and urban boys and girls had 8 -10 hours of sleep per day respectively.

3. Leisure time

Details regarding the leisure time of the selected subjects shown in Table XXIX.

TABLE XXIX

LEISURE TIME

(N=310)

Criteria	Rural (N=155)						Urban (N =155)					
	Boys (N =89)		Girls (N=66)		Total		Boys (N =85)		Girls (N=70)		Total	
	N	P	N	P	N	P	N	P	N	P	N	P
Household Activities	19	12.2	11	7	30	19.3	11	7	15	9.6	26	16.7
Watching TV	45	29	36	29.6	81	52.2	24	15.4	32	20.6	56	36
Sleeping	12	7.7	9	5.8	21	13.5	15	9.6	14	9.0	29	18.7
News paper reading	8	5.1	7	4.5	23	14.8	18	11.6	4	2.5	22	14.1
listening to music	5	3.2	3	1.9	8	5.1	17	10.9	5	3.2	22	14.1

Twenty nine percent, 29.6 percent of selected rural boys and girls and 15.4 percent, 20.6 percent of selected urban boys and girls spent their leisure time by watching TV, 3.2 percent, 1.9 percent of selected rural boys and girls and 10.9 percent, 3.2 percent of selected urban boys and girls spent their leisure time by listening to music respectively. Reading of news papers percentage was 14.8 percent, in case of rural boys and girls and 14.1 percent in the case of urban boys and girls. Listening to music percentage was higher in the case of total urban boys and girls 14.1 percent than when compared to rural total boys and girls 5.1 percent.

4. Stress

Details regarding the stress among the selected subjects shown in Table XXX.

TABLE XXX

STRESS AMONGG THE SELECTED SUBJECTS

(N=310)

Criteria	Rural (N=155)						Urban (N =155)					
	Boys (N =89)		Girls (N=66)		Total		Boys (N =85)		Girls (N=70)		Total	
	N	P	N	P	N	P	N	P	N	P	N	P
Calm and Relaxed	42	27	35	22.5	77	49.6	37	23.8	26	16.7	63	40.6
Family Stress	28	18	22	14.1	50	32.2	19	12.2	16	10.3	35	22.5
Educational Stress	19	12.2	9	5.8	28	18	29	18.7	28	18	57	36.7

Calm and relaxed were of 49.6 percent of total selected rural boys and girls against 40.6 percent of total selected urban boys and girls respectively. In rural boys and girls family stress was among 18 percent and 14.1 percent respectively. Educational stress was 18.7 percent and 18 percent among urban boys and girls respectively.

C. ASSESSMENT OF NUTRITIONAL STATUS

Anthropometric measurements like height, weight, head, and chest circumferences were measured for the selected subjects and body mass index was calculated and waist to hip ratio was drawn.

1. Mean height, weight, body mass index head, chestcircumference and waist to hip ratio

The details of mean height, weight, body mass index, head, chest circumference and waist to hip ratio of the selected subjects shown in Table XXXI.

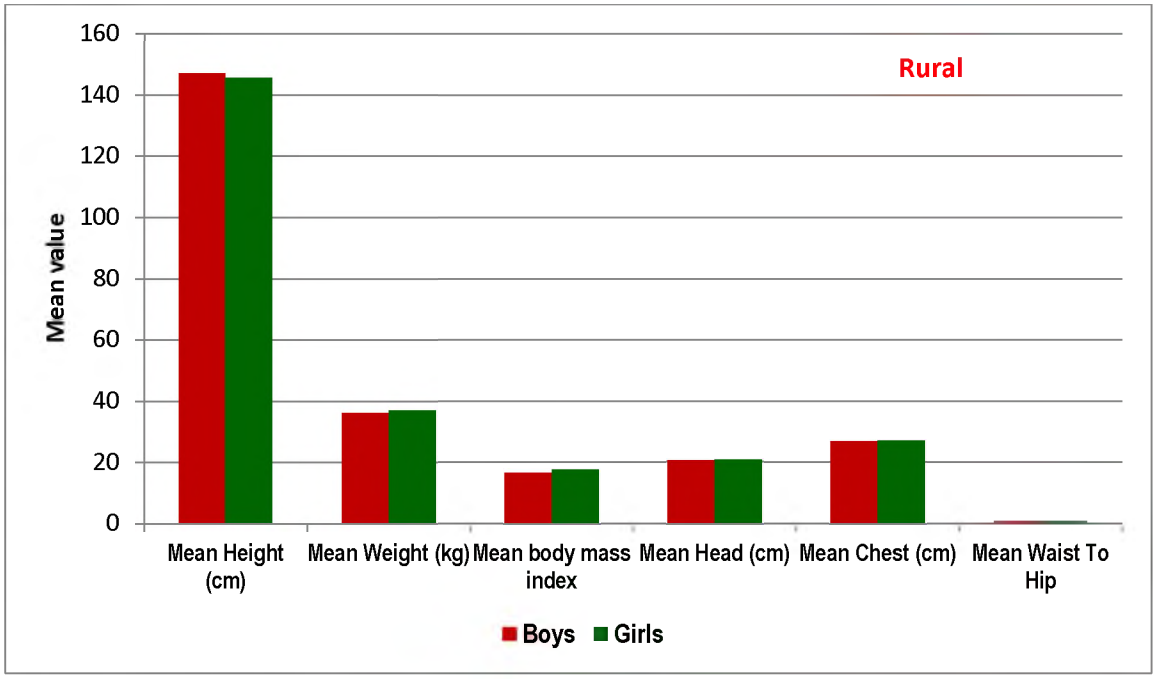
TABLE XXXI

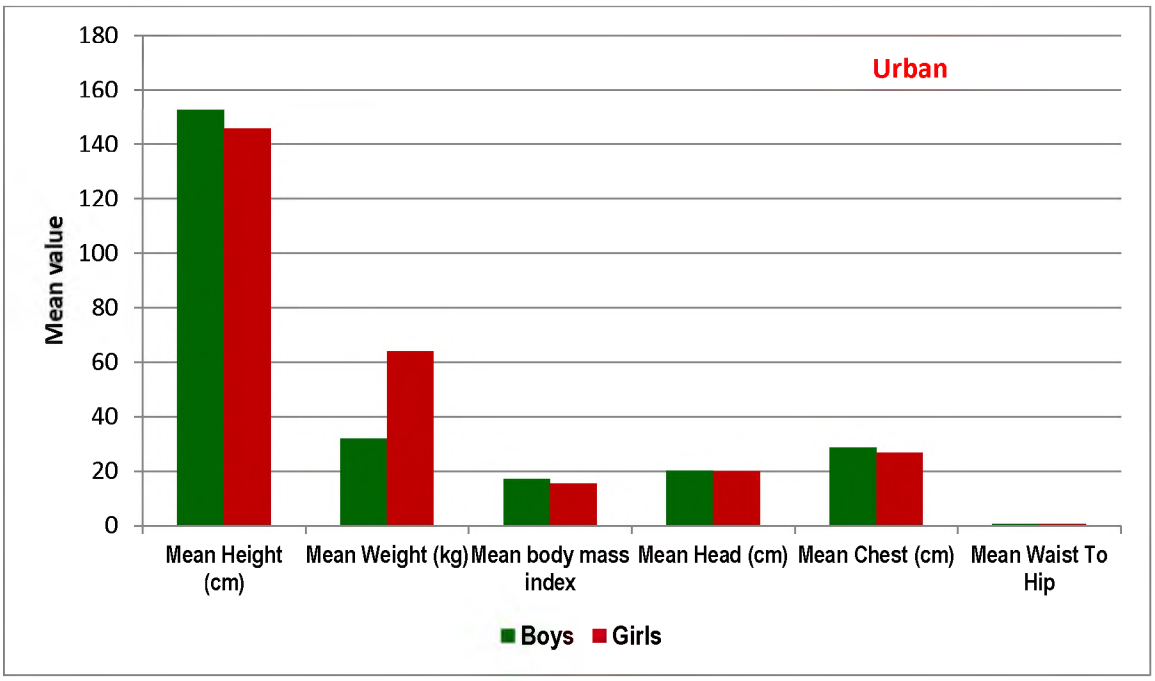
MEAN HEIGHT, WEIGHT, BODY MASS INDEX, HEAD, CHEST CIRCUMFERENCE WAIST TO HIP RATIO

(N=310)

Anthropometric Measurements	Rural (N=155)		Urban (N =155)	
	Boys (N =89)	Girls (N =66)	Boys (N =85)	Girls (N =70)
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Mean Height (cm)	146.94 ± 10.28	145.49 ± 9.91	152.61 ± 10.3	145.76 ± 9.8
Mean Weight (kg)	36.24 ± 9.11	36.97± 8.13	32.15 ± 4.49	36.97 ±9.1
Mean body mass index	16.45 ± 2.92	17.62 ± 3.18	17.18 ± 2.74	15.60 ± 2.363
Mean Head (cm)	20.53 ± 0.73	20.76 ± 0.66	20.33 ± 0.75	19.96 ± 2.39
Mean Chest (cm)	26.88 ± 3.41	27.03 ± 3.39	28.78 ± 3.92	26.84 ± 3.42
Mean Waist To Hip	0.80 ± 0.07	0.82 ± 0.07	0.81 ± 0.08	0.80 ± 0.08

The mean height of rural boys was 146.94± 10.28 and of girls was 145.49± 9.91 in the case of urban boys 152.61± 10.3 and of girls it was 145.76± 9.8. The mean weights of rural boys were 36.24±9.11 and girls were 36.97± 8.13 in the case of urban boys 32.15±4.49 and of girls it was 36.97±9.1 respectively. The mean body mass index of rural and urban boys and girls were 16.45 ± 2.92, 17.62±3.18 in the case of urban boys 17.18-2.74 and of girls it was 15.60-2.36. The mean weights of head circumference of rural boys were 20.53-0.73 and of girls were 20.76-0.66 in the case of urban boys, 20.33-0.75 and of girls it was 19.96-2.39. The mean chest circumference of rural boys and girls were 26.88-3.41 and 27.03-3.39 in the case of urban boys and girls it was 28.78-3.92 and 26.84± 3.42. The mean waist to hip ratio of rural boys were 0.80-0.07 and 0f girls were 0.82-0.07 in the case of urban boys 0.81-0.08 and girls it was 0.80-0.08 respectively.





MEAN HEIGHT, WEIGHT, BODY MASS INDEX, HEAD, CHEST CIRCUMFERENCE WAIST TO HIP RATIO

FIGURE 5

a) Body Mass Index

The body mass index of the selected subjects shown in Table XXXII

TABLE XXXII

BODY MASS INDEX

(N=310)

Body Mass Index	Rural (N=155)						Urban (N =155)					
	Boys (N =89)		Girls (N=66)		Total		Boys (N =85)		Girls (N=70)		Total	
	N	P	N	P	N	P	N	P	N	P	N	P
Under Weight (< 5th)	24	15.4	14	9	38	24.5	16	10.3	18	11.6	34	21.9
Healthy Weight (<5th to 90)	62	40	46	29.6	108	69.6	66	42.5	47	30.3	113	72.9
Overweight (90 to 95)	1	6.4	4	2.5	5	3.2	2	1.2	2	1.2	4	2.5
Obese (> 95)	2	1.2	2	1.2	4	2.5	1	0.6	3	1.9	4	2.5

Source WHO 2007

Total healthy weight of rural boys and girls were 69.6 percent and 72.9 percent were of urban boys and girls. Total underweight rural boys and girls were 24.5 percent and 21.9percent were of urban boys and girls. Total obese rural and urban boys and girls were 2.5 percent, overweight rural boys and girls were 3.2 percent and 2.5 percent were urban boys and girls respectively.

b) Waist to hip ratio

The Waist to hip of the selected subjects shown in Table XXXIII.

TABLE XXXIII
WAIST TO HIP RATIO

(N=310)

Waist to hip ratio	Health risk	Rural (N=155)				Urban (N=155)			
		Boys (N =89)		Girls (N=66)		Boys (N =85)		Girls (N=70)	
		N	P	N	P	N	P	N	P
< 0.80	Low Risk	23	14.8	8	5.1	27	17.4	22	14.1
0.81-0.85	Moderate Risk	43	27.7	31	20	24	15.4	23	14.8
>0.85	High Risk	23	14.8	27	17	34	21.9	25	16.1

WHO 2008

From the above table XXXIII, it is evident that 14.8 percent, 5.1 percent, 17.4 percent, 14.1 percent of rural and urban boys and girls were of moderate risk. Whereas 14.8 percent, 17 percent of rural boys and girls were high risk and 21.9 percent and 16.1 percent of urban boys and girls were of high risk. Low risk of rural and urban boys and girls were 14.8 percent, 5.1 percent, 17.4 percent,14.1 percent respectively.

2) Estimation haemoglobin level

The haemoglobin level of the selected subjects shown in Table XXXIV.

TABLE XXXIV

ESTIMATION HAEMOGLOBIN LEVEL OF THE SELECTED SUBJECTS

(N=310)

HAEMOGLOBIN RANGES	RURAL (N=155)				URBAN(N=155)			
	Boys (N =89)		Girls (N=66)		Boys (N =85)		Girls (N=70)	
	N	P	N	P	N	P	N	P
Mild (9.5 -13.0 g/dl)	67	43.2	40	25.8	55	35.4	50	32.2
Moderate (8.0-9.5 g/dl)	21	13.5	21	13.5	28	18	18	11.6
Severe (8.0 g/dl)	1	0.6	5	3.2	2	1.2	2	1.2

Mild anaemics percentages were 43.2 percent, 25.8 percent, 35.4 percent, and 32.2 percent of rural boys and girls and urban boys and girls respectively. Severe anaemics were 0.6percent, 3.2 percent in rural boys and girls and in urban boys and girls it was 1.2 percent respectively. Rural boys' percentages of moderate anaemics were 13.5 percent correspondingly for urban boys it was 18 percent.

3. Clinical signs and symptoms

Clinical signs and symptoms of the selected subjects shown in Table XXXV.

CLINICAL SIGNS AND SYMPTOMS

TABLE XXXV

(N=310)

Problems	Rural (N=155)		Urban (N=155)	
	Number	Percent	Number	Percent
Healthy and free from symptoms	94	60.6	102	65.8
Spoon shaped nails	1	0.6	-	-
Loss of hair	15	9.6	11	7.0
Pale eye	6	3.8	4	2.5
Night blindness	8	5.1	6	3.8
Pale conjunctiva	5	3.2	7	4.5
Dental carries	18	11.6	16	10.3
Angular stomatitis	5	3.2	2	1.2
Pale skin	4	2.5	7	4.5

Dental carries were 11.6 percent in rural selected subjects followed by 10.3 percent in urban in selected subjects. Loss of hair was predominant in rural as well as urban selected subjects and it was 9.6 percent and 7.0 percent respectively. Percentage of pale skin was 2.5 percent and 4.5 percent of rural and urban selected subjects respectively. Healthy and free from symptoms were 60.6 percent in rural selected subjects and 65.8 percent in urban selected subjects respectively.

4. Mean food stuffs intake of the selected sub sample

The mean food intake of the selected subjects shown in Table XXXVI.

TABLE XXXVI

MEAN FOOD STUFFS INTAKE OF THE SELECTED SUB SAMPLE – RURAL BOYS AND GIRLS

CRITERIA	RURAL BOYS (N=15)			RURAL GIRLS (N=15)		
FOOD STUFFS	**Mean ± SD**	**RDA**	**Excess/ Deficit**	**Mean± SD**	**RDA**	**Excess/ Deficit**
Cereals	177.0 ± 25.9	330	-155	187 ± 30.86	330	-143
Pulses	39.6 ± 19.1	75	-35.4	43 ± 12.62	75	-32
Green Leafy Vegetables	21.3 ± 25.3	100	-78.7	26 ±29.9	100	-74
Other Vegetables	40.2 ± 13.9	100	-57.8	31± 11.4	100	-69
Roots and Tubers	22 ± 27.4	100	-78	22.6 ± 17.01	100	-78
Fruits	17.0 ± 22.0	100	-83	31.3 ± 24.9	100	-68.7
Milk and Milk Products	235 ± 81.7	500	-265	225 ± 72.9	500	-275
Sugar and Jaggery	12.3 ± 3.09	25	-12.7	13.67±2.21	25	-11.33
Fats and Oils	17.67 ± 2.4	35	-17.33	17 ± 3.05	35	-18

ICMR 2010

The mean food stuffs intake of the selected sub sample of rural and urban boys and girls were calculated and compared with the recommended allowances. According to the table the mean food intake of the selected subjects were very low expect the intake of iron when we compared to the recommended allowance. The mean intake of iron was higher because of nibbling the snacks like dates, rice flakes, and watermelon thus the calories and iron intake were higher than recommended allowance.

5. Mean food stuffs intake of the selected sub sample

The mean food intake of the selected subjects shown in Table XXXVII.

TABLE XXXVII

MEAN FOOD STUFFS INTAKE OF THE SELECTED SUB SAMPLE – URBAN BOYS AND GIRLS

(N=30)

CRITERIA	URBAN BOYS (N=15)			URBAN GIRLS (N=15)		
FOOD STUFFS	**Mean± SD**	**RDA**	**Excess/ Deficit**	**Mean± SD**	**RDA**	**Excess/ Deficit**
Cereals	194.66 ± 15.43	330	135	175±30.87	330	155
Pulses	40.3± 9.39	75	34.7	27.33± 9.80	75	102.33
Green leafy vegetables	0	100	0	0	100	0
Other vegetables	39.33 ± 13.76	100	60.67	38.66 ± 15.32	100	61.34
Roots and tubers	28.66 ± 13.9	100	71.34	27± 10.29	100	73
Fruits	27 ± 17.20	100	73	31± 17.5	100	63
Milk and milk products	258.66 ± 58.7	500	242	295.3± 50.7	500	205
Sugar and jaggery	18.6 ± 5.90	25	64	20 ± 3.65	25	5
Fats and oils	17.66 ± 2.49	35	17.34	16.33 ± 3.39	35	18.67

ICMR 2010

The mean food stuffs intake of the selected sub sample of rural and urban boys and girls were calculated and compared with the recommended allowances. According to the table the mean food intake of the selected subjects were very low expect the intake of protein when we compared to the recommended allowance. The mean intake of protein was higher because of nibbling between the meals like sports, dhal thus the calories and iron intake were higher than recommended allowance.

6. Mean nutrient intake

The mean nutrient intake of the selected sub sample was given in the Table XXXVIII.

TABLE XXXVIII

MEAN NUTRIENT INTAKE OF THE SELECTED SUB SAMPLE –RURAL BOYS AND GIRLS

(N=30)

Nutrients	Rural Boys (N=15)		Rural Girls (N=15)	
	Mean ± SD	RDA	Mean ± SD	RDA
Energy (kcal)	1930	2440	1650	2440
Protein (g)	47± 13.2	55.5	49.3± 3.4	55.5
Fat (g)	18 ± 2.3	25	16.2± 9.45	25
Iron (mg)	29± 18.2	26	23.2 ±17.41	26
Calcium (mg)	353±32.2	800	289.2±21.2	800

ICMR 2010

The mean nutrient intake was calculated and the mean values were obtained. The energy of rural boys and girls was lower when compared to the recommended dietary allowances due to high calorie diet, protein, fat, were less of rural boys and girls. With regard to iron in boys it was higher where in girls. It was less when compared with recommended allowances.

7. Mean nutrient intake

The mean nutrient intake of the selected sub sample was given in the Table XXXIX.

TABLE XXXIX

MEAN NUTRIENT INTAKE OF THE SELECTED SUB SAMPLE –URBAN BOYS AND GIRLS

(N=30)

Nutrients	Urban Boys (N=15)		Urban Girls (N=15)	
	Mean± SD	RDA	Mean ± S.D	RDA
Energy (kcal)	1670±89.2	2440	1542±78.9	2440
Protein (g)	41.2±31	55.5	39 ± 14.3	55.5
Fat (g)	18.1±12	25	17.45	25
Iron (mg)	29 ± 18.2	26	22±12.4	26
Calcium (mg)	258± 32.1	800	249±26.4	800

ICMR2010

The mean nutrient intake was calculated and the mean values were obtained. The energy of rural boys and girls was lower when compared to the recommended dietary allowances due to high calorie diet, protein, fat, were less of rural boys and girls. With regard to protein in boys it was higher where in girls. It was less when compared with recommended allowance.

D) IMPACT OF NUTRITION EDUCATION

In order to assess the impact of nutrition education the scores of the nutrition knowledge before and after of the sub sample were evaluated. Similarly the haemoglobin levels, anthropometric measurements and the mean nutrient intake of the sub sample were statistically analyzed.

I. Nutrition knowledge before and after of the selected sub sample

Nutrition knowledge of the selected sub sample shown in Table XL

TABLE XL

NUTRITION KNOWLEDGE BEFORE AND AFTER OF THE SELECTED SUB SAMPLE

(N=30)

Nutrition Knowledge	Boys (N=15)				Girls (N=15)			
	Before Mean±SD	After Mean±SD	Mean difference	't' value	Before Mean±SD	After Mean±SD	Mean difference	't' value
Rural	7.93±1.65	8.07±1.57	2.14±0.08	3.50**	5.8±2.04	8.8± 1.904	3±0.1	4.08**
Urban	6.5±1.50	8.93±1.61	2.43±0.11	4.02**	6.53±1.45	8.73±1.95	2.2±O.45	3.38**

**Significant at one percent level.

From the above table it is evident that the mean scores obtained were 5.93 percent and 5.8 percent of rural boys and girls and 6.5 percent of urban boys and girls respectively before education. The mean scores increased to 8.07 percent, 8.8 percent of rural boys and girls and 8.93 percent of urban boys and 8.73 percent of urban girls respectively after education. Statistical analysis revealed a significant increase at one percent level between the initial and final values. From the results it can be inferred that nutrition education imparted through the charts, food models, food pyramid, and demonstration, snake and ladder games and interaction session had a positive impact on the nutritional knowledge of selected rural and urban boys and girls respectively.

II. Mean anthropometric measurements

In order to evaluate the impact of nutrition education the anthropometric measurements were measured for the selected sub sample after the completion of imparting nutrition education. The efficacy of nutrition education with regard to anthropometric measurements was evaluated for the selected sub sample before and after nutrition education.

TABLE XLI

MEAN ANTHROPOMETRIC MEASUREMENTS OF THE SELECTED SUB SAMPLES BRFORE AND AFTER NUTRITION EDUCATION

(N=30)

Anthropometric Measurements	Rural Boys (N=15)		Rural Girls (N=15)	
	Before	After	Before	After
	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD
Mean height (cm)	146 ± 7.32	147.47 ± 7.35	134.2 ± 6.09	136±6.44
Mean weight (kg)	31.93 ± 5.17	33.17±5.52	28.93 ± 4.06	29.87± 3.83
Mean Body mass index	14.67 ± 2.02	17.87 ± 2.81	15.67 ± 1.81	16.05 ± 1.87
Mean waist to hip ratio	0.76 ± 0.061	0.81± 0.082	0.83± 0.05	0.84± 0.07

(N=30)

Anthropometric measurements	Rural Boys (N=15)		Rural Girls (N=15)	
	Before	After	Before	After
	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD
Mean height (Cm)	158.87 ± 5.56	160.87±5.96	133.27± 5.97	134.4±5.93
Mean weight (kg)	37.1± 4.24	38.13± 4.36	26.57± 4.03	27.6± 4.03
Mean Body mass index	14.27± 1.95	17.43 ± 4.76	14.73 ± 2.02	19.27± 4.85
Mean waist to hip ratio	0.83 ± 0.07	0.85± 0.075	0.81± 0.072	30 ± 077

From the above table it was clear that there was a slight increase in the height, weight, Body mass index, waist to hip ratio of the selected subjects after imparting nutrition education.

Estimation haemoglobin level

Blood was estimated for haemoglobin level for the selected sub sample after the completion of nutrition education to assess the anemic status and presented in Table XLII.

TABLE XLII

ESTIMATION OF HAEMOGLOBIN LEVEL OF THE SELECTED SUB SAMPLE BEFORE AND AFTER NUTRITION EDUCATION

(N=30)

Haemoglobin Levels	Boys (N=15)				Girls (N=15)			
	Before Mean± S.D	After Mean± SD	Mean difference	't' value	Before Mean± SD	After Mean± SD	Mean difference	't' value
Rural	9.69±0.47	10.29± 1.27	0.69±0.8	1.65**	9.45± 0.88	9.75± 1.01	0.3±0.13	0.8**
Urban	10.11± 0.53	10.65± 0.98	0.54±0.45	1.84**	9.97± 0.53	10.25± 0.78	0.28±0.25	1.21**

**Significant at one percent level.

As presented in Table XLII the mean haemoglobin level of boys sub sample was increased from 9.69 g/dl to 10.29g/dl of rural boys and 9.45g/dl to 9.75g/dl of rural girls after imparting nutrition education for given three hours per week. The increase was statistically significant at one percent level. Similarly in also the haemoglobin level of the sub sample was increased from 10.11 g/dl to 10.65g/dl of urban boys and 10.25 g/dl to 10.25g/dl of urban girls and was statistically significant at one percent level. Imparting nutrition education need of the hour.

Mean nutritent intake of selected sub sample before and after education

The mean nutrient intake which is obtained from the sub sample before and after imparting nutrition education and it was presented in the Table XLIII.

TABLE XLIII

MEAN NUTRITENT INTAKE OF SELECTED SUB SAMPLE BEFORE AND AFTER NUTRITION EDUCATION RURAL BOYS AND GIRLS

(N=30)

Criteria	Rural Boys (N=15)		Rural Girls (N=15)	
Food Stuffs	**Before Mean± SD**	**After Mean ± S.D**	**Before Mean ±S.D**	**After Mean± S.D**
Energy (kcal)	1930±146.5	2118± 145.2	1650	19708± 115.2
Protein (g)	47± 13.2	49±15.4	49.3± 3.4	47±15.4
carbohydrates (g)	18±2.3	22±5.4	16.2± 9.45	19±5.4
fat (g)	34.2± 17.4	37.1±13.5	32.1±18.3	34.1±13.5
iron (mg)	29± 18.2	31.23±15.6	23.2 ±17.41	26.23±15.6
calcium (mg)	353±32.2	378± 45.4	289.2±21.2	348± 45.4

From the above table it was found that all the nutrients were increased slightly. During imparting nutrition education the selected sub sample rural boys and girls were asked to increase their calories and fat and iron intake and they were asked to increase the intake of fruits daily.

Mean nutrient intake of selected sub sample before and after education

The mean nutrient intake which is obtained from the sub sample before and after imparting nutrition education and it was presented in the Table XLIV.

TABLE XLIV

MEAN NUTRITENT INTAKE OF SELECTED SUB SAMPLE BEFORE AND AFTER NUTRITION EDUCATION URBAN BOYS AND GIRLS

(N-30)

Criteria	Rural Boys (N=15)		Rural Girls (N=15)	
Food Stuffs	**Before Mean± SD**	**After Mean ± S.D**	**Food Stuffs**	**Before Mean± SD**
Energy (kcal)	1670±89.2	2118± 145.2	1542±78.9	1970±134
Protein (g)	41.2±31	49±15.4	39 ± 14.3	42±16.4
Fat (g)	18.1±12	22±5.4	17.45	19±7.3
Carbohydrates (g)	56.2±13	37.1±13.5	49±18.2	52±18.4
Iron (mg)	29 ± 18.2	31.23±15.6	22±12.4	24±13.3
Calcium (mg)	258± 32.1	378± 45.4	249±26.4	256±29.3

From the above table it was found that all the nutrients were increased slightly. During imparting nutrition education the selected sub sample urban boys and girls were asked to increase their calories and protein and calcium intake and they were asked to increase the intake of vegetables daily.

V SUMMARY AND CONCLUSION

Nutrition is the intake of food, considered in relation to the body's dietary needs. It is defined as diet, food, maintenance or nourishment. Good nutrition means an adequate, well balanced diet combined with regular physical activity and getting the right amount and high quality of nutrients from healthy foods in the right combinations to do a good job (WHO, 2014).

Good whole foods and good whole food supplements provide the nutritional diversity and density that lay the foundation for good health. Our body needs the right fuel (food) and regular maintenance (exercise, lifestyle and mental attitude) to achieve its true health potential. Nothing is more important than healthy eating (Bernadine Healy, 2011).

The child eats today will have a striking impact on her health throughout adolescence and adulthood. Consuming nutritious foods helps children and teens grow, develop, do well academically and feel good about themselves. Good nutrition also helps in preventing child and teen issues such as eating disorders, obesity, dental cavities and iron deficiency anemia. Teaching children the importance of good nutrition throughout childhood will lay the foundation n for a healthier more fulfilling life (Kristy lee Wilson, 2014).

The period of adolescence is considered as crucial and significant period of an individual's life. Psychologically, adolescence is the age when the individual becomes integrated into the society of the adults. It is the age when the child no longer feels that he is below of his elders but rather an equal with them, at least in rights. This integration into the adult society has many aspects, more or less linked with puberty. It also includes profound intellectual changes. These intellectual transformations, typical of an adolescents thinking, enable him to achieve his integration into the social relationships of the adults (Hurlock, 2011).

Adolescence is also a unique intervention point in the life cycle. It is a stage of receptivity to new ideas and a point at which life style choices may determine an individual's life course. It offers a chance to acquire knowledge about optimal nutrition during young adult hood that could prevent or delay adult onset diet related illness later

on potentially, the inclusion of adolescent boys in nutrition and healthy life style programs will constitute to the improved nutrition and health of women during child bearing and for infants and young children in the critical early years of life (Elder, 2004).

Iron deficiency is the most common cause for anemia in adolescents and an adolescent girl is 10 times more likely to develop anemia than a boy. Teenagers are at the highest risk of anemia during their adolescent growth spurt. Among girls menstruation increases the risk for iron deficiency and child bearing years. Boys on the other hand, are at risk for anemia only during their adolescent growth spurt (Dimeglio, 2009).

Nutrition education intervention is one of the appropriate, effective and sustainable approaches to combat iron deficiency anemia. Nutrition education might be of the important strategies to combat iron deficiency anemia in adolescent girls, stressing the importance of haemopoitic nutrients and consumption of green leafy vegetables which are excellent source of iron and micronutrients (Sajian, et al, 2011).

Imparting nutrition education is not simply to change the nutritional habits but also to assess their own eating behaviors and set goals for dietary change. Thus the present study entitled "Haemoglobin status of selected rural and urban adolescents and the impact of intervention programme" To study nutritional status of adolescents, understand dietary pattern and life style practices, assess their nutritional knowledge and to determinate the impact of nutrition education.

The school selected was Nagini Vidyalaya matriculation higher secondary school located in K.N.palayam (Rural area) and Violet matriculation higher secondary school located in S.M palayam (Urban area) respectively at Coimbatore.

Three hundred and ten samples of 155 in each school in the age group of 10-15years studying from V to IX standard of both sexes were selected respectively by purposive sampling method. A well structured interview schedule was formulated to gather information on socio-economic aspects like type of family, age, sex, education, family income, dietary pattern, and life style practices of the selected adolescents by direct interview method.

The salient findings of the results are summarized below:

- Rural boys were 57.4 percent and 42.5 percent were girls respectively. Urban boys were 54.8 percent followed by 45.1 percent urban girls
- I t was noted that 15.4 percent and 9 percent of rural boys and girls were in the age group of 14-15 years respectively. In the age group of 10-11 years the percentage of rural boys was 9.6 followed by rural girls 7.7 percent. With regard to urban boys 12.2 percent were of 14-15 years and 10.3 percent were of 11-12 and 12-13 years respectively. In the age group of 14-15 years the percentage of urban girls was 9.6 and 8.3 percent were in the age group of 11-12 years.
- It was clear that the percentage of joint family was higher in rural areas 36.7 percent when compared to urban areas 32.9 percent. The percentage of nuclear family was higher in urban areas than rural areas 67 percent and 63.2 percent respectively.
- It was observed that 18 percent, 14.1 percent, 7.7 percent and 10.9 percent of the family had a large size of 6-8 members of selected rural and urban boys and girls respectively. Maximum of 27percent, 18 percent, 37.4 percent and 20.6 percent had less than 3 to 4 members in the families of selected rural and urban boys and girls respectively. Only 12.2 percent of rural boys and 13.5 percent of urban girls had 4 to 6 members consisting joint family system.
- It is clear that 27.7 percent of rural and25.4 percent of urban completed their high school level education. 15.8 percent and 21 percent of rural and urban completed their higher secondary education level. The rural and urban completed their graduate level education were 20.7 percent and 21.4 percent. Primary school level educations were 18.9 percent and 22 percent of rural and urban respectively. Illiterate levels of rural and urban were 16.7 percent and 9.9 percent respectively.
- Occupational status of rural and urban families showed that 23.8 percent and 18 percent were employed in construction workers, 20.2 percent and 22.3 percent were own business respectively. 21.2 percent and 10.9 percent of rural and urban families were employed in agriculture. Three percent and 7.6 percent were teachers and 9.8 percent, 17.6 percent were employed in government job and the

remaining 4.1 percent and 2.3 percent were bricking workers of selected rural and urban families respectively.

- The monthly income of the families was tabulated according to the HUDCO (2007) classification. Among the families studied 48.1 percent and 58 percent earned a monthly income of greater than Rs. 10,000 and 27.4 percent and 28 percent of the families had a income of Rs 5,000-10, 000 and 20.2 percent and 8.5 percent earned a monthly income of 3,000-5,000, and the remaining 3.1 percent and 5.2 percent earned a monthly income of less than 3,000 of selected rural and urban families respectively.
- From the total income of the family the food expenditure percentages ranged from 10 percent and from urban 40 percent were in the range of 41-50 percent. Up to 10 % the percentage was 4.9 percent and 5.2 percent of rural and urban respectively.
- Rural of 49.6 percent of rural boys, 30.9 percent of rural girls and 43.2 percent of urban boys,30.3 percent of urban girls were non vegetarian followed by 2.5 percent, 3.2 percent rural boys and girls and 4.5 percent , 5.8 percent urban boys and girls were ovo vegetarians.
- Rural boys 23.8 percent, 18 percent of rural girls and 25.1 percent of urban boys, 20.6 percent urban girls followed 3 meals per day. Whereas 21.2 percent, 14.8 percent rural boys and girls and 15.4 percent, 11.6 percent urban boys and girls followed less than 3 meal pattern per day respectively.
- It was found that only 1.2 percent, 1.9 percent of rural boys and girls followed by 3.8 percent, 2.5 percent of urban boys and girls skipped breakfast respectively. Regarding lunch 1.2 percent, 0.6 percent of rural boys and girls and 5.8 percent, 3.2 percent urban girls skipped lunch. Three meal pattern were followed by 54.1 percent, 39.2 percent of rural boys and girls and 43.8 percent, 35.4 percent of urban boys and girls respectively.
- It was found that 18.7 percent, 15.4 percent of rural boys and girls and 19.3 percent, 10.3 percent of urban boys and girls consume fruits respectively. Processed foods were consumed by 9.6 percent and 5.8 percent of rural boys and girls respectively. In the case of urban boys and girls it was 9 percent and

4.5 percent respectively. Fried foods were consumed by 16.7 percent, 11.6 percent, 12.2 percent and 8.3 percent of rural boys and girls and urban boys and girls respectively.

- With regard to bitter gourd 5.1 percent of rural boys and girls expressed their allergy followed by 4.5 percent, 3.2 percent, and 2.5 percent, for brinjal, green leafy vegetables and chicken. In case of urban boys and girls 9 percent were allergic to green leafy vegetables followed by 8.3 percent, 6.4 percent, and 1.9 percent towards bitter gourd, brinjal and chicken.
- It was noted that both rural and urban boys and girls were having medicinal supplements. Vitamin tablets were consumed by 5.8 percent in the case of rural boys and girls and urban girls. The urban boys' percentage was 11.6. Total of 8.3 percent of rural boys and girls and 17.4 percent of urban boys and girls had iron tablets. Calcium tablets were consumed by 3.8 percent, 1.9 percent of rural boys and girls respectively followed by 12.2 percent, 7 percent with regard to urban boys and girls. Total of 74.1 percent, 45.8 percent of rural and urban boys and girls did not have any supplements.
- It was found that 15.4 percent, 11.6 percent of selected rural boys and girls and 18.7percent, 19.3 percent of selected urban boys and girls consumed outside foods weekly. 19.3 percent, 16.7 percent, 23.8 percent, 20 percent of selected rural and urban boys and girls consumed food outside monthly.
- Daily consumption of parboiled rice of total rural selected subjects were 98 percent and that of total urban selected subjects were 76.1. Daily consumption of raw rice, Samai, Bajra of rural selected subjects were of 80 percent, 55.4 percent and 50.3 percent respectively, and of urban selected subjects the percentage were 90.9, 34.8, and 31.6 respectively. Weekly consumption of wheat, semolina, rice flakes and vermicelli were 34 percent, 38 percent, 31.6, 28.3 in the case of rural selected subjects and the percentage were 30.6, 14.8, 15.4, and 31.6 of urban selected subjects respectively. Monthly consumption of Ragi, of rural selected subjects was 41.9 and that of urban selected subjects was 14.8 respectively. The rural selected subjects it was found that occasion consumption of wheat, Ragi, Bajra and rice flakes were 31 percent, 24.5 percent, and 20.6 percent respectively.

In the Case of urban selected subjects occasion consumption of Ragi was 71.6 percent and of raw rice was 1.2 percent respectively.

- The daily consumption of red gram dhal of total selected rural subjects was 80 percent daily 10.3 percent weekly 7.7 percent monthly and 1.9 percent occasionally. Bengal gram was 10.3 percent daily, 47.7 percent weekly, monthly 18 percent and occasionally 23.8 percent respectively. The daily, weekly, monthly and occasionally consumption of green gram whole of total urban selected subjects were 1.9 percent, 28.3 percent, 54.1 percent, 15.4 percent respectively.
- Consumption of drumstick leaves of total rural selected subjects was 3.8 percent 18 percent 36 percent 41.9 percent daily, weekly, monthly and occasionally respectively, whereas of total urban selected subjects consumption was 4.5 percent, 33.5 percent, 13.5 percent and 48.3 percent respectively. Daily consumption of curry leaves was 46.4 percent, 44.5 percent of total rural and urban selected subjects.
- It was found that the daily consumption of ash gourd was 1.9 percent and 2.5 percent of the total rural and urban selected subjects. Weekly consumption of beans, ladies finger, snake gourd and pumpkin were 47 percent, 49.6 percent, 32.2 percent,12.9 percent and 52.2 percent, 50.9 percent,19.3 percent respectively of the total rural and urban selected subjects.
- Daily consumption of onion was 46.4 percent, 53.5 percent of total rural and urban selected subjects respectively. Consumption of radish occasionally was 76.1 percent and 67 percent respectively of the total rural and urban selected subject.
- Daily consumption of banana of total selected rural and urban subjects were 52.2 percent and 43.8 percent respectively and that of apple the percentage were 10.9 and 20.6. Consumption of guava and orange by the total selected rural and urban subjects were 69.6percent and 63.8 percentages, 60.6 percent and 52.9percent occasionally.
- Daily consumption of curd of total selected rural and urban subjects were 11.6 percent and 13.5 percent respectively. Consumption of ghee by the total selected rural and urban subjects were 4.5 percent and 9 percent weekly. Monthly

consumption of butter 5.8 percent and 21.9 percent of the selected rural and urban boys and girls respectively.

- Consumption of cooking oil of total rural selected subjects were 52.2 percent, 10.3 percent, 14.1 percent and 23.2 percent daily, weekly, monthly, occasionally respectively. Whereas of total urban selected subjects consumption were 61.2 percent, 14.8 percent, 19.3 percent and4.5 percent respectively. Daily consumption of coconut oil were 10.9 percent, 29.6 percent of total rural and urban selected subjects respectively.
- Weekly consumption of chicken of total selected rural and urban subjects were 21.9 percent, 26.4 percent respectively and that of mutton the percentage were 14.8 percent 18.7 percent. Consumption of egg and fish by the total selected rural and urban subjects were 52.2 percent and 25.8 percentages, 61.2 percent and 54.1 percent occasionally.
- All the selected subjects consumed sugar. With regard to honey 9.6 percent and 11.6 percent consumed monthly, whereas 76.1 percent, 79.3 percent consumed occasionally and Jaggery was consumed monthly by 23.8 percent and 16.7 percent of the selected rural and urban boys and girls respectively.
- It was found that daily consumption of milk were 25.1 percent and 39.3 percent of the selected rural and urban boys and girls. Weekly consumption of soft drinks and tea were 13.5 percent, 8.3 percent, 9.6 percent and 7.7 percent of selected rural and urban boys and girls respectively.
- Fourteen percent, 9.6 percent of rural boys and girls and 20 percent, 15.4 percent urban boys and girls exercise for half an hours every day. Whereas 13.5 percent, 2.5 percent, 9 percent, 5.8 percent of rural and urban boys and girls had 1 ½ hour meditation observed every day respectively.
- Seven percent, 9.6 percent of rural boys and girls 12.2 percent, 14.1 percent urban boys and girls had 6-8 hours of sleep every day whereas 50.3 percent, 32.9 percent,42.5 percent, 30.9percent of rural and urban boys and girls had 8 -10 hours of sleep per day respectively.
- Twenty nine percent, 29.6 percent of selected rural boys and girls and 15.4 percent, 20.6 percent of selected urban boys and girls spent their leisure time

by watching TV. 3.2 percent, 1.9 percent of selected rural boys and girls and 10.9 percent, 3.2 percent of selected urban boys and girls spent their leisure time by listening to music respectively.

- Calm and relaxe were of 49.6 percent of total selected rural boys and girls against 40.6 percent of total selected urban boys and girls respectively. In rural boys and girls family stress was among 18 percent and 14.1 percent respectively. Educational stress was 18.7 percent and 18 percent among urban boys and girls respectively.
- The mean height of rural boys was 146.94± 10.28 and of girls was 145.49± 9.91 in the case of urban boys 152.61± 10.3 and of girls it was 145.76± 9.8. The mean weights of rural boys were 36.24±9.11 and girls were 36.97± 8.13 in the case of urban boys 32.15±4.49 and of girls it was 36.97±9.1 respectively. The mean body mass index of rural and urban boys and girls were 16.45 ± 2.92, 17.62±3.18 in the case of urban boys 17.18-2.74 and of girls it was 15.60-2.36. The mean weights of head circumference of rural boys were 20.53-0.73 and of girls were 20.76-0.66 in the case of urban boys, 20.33-0.75 and of girls it was 19.96-2.39. The mean chest circumference of rural boys and girls were 26.88-3.41 and 27.03-3.39 in the case of urban boys and girls it was 28.78-3.92 and 26.84± 3.42. The mean waist to hip ratio of rural boys were 0.80-0.07 and 0f girls were 0.82-0.07 in the case of urban boys 0.81-0.08 and girls it was 0.80-0.08 respectively.
- Total healthy weight rural boys and girls were 69.6 percent and 72.9 percent were of urban boys and girls. Total underweight rural boys and girls were 24.5 percent and 21.9percent were of urban boys and girls. Total obese rural and urban boys and girls were 2.5 percent, overweight rural boys and girls were 3.2 percent and 2.5 percent of urban boys and girls respectively.
- It is evident that 14.8 percent, 5.1 percent, 17.4 percent, 14.1 percent of rural and urban boys and girls were of moderate risk. Whereas 14.8 percent, 17 percent of rural boys and girls were high risk and 21.9 percent and 16.1 percent of urban boys and girls were of high risk. Low risk of rural and urban boys and girls were 14.8 percent, 5.1 percent, 17.4 percent, 14.1 percent respectively.

- Mild anaemics percentages were 43.2 percent, 25.8 percent, 35.4 percent, and 32.2 percent of rural boys and girls and urban boys and girls respectively. Severe anaemics were 0.6percent, 3.2 percent in rural boys and girls and in urban boys and girls it was 1.2 percent respectively. Rural boys' percentages of moderate anaemics were 13.5 percent correspondingly for urban boys it was 18 percent.
- Dental carries were 11.6 percent in rural selected subjects followed by 10.3 percent in urban in selected subjects. Loss of hair was predominant in rural as well as urban selected subjects and it was 9.6 percent and 7.0 percent respectively. Percentage of pale skin was 2.5 percent and 4.5 percent of rural and urban selected subjects respectively. Healthy and free from symptoms were 60.6 percent in rural selected subjects and 65.8 percent in urban selected subjects respectively.
- The mean food stuffs intake of the selected sub sample of rural and urban boys and girls were calculated and compared with the recommended allowances. According to the table the mean food intake of the selected subjects were very low expect the intake of iron when we compared to the recommended allowance. The mean intake of iron was higher because of nibbling the snacks like dates, rice flakes, and watermelon thus the calories and iron intake were higher than recommended allowance.
- The mean food stuffs intake of the selected sub sample of rural and urban boys and girls were calculated and compared with the recommended allowances. According to the table the mean food intake of the selected subjects were very low expect the intake of protein when we compared to the recommended allowance. The mean intake of protein was higher because of nibbling between the meals like sports, dhal thus the calories and iron intake were higher than recommended allowance.
- The mean nutrient intake was calculated and the mean values were obtained. The energy of rural boys and girls was lower when compared to the recommended dietary allowances due to high calorie diet, protein, fat, were less of rural boys and girls. With regard to iron in boys it was higher where in girls. It was less when compared with recommended allowances.

- The mean nutrient intake was calculated and the mean values were obtained. The energy of rural boys and girls was lower when compared to the recommended dietary allowances due to high calorie diet, protein, fat, were less of rural boys and girls. With regard to protein in boys it was higher where in girls. It was less when compared with recommended allowance.
- it is evident that the mean scores obtained were 5.93 percent and 5.8 percent of rural boys and girls and 6.5 percent of urban boys and girls respectively before education. The mean scores increased to 8.07 percent, 8.8 percent of rural boys and girls and 8.93 percent of urban boys and 8.73 percent of urban girls respectively after education. Statistical analysis revealed a significant increase at one percent level between the initial and final values. From the results it can be inferred that nutrition education imparted through the charts, food models, food pyramid, and demonstration, snake and ladder games and interaction session had a positive impact on the nutritional knowledge of selected rural and urban boys and girls respectively.
- From the above table it was clear that there was a slight increase in the height, weight, Body mass index, waist to hip ratio of the selected subjects after imparting nutrition education.
- The mean haemoglobin level of boys sub sample was increased from 9.69 g/dl to 10.29g/dl of rural boys and 9.45g/dl to 9.75g/dl of rural girls after imparting nutrition education for given three hours per week. The increase was statistically significant at one percent level. Similarly in also the haemoglobin level of the sub sample was increased from 10.11 g/dl to 10.65g/dl of urban boys and 10.25 g/dl to 10.25g/dl of urban girls and was statistically significant at one percent level. Imparting nutrition education need of the hour.
- It was found that all the nutrients were increased slightly. During imparting nutrition education the selected sub sample rural boys and girls were asked to increase their calories and fat and iron intake and they were asked to increase the intake of fruits daily.

- It was found that all the nutrients were increased slightly. During imparting nutrition education the selected sub sample urban boys and girls were asked to increase their calories and protein and calcium intake and they were asked to increase the intake of vegetables daily.

CONCLUSION

Nutrition education plays a pivotal role in adolescents' life. Thus it is proved that by imparting nutrition education to certain extent the life style practices, dietary pattern, was improved and there was an increment of a haemoglobin level among the adolescents.

RECOMMENDATION

- The study period can be longer so that the impact will be effective and long lasting.
- For the different stages of lifecycle this study can be carried out.
- Intervention of dietary supplementation is recommended.

BIBLIOGRAPHY

Anemia among adolescent girls in Shimla hills of north India: Does BMI and onset of menarche have a role?

CDC (2013), Healthy Weight - it's not a diet, it's a lifestyle! Centers for Disease Control and Prevention 1600 Clifton Rd. Atlanta, GA 30333, USA, 800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 –

Charles B. Kimmel,(2011) independent axes of genetic variation and parallel evolutionary divergence of opercle bone shape in threespine stickleback

Elsevier,(2009) Mosby's medical dictionary vol 10 issue 1

Gupta, A., Parashar, A., Thakur, A. and Sharma, D. (2011), Department of Community Medicine, Indira Gandhi Medical College, Shimla, India School of Public health, Post Graduate Institute of Medical Education and Research, Chandigarh, India, Int J Biol Med Res. 2011; 2(4): 922 – 924.

http://weight loss.about.com/od/glossary/g/whr.htm

http://weight loss.about.com/od/glossary/g/whr.htm

Isobel, R,(2008) Nutrition Education: Linking Research, Theory, and Practice. Asia Pac J Clin Nutr 2008; 17(1):176-179

Kalaivani, K. (2009), Prevalence & consequences of anaemia in pregnancy Department of Reproductive Biomedicine, National Institute of Health & Family Welfare, New Delhi, India, Received April 24, 2009

Maiti Soumyajit, Chatterjee Kauhik, Ali Monjur Kazi, Ghosh Devidas, Paul Shyamapada. (2011), Nutritional status of adolescents, National J of Com.Med; 2011, Vol.2.

Medford, M, (2008) Statement on the Link between Nutrition and Cognitive Development in Children. Center on Hunger, Poverty and Nutrition Policy. Vol 17(1), 176-179

Mukhopadhyay Ashish,Bhadra Mithu, Bose Kaushik. Antropometric Assesment of Nutritional Status of Adolescents of Kolkata, West Bengal;J. Hum.Ecol..18(3): 213-216(2005)

Mulugeta Afework, Fitsum Hagos, Barbara Stoecker, Gideon Kruseman. (2009), Nutritional Status Of Adolescent Girls From Rural Communities OF Tigray, Northern Ethiopia: Ethiopia. J. Health Dev.2009; 23(1).

Premalatha et al. (2012), Corresponding author: Premalatha T, Department of Epidemiology, Tamil Nadu Dr.M.G.R Medical University, Chennai,2:2

Premalatha T*, Valarmathi S, Parameshwari Srijayanth, Jasmine S Sundar and Kalpana S. (2008), Department of Epidemiology, Tamil Nadu Dr.M.G.R Medical University, Indian J Community Med. Oct 2008; 33(4): 243–245. doi: 10.4103/0970-0218.43230

Prevalence of Anemia and its Associated Factors among Adolescent School Girls in Chennai, Tamil Nadu, INDIA. Epidemiol 2:118. doi:10.4172/2161-1165.1000118,

Sachan B, Singh A, Sachan N. Interview Method In Research. The southeast asian journal of case report and reviewPeriodical Of National Institute Of Continuing Professional Development, Seajcrr. 2012; 1(1): 8-15.

Sanjeev M Chaudhary and Vasant R Dhage (2012), A Study of Anemia Among Adolescent Females in the Urban Area of Nagpur, Volume : 66(5): Pp.126-130.

Selomon Assefa, Andualem Mossie and Leja Hamza Selomon Assefa, Andualem Mossie and Leja Hamza, (2014), Prevalence and severity of anemia among school children in Jimma Town, Southwest Ethiopia, BMC Hematology 2014, 14:3 doi:10.1186/2052-1839-14

Shilpa S. Biradar, Somashekar P. Biradar, A.C. Alatagi, A.S. Wantamutte, P.R. Malur, (2009), Prevalence of Anaemia among Adolescent Girls: A One Year Cross-Sectional Study

Stang Janie and Mary story, (2005).guidelines for adults- nutrition service. Journal of nutrition education Vol33, 193-198

Sudhagandhi, B., Sivapatham Sundaresan, W.Ebenezer William, A.Prema (2010), Prevalence of anemia in the school children of Kattankulathur, Tamil Nadu, India, Indian J Med Res 130, November 2009, pp 627-633.

Unnithan,A., Syamakumari. S. (2007), Prevalence of Overweight, Obesity and Underweight among School Going Children in Rural and Urban areas of Thiruvananthapuram Educational District, Kerala State (India). The Internet Journal of Nutrition and Wellness. 2007 Volume 6 Number 2

Waist Circumference and Waist-Hip Ratio, Report of a WHO Expert Consultation.

WHO 2011 department of nutrition for health and development haemoglobin concentration of anaemia for the diagnosis of anaemia and assessment of severity.

World Health Organization. 8–11 December 2008. Retrieved March 21, 2012, doi:10.1111/j.1558-5646.2011.01441.x

Yasemin Işık Balcı*, MD; Aysun Karabulut, MD; Dolunay Gürses, MD; İbrahim Ethem Çövüt; MD. (2011), Department of Pediatric Hematology, Pamukkale Universty, Denizli, Turkey, Received: Feb 14, 2011; Final Revision: Sep 17, 2011; Accepted: Oct 22, 2011

APPENDIX I

INTERVIEW SCHEDULE TO ELICIT INFORMATION ON HAEMOGLOBIN STATUS OF SELECTED RURAL AND URBAN ADOLESCENTS AND THE IMPACT OF INTREVENTION PROGRAMME

1. BACKGROUND INFORMATION:

Name :

Age :

Sex :

Date of birth :

Education :

Name of the school :

Type of family : Joint ☐ Nuclear ☐

Name of the Family Members	Age	Sex	Relation	Education	Occupation	Income Per Month

2. ANTHROPOMETRIC MEASUREMENT

Height (cm) :

Weight (kg) :

Body mass index :

Head circumference (cm) :

Chest circumference (cm) :

Waist circumference (cm) :

Hip circumference (cm) :

Waist hip ratio (cm) :

3. BIOCHEMICAL ESTIMATION

TEST NAME	RESULT	REFERENCE RANGE

HAEMOGLOBIN LEVEL:

Mild Anaemia ☐ Moderate Anaemia ☐evere Anaemia ☐

4.

PROBLEMS	
Eyes	Normal/Watery/Dry
Lips	Normal/Angular Stomatitis
Tongue	Normal/Pale/Red
Skin	Normal/Pale/Dry
Teeth	Normal/Discoloured
Gums	Normal/Bleeding
Hair	Lack of shine and luster
Face	pigmentation/diffuse

CLINICAL SIGNS AND SYMPTOMS

5. DIETARY PATTERN

1. Type of diet : 1. Vegetarian 2.Non vegetarian 3. Ova- vegetarian

2. Do you skip meals 1. Yes ☐ 2. No ☐

If yes Breakfast ☐ Lunch ☐ Dinner ☐

Reason: _____

3. Types of snacks do you like to have?

1. Processed food ☐ 2. Baked food ☐ 3. Fried food ☐ 4. None ☐

4. Do you have the habit of eating food outside?

1. Yes ☐ 2.No ☐

If yes: weekly ☐ monthly ☐ once in 6 months ☐ occasionally ☐

5. Meal pattern - less than 3 ☐ 3meals ☐ above 3 ☐

6. Do you have allergy towards any food? 1. Yes ☐ 2.No ☐

7. Do you take any supplements? 1. Yes ☐ 2. No ☐

Please record all food and beverages consumed over a 24-hour time period. Remember to include snacks, desserts/candies, and drinks. Try to record at the time you consume the food. Please estimate portion size (1 cup, 1 piece, 1 handful, etc).

FOOD EXPENDITURE PATTERN:

SL. NO	FOOD STUFFS	DAILY	WEEKLY	MONTHLY	OCCASIONALLY
1.	**CEREALS**				
	Bajra				
	Ragi				
	rice				
	rice flakes				
	rice puffed				
	wheat				
	Samai				
	vermicelli				
	semolina				
2.	**PULSES**				
	Bengal Gram Whole				
	Bengal Gram Dhal				
	Bengal Gram Roasted				
	Green Gram Whole				
	Green Gram Dhal				
	Horse Gram Whole				
	Peas Green				
	Rajmah				
	Red Gram Dhal				
	Soya bean				
3.	**LEAFY VEGETABLES**				
	Agathi				
	Amaranth				
	Cabbage				
	Coriander Leaves				
	Curry Leaves				
	Drumstick Leaves				

	Fenugreek Leaves				
	Manathakkali Leaves				
	Mint				
	Paruppu Keerai				
	Ponnanganni Leaves				
	Spinach				
4.	**ROOTS AND TUBERS**				
	beet root				
	carrot				
	onion				
	potato				
	radish				
	sweet potato				
	tapioca				
	yam				
5.	**OTHER VEGETABLES**				
	Ash gourd				
	beans				
	bitter gourd				
	bottle gourd				
	brinjal				
	board beans				
	cauliflower				
	cucumber				
	drumstick				
	ladies finger				
	papaya				
	plantain stem				
	pumpkin				
	snake gourd				
6.	**FRUITS**				
	Apple				
	Banana				
	Dates				
	Grapes				
	Guava				
	Sweet Lemon				
	Water Melon				
	Orange				
	Pomegranate				
7.	**FLESHY FOODS**				
	Mutton				
	Chicken				
	Liver				
	Egg				
	Fish				
	Beef				

8.	**MILK AND MILK PRODUCTS**				
	Butter				
	Ghee				
	Milk				
	Paneer				
	Cheese				
	Curd				
9.	**FATS AND OILS**				
	Vanaspathy				
	Palm Oil				
	Coconut Oil				
	Mustard Oil				
10.	**SUGAR AND JAGGERY**				
	Sugar				
	Jaggery				
	honey				
11.	**BEVERAGES**				
	Tea				
	coffee				
	soft drinks				

24 HOURS RECALL METHOD

TIMINGS	**MENU**	**OUANTITY(ML/GM)**
Early Morning		
Breakfast		
Mid-Morning		
Lunch		
Evening Snack		
Dinner		
Bed –Time		

6. LIFE STYLE PATTERN

1. Do you have the habit of doing exercise/ yoga /meditation?

   If yes: Mention type : _____

   Duration : _____

2. How many hours do you sleep every day?

☐ 4-6 hrs ☐ 6-8 hrs ☐ 8-10 hrs ☐ >10hrs

3. How do you spend your leisure time?

☐ Household activities ☐ watching TV ☐ sleeping ☐ others

4. Do you get stress often?

☐ Yes ☐ no

If yes, reason _____

APPENDIX II

ANTHROPOMETRIC MEASUREMENTS OF HEIGHT, WEIGHT, BMI, CHEST, HEAD CIRCUMFERENCE AND WEIGHT TO HIP RATIO

RURAL GIRLS						
SL.NO	HEIGHT	WEIGHT	BMI	HEAD	CHEST	WAIST TO HIP RATIO
1	135	26	13.9	20	23	0.9
2	134	26	13.9	19.5	23	0.9
3	141	35	15	20	24	0.8
4	131	25	14.5	20.5	22	0.8
5	123	24	15.8	19	22	0.8
6	142	34	16.8	20.5	26	0.9
7	137	29	15.5	20	24	0.9
8	129	30	16	20	24	0.9
9	130	22	13	21	22.5	0.8
10	126	24	15.1	20	24.5	0.8
11	137	31	16.5	21	24.5	0.8
12	147	31	15.8	21	24.5	0.8
13	136	31	16.7	21	25	0.8
14	135	31	17	21	23	0.8
15	130	35	19.6	21	27	0.8
16	136	31	16.7	20	24	0.8
17	138	30	15.7	21	24	0.8
18	140	31	15.8	20.5	25	0.9
19	140	32	16.3	20	25	0.9
20	145	38	18	20.5	27	0.9
21	136	38	19	20.5	26.5	0.9
22	143	54	24.5	20	34	0.8
23	142	31	15.3	20	25	0.9
24	135	28	15.3	19	23	0.9
25	151	45	19.7	21	20	0.9
26	132	32	18.3	20	26.5	0.8
27	137	25	13.3	20.5	22	0.8
28	161	40	15.6	21.5	28	0.8
29	151	34	14.9	21	26.5	0.8
30	149	30	13.5	21	25	0.8
31	151	39	17.1	21.5	28	0.8
32	154	65	24	21	36	0.8
33	146	42	19.7	21	28	0.8
34	145	34	16.1	20	26	0.8
35	150	36	16	21	27	0.9
36	142	39	19.3	20.5	30	0.9

37	135	34	18.6	21	28	0.7
38	151	32	14	22	25	0.8
39	145	43	21	21.5	28.5	0.7
40	142	31	15.3	20.5	26	0.8
41	149	39	17.5	21	27	0.9
42	144	41	19.77	21.5	29	0.8
43	151	33	14.4	21	26	0.7
44	152	45	20.3	21	29	0.8
45	157	35	14.5	21	26	0.9
46	157	35	14.2	21	26	0.9
47	151	41	17.9	21	28	0.9
48	157	45	21.9	21.5	33	0.8
49	161	39	15.2	20	26	0.8
50	166	44	18.8	21	31	0.9
51	166	36	13	21	26	0.7
52	153	41	17.5	21	28.5	0.9
53	157	40	15	22.5	29	0.8
54	151	44	19.7	21	30	0.7
55	150	41	19.55	20.5	28	0.8
56	154	41	19.8	21.5	31	0.8
57	155	36	19.55	21	29.5	0.7
58	142	56	25	21	34	0.8
59	156	43	22.6	22	32	0.9
60	159	40	15.8	21	29.5	0.9
61	157	46	16	21	33	0.7
62	145	39	18.5	21	29	0.8
63	152	44	17	22	30.5	0.9
64	158	57	18	21	35	0.7
65	147	37	17.1	20	28	0.9
66	**145**	**41**	**18**	**21**	**31**	**0.8**

URBAN BOYS						
	HEIGHT	WEIGHT	BMI	HEAD	CHEST	WAIST TO HIP RATIO
1	141	41	20.9	19.0	27	0.9
2	142	42	20.9	20.5	28	0.8
3	132	28	16.5	21	23	0.9
4	139	32	16.5	20.5	25	0.7
5	134	42	20	21	26	0.9
6	137	26	13.5	19	24	0.8
7	135	24	13	19.5	25	0.8
8	133	28	14.5	21.5	27	0.7
9	138	30	15.5	20	24	0.7
10	140	31.5	14.5	20	28	0.9
11	136	29	15.5	20	26	0.8
12	127	25	17.3	20	24	0.7
13	124	26	16	20	25	0.9
14	139	27	15.9	19.5	26	0.7
15	140	28	15.5	21	27	0.7
16	150	34	15.1	19.5	32	0.9
17	162	36	14.4	21	34	0.8
18	163	37	13	20	32	0.9
19	173	35	12.1	20	33	0.7
20	152	33	1.6	20	27	0.8
21	165	29	11.3	19.5	26	0.9
22	157	33	13	20.5	30	0.7
23	152	28	12.4	20	29	0.9
24	148	29	13	21	26	0.7
25	145	26	13.6	21	24	0.9
26	150	33	14	21	26	0.7
27	153	32	13	20.5	30	0.8
28	156	34	14	19.5	32	0.9
29	159	26	11.5	21.5	32	0.7
30	161	30	11.7	20	34	0.9
31	149	31	13	21	26	0.7
32	144	31	14	21	25	0.8
33	146	30.5	12.5	20	26	0.9
34	148	29	13	20.5	24	0.8
35	152	32	13	19.5	27	0.7
36	153	33	14	21	30	0.9
37	152	34	13.4	21	31	0.8
38	157	37	15	21	35	0.9
39	161	35	13	20	35	0.7
40	163	28	10.9	20	24	0.9
41	152	28	12	20.5	26	0.7
42	146	29	13	19.5	24	0.9
43	149	29	12.5	19	27	0.8

44	152	31	13	21.5	25	0.7
45	157	33	13	20	23	0.9
46	152	37	15.5	21	23	0.8
47	156	36	14	19.5	26	0.9
48	152	34	14	19	27	0.8
49	147	36	15.5	20	28	0.7
50	149	37	17	20.5	25	0.9
51	151	25	10.9	19	22	0.8
52	160	27	10.9	21.5	32	0.9
53	171	44	25	21.5	31	0.9
54	166	28	10.9	19.5	25	0.8
55	159	34	13	20.5	33	0.8
56	157	31	13.5	19.5	27	0.9
57	154	27	12.4	21.5	37	0.7
58	148	31	14	19.5	32	0.9
59	148	31	14.5	20	24	0.7
60	145	29	13	21.5	26	0.9
61	161	33	12	19	31	0.8
62	157	28	11.9	19.5	32	0.8
63	159	40	24	21	35	0.9
64	163	30.5	11.9	20.5	32	0.7
65	170	37	12	21	32	0.9
66	157	35	14	21	38	0.8
67	149	34	14	20.5	34	0.9
68	154	29	12	19.5	32	0.8
69	155	28	12.4	20.5	35	0.7
70	159	28	12.4	19.5	32.5	0.8
71	158	30.5	12	21.5	32	0.9
72	152	32	13	20.5	41	0.9
73	159	33	15	21.5	34	0.8
74	162	35	13.5	20	33	0.9
75	164	36.5	23	21.5	33.5	0.8
76	159	37	14.5	19.5	34	0.9
77	157	34	13	21	40.5	0.8
78	171	37	13.5	20.5	44	0.9
79	146	34	18.5	19	42	0.7
80	164	37	14.5	20.5	32.5	0.9
81	160	34	13.2	19.5	40	0.8
82	169	36	15	21	41	0.7
83	170	52	17	20.5	43	0.9
84	156	37	18.5	21.5	33	0.9
85	162	35	14	20.5	41	0.7

URBAN GIRLS						
HEIGHT		WEIGHT	BMI	HEAD	CHEST	WAIST TO HIP RATIO
1	141	21.5	10.9	19.5	24	0.8
2	135	29	15	20.5	26	0.9
3	131	24	13	20	22	0.7
4	132	22	13.5	20	23	0.9
5	129	31	21.5	20.5	24	0.8
6	134	32	18.9	21	25	0.9
7	147	33	16.8	21	24.5	0.7
8	135	24	18	20.5	23	0.9
9	137	31	16	19.5	24	0.8
10	135	26	14	20	25	0.9
11	123	20.5	14.5	21.5	22.5	0.7
12	136	30	16	20	25	0.9
13	129	22.5	15	19.5	23.5	0.8
14	123	25	18	20	22.5	0.7
15	132	27	15.9	19.5	24	0.9
16	131	25	14	20	26.5	0.8
17	140	26	14	19.5	25.5	0.9
18	134	24	14.2	20.5	23	0.7
19	137	22	14.5	19.5	22.5	0.8
20	141	20.5	10.4	21	24.5	0.7
21	143	32	15	19	34	0.9
22	141	35	17	20	25.5	0.8
23	135	26	14	21.5	23	0.9
24	134	25	16.5	19.5	23	0.9
25	137	31	16	19	22.5	0.7
26	151	35	15	20	30	0.7
27	149	32	14	20.5	25	0.8
28	151	34	14	21	27	0.7
29	143	36	19	21	30.5	0.9
30	146	27	25	20.5	28	0.9
31	150	29	12.8	21.5	27	0.8
32	142	28	14	21	29	0.7
33	149	32	14.2	19	25	0.9
34	151	32	14.2	20	25	0.7
35	157	35	16	21.5	26	0.9
36	151	33	14.2	20.5	24	0.8
37	161	38	14	20.5	29	0.7
38	166	35	13	19.5	31	0.9
39	163	34	13.2	21	34	0.7
40	147	30	13	19	25	0.8
41	158	35	14	21	35	0.9
42	152	32	13	20	31	0.7

43	159	37	14	21	32.5	0.8
44	144	33	15	20	29	0.7
45	152	36	15.5	21	29	0.8
46	143	32	15	21.5	25	0.9
47	155	36	14.5	20	26.5	0.7
48	151	36	15	20	26	0.8
49	153	34	14	20	29	0.9
50	150	31	15	19.5	24	0.8
51	142	30	14	19.5	26	0.7
52	156	42	17	20	25	0.8
53	152	34	17	20.5	27	0.9
54	143	33	16	21	24	0.8
55	159	41	20	21	31	0.7
56	149	30.5	15.5	21.5	27	0.8
57	162	46	18	21	33	0.9
58	151	35.5	16.5	20	32	0.8
59	146	34	17.3	19	26	0.9
60	147	44	22	19.5	27	0.7
61	151	28.5	12.6	20.5	31.5	0.8
62	155	32	13.5	21	26	0.9
63	153	33	14	20	24	0.8
64	152	27	15	20.5	31	0.7
65	151	35	15.5	19	35	0.8
66	150	32	17	19.5	32	0.9
67	155	40	21	19	26.5	0.7
68	158	41	23	20.5	31	0.9
69	153	33	18	21	28	0.8
70	152	34	16	19.5	25	0.7

APPENDIX III

ESTIMATION OF HAEMOGLOBIN CYAANMET – METHOD

AIM

To estimate the amount of haemoglobin in the sample of blood.

PRINCIPLE

This method measure not only oxyhaemoglobin but also carboxyhaemoglobin and meth-haemoglobin. Expect sulph haemoglobin and with filter type photoelectric calorimeter. The single relatively broad band of cyan meth – haemoglobin in the given spectral region has a district advantage. This method can be modified to determine haemoglobin in dry blood on filter paper.

REAGENT

Drapkin's diluents solution (Cartwright, 1958)

1. Sodium hydrogen carbonate 1g
2. Potassium cyanide 0.5g
3. Potassium ferricyanide 0.2g
4. Distilled water 1 litre

This solution should not be used after it forms a precipitate on the bottom of the storage bottle. This solution is preserved in a dark brown bottle and preferably under cold storage. Its precipitation and handling should be done with great care.

PROCEDURE

i. Exactly 5ml of Drapkin's solution was measured in to a dry test tube from a burette or a pipette with a suction pull.

ii. Exactly 0.2 ml of blood was transferred from a standard haemoglobin pipette in to a diluents solution. Usual care in filling and cleaning of loaded haemoglobin pipette must be observed.

iii. The pipette was rinsed tree times diluents solution without allowing the formation of air bubbles in the solution.

iv. The blood and diluents are thoroughly mixed by rotating the tube.

v. 10 minutes time was allowed for the formation of cyanmet – haemoglobin.

vi. 5ml of the diluents solution was used a blank.

vii. With green filter number 514 the readings were taken in a photoelectric calorimeter.

APPENDIX IV

CLINICAL SIGNS AND SYMPTOMS

PROBLEMS	
Eyes	Normal/Watery/Dry
Lips	Normal/Angular Stomatitis
Tongue	Normal/Pale/Red
Skin	Normal/Pale/Dry
Teeth	Normal/Discolored
Gums	Normal/Bleeding
Hair	Lack of shine and luster
Face	Pigmentation/diffuse

APPENDIX V

KNOWLEDGE CHECKLIST

1. Do you know about anaemia?

   a) Yes **b) No**

2. What do you know about iron?

   a) Yes **b) No**

3. Do you think that iron is important nutrient for anaemia?

   a) Yes **b) No**

4. Do you know the normal haemoglobin level?

   a) Yes **b) No**

5. Loss of blood is a cause of anaemia?

   a) Yes **b) No**

6. Do you know the functions of iron?

   a) Yes **b) No**

7. Do you know about the symptoms of anaemia?

   a) Yes **b) No**

8. Do you know the good source of iron?

   a) Yes **b) No**

9. Do you know the source of vitamin C

   a) Yes **b) No**

10. Do you know that rice flakes, green leafy vegetables, Jaggery are good source of iron?

    a) Yes **b) No**

11. Do you know the correct amount of iron to be taken per day?

    a) Yes **b) No**

12. Do you know about any iron supplements?

    a) Yes **b) No**

13. Do you know about any iron supplements?

    a) Yes **b)No**

14. Do you know tea and coffee drinking inhibit iron absorption?

    a) Yes **b) No**

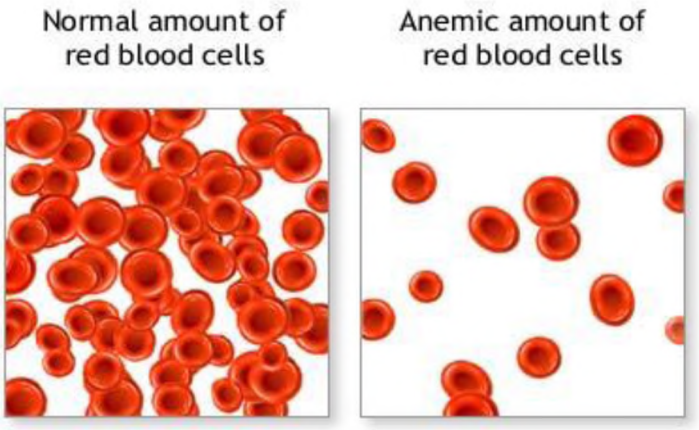
15. Do you think that pale skin is one of the symptoms of anaemia?

    a) Yes **b)No**

APPENDI VI

PAMPHLET

ANAEMIA –CALLS FOR CONCERN



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ANAEMIA

Anaemia is a condition in which the number of red blood cells or their oxygen-carrying capacity is in sufficient to meet physiologic needs, which vary by age, sex, altitude, smoking and pregnancy status.

HAEMOGLOBIN

Haemoglobin is the protein molecule in red blood cells that carries oxygen from the lungs to the body's tissues and returns carbon-dioxide from the tissues back to the lungs.

HAEMOGLOBIN VALUES

Mild anaemia -9.5-13.0 g/dl

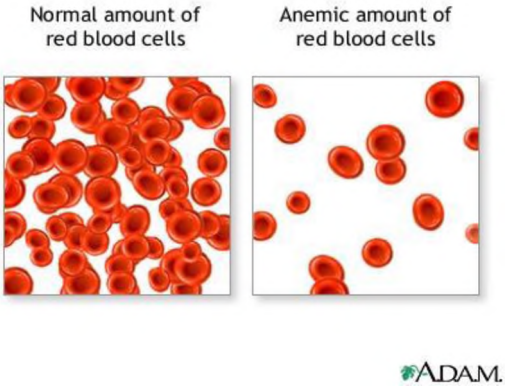
Moderate – 8.0 -9.5 g/dl

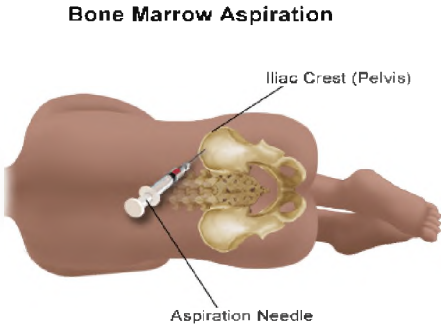
Severer –8.0 g/dl

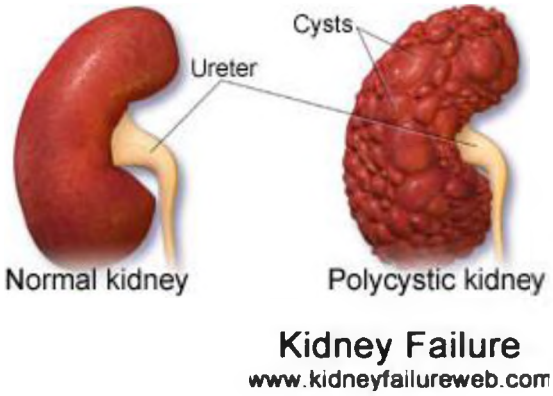
CAUSES

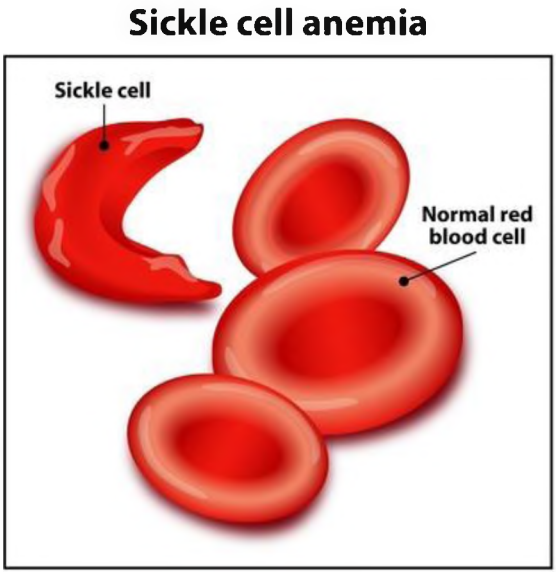
- ✓ loss of blood
- ✓ nutritional deficiency
- ✓ bone marrow problems
- ✓ suppression by chemotherapy drugs
- ✓ kidney failure and
- ✓ abnormal hemoglobin structure

Causes picture



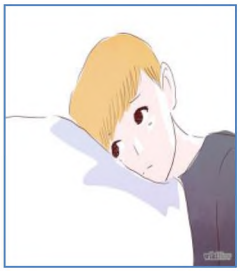




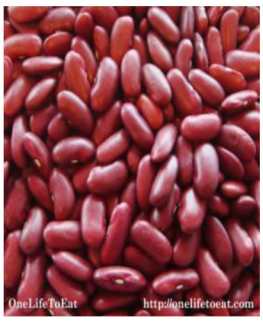


SIGNS AND SYMTOMS

- shortness of breath
- Dizziness
- Headache
- Coldness in the hands
- Pale skin
- Chest pain
- Tiredness
- Lethargy



Iron rich foods



INTERVIEW METHOD

PLATE I

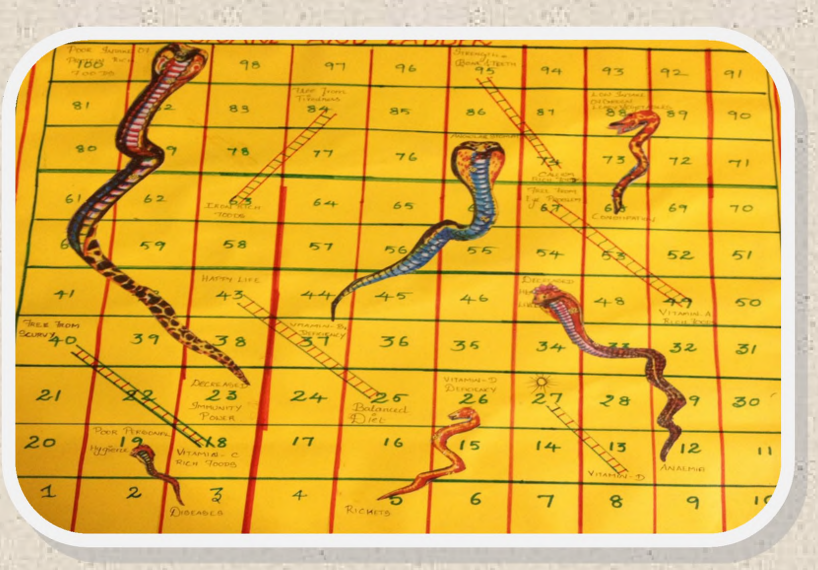
ANTHROPOMETRIC MEASUREMENTS

PLATE II

BIOCHEMICAL ESTIMATION
PLATE III

CLINICAL ASSESSMENT

PLATE IV



IMPARTING NUTRITION EDUCATION

PLATE V