Assessment of Nutritional Knowledge and Food Consumption Pattern of College Going Girls

By

Priyadharshini, R

(12PFN013)

Thesis submitted to the
Avinashilingam Institute for Home Science and
Higher Education for Women
Coimbatore-641 043.

In partial fulfilment of the requirement for the degree of

Master of Science in Food Science and Nutrition

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Certified as Bonafide Research Work

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Guide

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I INTRODUCTION

Adolescence has been defined by World Health Organization as the period of life spanning between10-19 years and the youth between 15-24 years. Young people, when referred to as such, are those between 10-24 years of age.

India is the second most populous country in the world with a total population of over 1081 million. Adolescents form a large section of population about 22.5percent that is, about 2.25 million and represents 26 percent of the world's total teenagers. In India this age group forms 21.4 percent of the total population. They are living in diverse circumstances and have diverse health needs. They are no longer children, but not yet adults. They are developing rapidly and having an extreme degree of pressure from peers, parents, society, and self. They lack knowledge and skill to cope up with pressure. Adolescents are full of energy, have significant drive and new ideas. They are a positive force for a Nation and are responsible for its future productivity provided they develop in a healthy manner (Population action international, 2005).

Special attention should be given to adolescent girls, who need to be well-nourished for their own immediate development and for the future nutritional demands of childbearing. Adolescence is a critical time for young women, building the foundation for successful reproduction and a healthy adulthood and later life. Young women must enter adulthood with good nutritional stores to remain strong and healthy throughout their child-bearing years and into old age. Good nutrition is especially important for adolescent girls to meet future needs of pregnancy and breastfeeding. Adolescence is also the time that the skeletal system builds its strong foundation of calcium stores. Nutrition during adolescence is one of the vital aspects as adolescence comprises the second and last growth spurt period and adolescents are susceptible to develop faulty eating behaviour leading to malnutrition. The most prevalent consequences of malnutrition in adolescents are underweight, overweight and obesity, iron deficiency anemia and eating disorders such as anorexia nervosa and bulimia. Poor health, parental and

pressure for studies, peer bullying and teasing can cause stress amongst adolescents (http://www.pubs.ext.vt.edu/350/350-850.pdf).

High peer pressure and craze to match the latest trends lead one to eat pizzas, burgers, aerated drinks, chocolates, etc., which have a long term effect of obesity, hyperlipidemia and sextual maturation delays. In appropriate nutrition during adolescence can lead to several consequences. Teenagers who eat lots of take away foods and junk foods are found to have bad behavioural outcomes like depression, aggression and delinquency. During adolescentstage, nutritional intake and quality of diet are important to support, maintain physical health, prevent chronic disease and promote a healthful weight (Health Action, 2013).

Adolescence is a time of many transitions for the children in terms of physical growth, psychological development and emotional maturity. Growth in stature, muscle and fat mass during the peak of adolescent growth spurt calls for the need of extra nutrients (Thompson, 2007).

Nutritional needs during adolescence are influenced mainly by the onset of puberty with its associated increased growth rate and changes in body composition and organ systems. Growth during adolescence is accompanied by an increased proportion of body fat for girls and an increased proportion of lean body mass and blood volume in boys. The recommended dietary energy requirements in adolescents are defined to maintain health, promote optimal growth and maturation, and support a desirable level of physical activity. (www.uptodate.org).

The quest for independence and acceptance by peers, increased mobility, and greater time spent at school, college and/or work activities, and preoccupation with self-image, contribute to the erratic and unhealthy eating behaviors that are common during adolescence (Jenkins et al., 2005).

National and population-based surveys have found that adolescents often fail to meet dietary recommendations for overall nutritional status and for specific nutrient intakes .Many adolescents receive a higher proportion of

energy from fat and/or added sugar and have a lower intake of vitamin A, folic acid, fiber, iron, calcium, and zinc than is recommended (Larson et al., 2007).

From a public health point of view, a high consumption of fruits and vegetables reduces the risk of heart disease and tumor .Furthermore, eating enough fruits and vegetables during childhood and adolescence is important for at least three reasons. First, as childhood and adolescence are phases of growth, the body requires more nutrients. Second, the eating patterns established during childhood and adolescence tends to continue in adulthood. Third, childhood and adolescence are key phases for easily modifying eating habits, as opposed to adulthood when such habits tend to be more rigid (Boeinget al., 2012).

Eating right and nutritious food during adolescence provides necessary nutrients to meet physical and intellectual growth; provides adequate stores in case of illness or pregnancy and prevent onset of adult diseases like hypertension, obesity, and osteoporosis later in life (Gowri and Surya, 2008)

The low intake of iron and calcium among adolescent girls is of particular concern. Iron deficiency can impair cognitive function and physical performance, and inadequate calcium intake may increase fracture risk during adolescence and the risk of developing osteoporosis in later life (Greer, 2006).

Eating habits vary widely between individual adolescents, and also display some general trends over time, reflecting sociocultural trends in food availability and nutritional goals. Data from six national representative surveys showed that total energy intake among adolescents increased through 2004, then decreased through 2010.Seven food sources, including sugar-sweetened beverages, pizza, full-fat milk, grain-based desserts, breads, pasta dishes, and savory snacks, consistently contributed to this trend. Intakes of full-fat milk, meats, ready-to-eat cereals, burgers, fried potatoes, fruit juice, and vegetables decreased, whereas nonfat milk, poultry, sweet snacks and candies, and tortilla- and corn-based dishes increased through 2010. The recent changes included significant decreases in sugar-sweetened

beverages, pizza, pasta dishes, bread, and savory snacks; and significant increases in fruit (Slining et al.,2013).

Soft drink and fast food are energy dense foodstuffs that are heavily marketed to adolescents. Fast food consumption is positively associated with energy intake and soft drink consumption, and negatively associated with fruit, vegetable and milk intakes in adolescents. Both soft drink and fast food consumption may adversely affect health (Vartanian et al., 2007).

The strength of adult bone reflects factors that regulate bone quality (architecture) and density (bone mass or quantity of calcium deposited/unit of bone) acquired during childhood and adolescence. Near maximal or peek bone mass of the vertebrate and femursis achieved at the completion of pubertal development. Because inexorable loss of bone mass begins in mid-adulthood in normal people, the magnitude of peak bone mass determines individual risk of later development of osteopenia and osteoporosis-disorders of compromised bone strength that lead to bone fragility and increased fracture risk. Soft drink consumption is known to alter bone mineral density and increases bone fractures which may pose a risk to osteoporosis. (Estherlydiaand John, 2011).

Adolescents eat differently as they are preoccupied with after-school activities and engagement in active social endeavours,they are not able to sit down for three meals a day. These apparent busy schedules lead to meal skipping, snacking throughout the day, and more eating away from home. Teens skip meals at home is prevalent, the likelihood of purchasing fast food from a restaurant, vending machine, or convenience store will be high. These foods tend to be high in fat and sugar and they provide little nutritional value. More importantly, eating too many fast foods can lead to weight gain and which may predispose one to diseases such as diabetes and heart disease (Beresford et al., 2006).

Main cause of malnutrition in urban affluent class adolescent females is more intakes of fast and junk foods and this is in the form of obesity. Contrary to this malnutrition in rural, backward poor class adolescent females is of

marasmus type (decrease in body weight) which is due to inadequate food items or caloric intake. Various types of worm infestations, due to inadequate food hygiene, add to this problem (Dubey, 2008).

Due to peer pressure the need to be in step with the trends and belong to the peer group leads the adolescent to eating non-nutritious foods like pizzas, burgers, coffees, aerated drinks, chocolates and also other roadside junk foods. Girls skip meals in their anxiety to be thin. This leads to anemia or low bone density in adulthood. Due to irregular college or school schedules, intake of caffeinated drinks increases and water intake reduces. Poor nutrition can lead to reduced concentration in studies, hair fall, low stamina, depression or poor posture(www.virtualmedicalcentre.com).

To prevent the development of chronic conditions, decreasing the consumption of energy-dense foods and increasing the consumption of fruits and vegetables during adolescence is important target of nutrition interventions. The development of effective nutrition interventions requires a detailed understanding of the determinants of target eating behaviour. More, specifically, knowledge about the determinants of developmental change in target eating behaviours during key life stages such as Adolescence is required (Brug, et al., 2005).

In India adolescent lifestyle has undergone vast changes, with lower levels of physical activity, with a sedentary life, irregular meal time, and diet rich in fat and refined carbohydrates. Due to unhealthy eating habits and lifestyle adolescents are more and more affected.

Hence with this background the present study was planned to assess the assessment of nutrition knowledge and food consumption pattern of adolescents and the Impact of nutrition education.

The present study entitled, “Assessment of nutrition knowledge and food consumption pattern of college going girls” was planned with the following objectives.

Objectives of the study

To

- Study the socio economic background, nutritional status and dietary pattern of college going students
- Assess the nutritional knowledge and food consumption pattern of college going students
- Impact of nutrition education on college going students.

II REVIEW OF LITRATURE

The Review of literature pertaining to the present study entitled "**Assessment of Nutritional Knowledge and Food Consumption Pattern of College Going Girls"** is presented under the following headings:

E. Lifestyle practices of adolescents
F. Eating disorders of adolescents
G. Nutritional Problems of adolescents
H. Nutritional knowledge of adolescents

A. LIFESTYLE PRACTICES OF ADOLESCENTS

i. Fast food consumption

Fast food consumption among the adolescents was predominantly influenced by taste, convenience and value for money. Over half of boys and girls agreed that they go to fast food outlets because they liked the taste of the food, with this response being more common among boys in all Grade groups. Boys seem more likely to choose the food combinations offered by fast food outlets than girls with 41.9 percentof Grade 10 boys, and26.6 percent of girls agreeing that they usually chose the value (burger, chips and drink) meal, but 14.0 percent of girls choosing the fast food outlet with the best value meals (Wilson et al., 2009).

Fast food consumption can lead to hyperinsulinemia and development of insulin resistance. High energy density, high glycemic index and fatty acid composition of fast foods may increase the prevalence of obesity and cardiovascular risk factors. The relevance between dietary quality and fast food consumption was evaluated by Isganaitis and Lustig (2005). The energy-adjusted distribution of nutrients across quartiles of fast food consumption showed that adolescents in the highest quartile consumed more amount of protein, carbohydrate, fat, saturated fatty acid, and vitamin C.

Due to the change in life style pattern and westernization the children are consuming more of junk food, which are high in carbohydrates. This results in high BMI that leads to attainment of puberty at an early age due to which hormonal changes takes place, which lead to aggression (Reen, 2009).

Nutritionally, the fast-food diet has been questioned. Most fast foods are very caloriedense and a small amount taken can increase calorific intake. These energy-dense foods can entice people into consuming more calories than the body needs because of the satisfying taste (Ding and Parks, 2007).

Consumption of fast food is associated with other poor nutritional habits: surveys show that parents who reported purchasing fast food for family meals at least three times per week were significantly more likely than parents who reported purchasing fewer than three fast food family meals to report the availability of soft drinks and chips in the home(Boutelleet al., 2007).

In the United States, more than 49 percent of today's food dollar is spent away from home, and this value continues to rise. Driven by consumers' growing need for convenience, sales at quick-service restaurants have increased to $168 billion in 2011 a 3 percent gain over 2010 (www.restaurant.org,2011).

ii. Fruit consumption

Adolescent self-efficacy for increasing fruit consumption mediated the positive associations between parental control and perceptions of the importance of healthy nutrition for child health and adolescent fruit consumption. Furthermore, adolescent self-efficacy mediated the negative association between parental barriers to buying fruits and vegetables and adolescent fruit consumption. The importance of explicating the mechanisms through which parental factors influence adolescent fruit consumption not only relates to the advancement of scientific knowledge but also offers potential avenues for intervention.Research should assess the effectiveness of methods to increase adolescent fruit consumption by focussing on both improving adolescents' dietary self-efficacy and on targeting parental control, perceptions and barriers. (Natalie Pearson et al., 2011).

The strongest determinants for fruit and vegetable intake were availability at home, parental modeling, demanding family rule, knowledge recommendations, positive self-efficacy, positive liking and preferences and demands (Shiuet al., 2012).

NurulIzzah et al. (2012) reported that the total consumption of fruits was reported as 3.12±1.41 servings/day and 173g/day.

Majlessi et al. (2013) in their study has reported that the girl students took only 2.58±0.96 serving of fruits and did not meet the recommended daily fruit and vegetable servings(more than 3-5 servings per day)and only one third (30.3%)of adolescents had the optimal consumption of fruits.

The lack of intervention success may be due to a poor understanding of the mechanisms underpinning adolescent eating behaviours and incorrect theoretical suppositions regarding the mechanisms through which eating behaviours can be modified (Cerin and Barnett, 2009).

Research by Pearson et al. (2010) indicates that parents play an important role in influencing the eating behaviours of adolescents; however, relatively few healthy eating programmes have utilized the home environment or parents as potential avenues for intervening with adolescents.

iii. Soft drink consumption

Over half of the boys and more than one third of the girls reported drinking soft drink daily, and consumption peaked in Grade 8 students. A quarter of students reported choosing soft drinks instead of water or milk, and around 40% agreed that soft drink was usually available in their homes. Availability in the home and drinking soft drinks with meals was most strongly associated with consumption in all age groups. One third and one half of adolescents reported that soft drink was usually available in their homes. Over half agreed that everyone in their age liked soft drink and a similar proportion agreed that soft drink was convenient to buy. Almost one quarter of boys and one fifth of girls reported that they usually drank soft drink with their meals at home (Elizabeth et al., 2009).

A recent study has linked soft drink consumption to general parenting style finding the lowest soft drink consumption in those families with a highly involved and moderately strict parenting style (Vereecken et al., 2009).

Predictors of soft drink consumption in adolescence have been studied before, but not extensively, and often the studies assess only the relation between adolescents' soft drink consumption and specific food lifestyle behaviours (e.g. television viewing), or singular individual or environmental factors (e.g. availability)(Bere et al., 2008 and Vartanianet al., 2007).

A recent study found no significant relationship between family meal frequencies and the availability or consumption of high-sugar/high-fat snack foods and soft drinks. Probably, availability, acceptability at home and communication during meals play a more important role than eating together. Further research is necessary to investigate the potential mechanisms underlying this association (Utter et al., 2008).

B. EATING DISORDERS OF ADOLESCENTS

Eating disorders and disordered eating behaviours, such as unhealthy weight control practices and binge eating, are of public health concern given their high prevalence and serious health consequences (Eaton et al., 2012).

Eating disorders (ED) typically emerge in adolescence. They represent a significant group of psychiatric disorders in adolescents, and are associated with a wide range of psychiatric and somatic problems and increased mortality (Steinhausen, 2009).

Epidemiological studies provide information about the occurrence of disorders and trends in the frequency of disorders over time. Eating disorders are relatively rare among the general population and patients tend to deny or conceal their illness and avoid professional help. This makes community studies costly and ineffective. Therefore, many epidemiological studies use psychiatric case registers or medical records from hospitals in a circumscribed area. This type of study will underestimate the occurrence of eating disorders in the general population, because not all patients will be detected by their general practitioner or referred to the hospital or mental health care. Furthermore, differences in rates over time could be due to improved case detection, increased public awareness leading to earlier detection and wider availability of treatment services, instead of a true increase in occurrence(Son et al., 2006).

The majority of eating disorders, which affect more than 11 million people with anorexia nervosa and bulimia nervosa, millions more with binge-eating disorders and an undetermined number of people with an eating disorder not otherwise specified in the United States, begin in adolescence (National Eating Disorder Association, 2005 andEngel et al., 2007).

Anorexia Nervosa is relatively common among young women. While the overall incidence rate remained stable over the past decades, there has been an increase in the high risk-group of 15–19 year old girls. It is unclear whether this reflects earlier detection of Anorexia Nervosa cases or an earlier age at onset. The occurrence of Bulimia Nervosa might have decreased since the early nineties of the last century. All eating disorders have an elevated mortality risk; Anorexia Nervosa the most striking. Compared with the other eating disorders, Binge Eating Disorder is more common among males and older individuals (Frederique and Smink, 2012).

Community studies assessing the incidence of eating disorders are scarce. Keski-Rahkonen et al. (2007) conducted a large community study to quantify the incidence of Anorexia Nervosa, yielding an incidence rate of 270 per 100 000 person in 15–19 year old Finnish female twins during 1990–1998. The incidence rate of broad Anorexia Nervosa was 490 per 100 000 person-years in the same group.

In a recent meta-analysis of studies describing the mortality rates of patients with Bulimia Nervosa, a weighted mortality rate of 1.74 per 1000 person-years was found (95 percent CI: 1.09-2.44), which means that per year 0.17 percent of Bulimia Nervosa patients die (Arceluset al., 2011).

Eating disorders are a predominantly female problem; only approximately 10% of the patients are male. It is alsonoteworthy that only a minority of ED patients are treated within mental healthcare (Hoek, 2006).

People with eating disorders can become seriously unwell and many will require access to hospital treatment. Common reasons forhospitalization include medical complications (e.g., cardiac abnormalities, electrolyte disturbance, bradycardia, and hypotension), suicidal behaviour, and lack of response to outpatient treatment in a very underweight patient. New South Wales data have suggested that 11percent are admitted with a life-threatening complication, up to 61percent if child inpatients are considered only (Madden et al.,2009).

Epidemiological estimates of eating disorders vary across studies and Australian epidemiological data are sparse. Nevertheless, based on international epidemiological data, the lifetime prevalence of anorexia

nervosain women is estimated to be between 0.3 percent and 1.5percent; the lifetime prevalence of Bulimia Nervosa is estimated to be between 0.9percent and 2.1percent; and the lifetime prevalence of Binge eating disorder is estimated to be between 2.5percent and 4.5percent(Hudsonet al., 2007).

Eating disorders are the third most common chronic illness in young females. Risk of premature death from an eating disorder is six-twelve times higher than the general population (www.nedc.com).

C. NUTRITIONAL PROBLEMS OF ADOLESCENTS

i. Overweight and obesity

Healthy People 2010 identified overweight and obesity as 1 of 10 leading health indicators and called for a reduction in the proportion of children and adolescents who are overweight or obese, but the United States has made little progress toward the target goal. Progress toward reducing the national prevalence of overweight and obesity is monitored using data from the National Health and Nutrition Examination Survey (NHANES).

Obesity is an independent risk factor for CVD. Obesity is associated with an increased risk of morbidity and mortality as well as reduced life expectancy. The last two decades of the previous century have witnessed dramatic increase in health care costs due to obesity and related issues among children and adolescents (Wanget al.,2006).

For children and adolescents, overweight and obesity are defined using age and sex specific normograms for body mass index (BMI). Children with BMI equal to or exceeding the age-gender-specific 95_{th} percentile are defined obese. Those with BMI equal to or exceeding the 85_{th} but are below 95_{th} percentiles are defined overweight and are at risk for obesity related co-morbidities (Donohoueet al., 2004).

In India, under nutrition and over nutrition are epidemics of the impoverished and the affluent respectively– and is part and parcel of the double burden of disease in this country (Subramanianet al., 2006).

Being obese increases the risk of chronic diseases like cardiovascular diseases (CVD), diabetes, a variety of cancers and death and it is closely

related to the BMI (body mass index) status. Weight loss has shown to decrease these health risks associated with obesity (Elmer et al., 2006).

Adolescents categorized as overweight or obese have increased risk for cardiovascular disease (CVD), type 2 diabetes mellitus, dyslipidemia, and metabolic syndrome (Urbinaet al., 2009).

A study by Kautiainen (2008) showed that there was a marked, steady growth in the prevalence of overweight and obesity among Finnish 12 to 18 year old adolescents between 1977 and 2005, resulting in a three to fourfold increase in the prevalence of overweight between the first and the last study year.

The main reason behind obesity is an increase in eating habits that include fatty and sweet snacks and soft drinks, which are not in accordance with the current dietary recommendations (Hoppu et al., 2008).

Nearly one of three adolescents in the United States can be classified as either overweight (defined as having a body mass index [BMI] greater than or equal to 85th percentile) or obese (BMI greater than or equal to 95th percentile), based on the BMI-for-age data from the National Health and Nutrition Examination Survey (NHANES; Ogden, Carroll andFlegal, 2008).

ii.Stress in adolescents

A depressive disorder is an infirmity that rivets the body, mood, thoughts and feelings and behaves. It influence the way an individual think, feel, eat, sleeps, act and react. These problems continue some times for weeks, months, or years until taking proper healing (Muhammadand Khan et al, 2006).

These strained conditions are taken place due to the stress. It may be acute, episodic acute and chronic stress. Academic institutions environment have entirely different work surroundings in contrast of nonacademic environment and therefore they produce different symptoms, causes, and consequences of stress in the academic institution (Elfering et al., 2005).

Ang and Huan (2006) found that adolescents experienced academicstress arising from both their own expectations to excel as well as expectationsarising from their parents and teachers.

Academic environment are considered as a stressful atmosphere that often put forth a negative effect on the student's performance, mental and physical health of the undergraduate. Stress has become an imperative issue in studious sphere as well as in our civilization (Agolla, 2009).

The articles paint a dismal picture of the growing pressure to excel, leading to an epidemic of student stress among top students, with adverse consequences such as poor sleep, cheating, depression, anxiety, and harmful coping mechanisms, including drug and alcohol abuse. While college preparatory high schools appearing in the news are portrayed as particular hotbeds of pressure and stress, few empirical researchers have examined the stress of students in these environments (Conner et al., 2010).

The empirical research that has been done has highlighted some disturbing trends; in addition to the normal stress of developmental changes that accompany the adolescent period, many students today must also cope with the stress of heavy academic workloads, a multitude of extracurricular and athletic engagements, and pressure from the increasingly competitive college application process (Bound, Hershbein and Long, 2009).

The stress which is experienced by students may adversely affect their academic achievement, personal well-being and long-term professional capabilities. It can lead to mental distress and it can have a negative impact on their cognitive functioning and learning (Dahlin, 2005).

Like all young adults, undergraduate students need to cope up with the academic and social demands that they may encounter in university studies in their preparation for professional careers. Therefore, the period of undergraduate education is a sensitive period in an individual's life span. The students from professional courses do feel a great amount of pressure in dealing with academic stress and anxiety. This can occur at different timeperiods during a semester or years in college and during the transition of the students from an intermediate to a professional academic status. The stress in undergraduate students has many sources, including academics, personal situations, environment, time management, and economic circumstances. Although some stress is expected in college and it can be a

motivation to study and learn, too much stress can deter learning (LeBlanc, 2009).

In a study by Hamza(2008), a majority of students said that the stress that they experienced, strengthened their commitment to their professional education and achievement.

ii. Polycystic ovarian syndrome

Polycystic ovary syndrome (PCOS) is the most common endocrine disorder affecting women worldwide. Studies indicate that 6–7percentof women are affected (Azzizet al., 2004).

Polycystic ovary syndrome is considered a heterogeneous condition, meaning that different individuals may have the same disorder due to different causes. The cause of PCOS is still undetermined, but research indicates that genetic and environmental factors may both be contributors (Teedeet al., 2010).

Women with Polycystic ovary syndrome have a vital need for information about their condition.Many physicians are largely unfamiliar with the syndrome, leading to women remaining undiagnosed or receiving inadequate information about their condition when they are diagnosed withpolycystic ovary syndrome (Avery, 2007).

The prevalence of Polycystic ovarian disease presenting earlier during adolescent stage in several ethnic minority groups in the USA and other parts of the world may also be accompanied by an increasing prevalence of Polycystic ovarian disease (Balen, 2007).

Polycystic ovarian disease is a common female endocrine disorder with prevalence ranging from 22 to 26 percent but the prevalence of polycystic ovarian disease in Indian adolescents is 9.13 percent (Nidhi et al., 2011). Prevalence of polycystic ovaries in Indian subcontinent Asian women aged 18 to 40 years is 52 percent (Kovacs, 2007).

D. NUTRITIONAL KNOWLEDGE OF ADOLESCENTS

A study by Azizi et al. (2010) show that the nutrition knowledge score were the highest in the nursing students and were the lowest in business management students. The ANOVA shows that there were significant

differences among the nutrition knowledge of all the majors. In addition, the nutrition attitude scores were the highest for physical education and were the lowest for business management; and the differences between nutrition attitudes among all of the majors were significant. Furthermore, there was a positive and significant correlation between the nutrition knowledge and attitude of the female (r=0/001; sig= 0/03) and male (r= 0/30; sig= 0/03) students; and a positive and significant correlation between the nutrition attitude and practices of male and female students (r= 0/18; sig=0/000). They suggest that students should pay more attention to nutrition.

The NKT (nutritional knowledge test) proved to be feasible in adolescents across Europe. In European adolescents, nutritional knowledge was modest and similar to results in adults. Intervention should be focused on the lower socio economic status components of the respective population. They should be initiated at a younger age and should be coupled with environmental prevention (Wolfgang et al., 2010).

Nutritional knowledge has been repeatedly assessed in adolescents, results are difficult to compare because different measurement instruments and definitions have been used. In addition, nutritional knowledge is influenced by biological and social factors (e.g. age, gender and social status) in both adolescents and adults (Wojcicki et al., 2009).

Sakamaki et al. (2005) opine that students are only slightly aware of nutrition issues and that their knowledge and attitude are average.

Cupisti et al. (2004), by comparing the nutrition habits and nutrition knowledge of female students in both physical education and non-physical education, found that the consumption of carbohydrate in physical education students was greater than in nonphysical education students, and the consumption of fat in non-physical education students was greater .Physical education students consumed large amounts of fiber, iron, and vitamin, but the consumption of iron and calcium in both groups was smaller than the required daily amounts (Cupisti et al., 2004).

The main goal of nutrition plans is to obtain the appropriate and necessary nutrition to remain healthy, to be physically prepared and to lead a

healthy life. For this reason to promote the health level of a society, and the attitudes of its people, must be taken into account. Given that one of the main goals of universities is to broaden the knowledge of the people in a society, the enhancement of the nutrition attitudes, knowledge and practices of its students is of high importance, as this will subsequently lead to a more food conscious society and more healthy people. Some studies have shown that most students are not familiar with the healthy foods needed for their body in different conditions (Cotugna et al., 2005).

Ruka et al. (2005) research showed that the majority of students (83.6%) eat three meals during the day regularly and no difference was found between men and women (Ruka et al., 2005).

IIIMETHODOLOGY

The methodology followed for the present study entitled, "**Assessment of Nutritional Knowledge and Food Consumption Pattern of College Going Girls"**is presented under the following heads:

H. Selection of area
I. Selection of subjects
J. Formulation of interview schedule and conduct of survey
    1. Obtaining Ethical Clearance of the study
K. Assessment of nutritional status
    1. Anthropometric measurement of the selected subjects
    2. Dietary survey
L. Formulation of questionnaire to assess nutritional knowledge
M. Imparting nutrition education to the selected adolescent girls
N. Analysis and interpretation of the data.

A. SELECTION OF AREA

The area selected for the study was Coimbatore district. Coimbatore is an educational hub of south India. As of 2010, the Coimbatore district is home to seven universities, 78 engineering colleges, three medical colleges, 35 polytechnic colleges and more than 150 Arts and Science Colleges and a large number of schools.

Coimbatore was chosen as the place of study due to the investigator's familiarity with place, people and resources. Easy accessibility and co-operation of the subjects made this place conducive for the study.

B.SELECTION OF SUBJECTS

Adolescence is the period of transition from childhood to adulthood and is crucial in the life of human beings. They need nutritional care to promote and to maintain their health status.

Sampling is simply the process of learning about population on the basis of the sample drawn from it. Under this method a small group of the universe is taken as the representative of the whole mass and the results

are drawn. It is a method to make social investigation practicable and easy (Kothari, 2011).

A total number of adolescent subjects in the age group of 17-21 years were selected for survey by random sampling technique.Two hundred girls in the age group 17-21 years were interviewed during the survey.

C.FORMULATION OF INTERVIEW SCHEDULE AND CONDUCT OFSURVEY

Interview as stated by FAO (2005) is more accurate than other methods as the interviewer comes in direct contact with interviewee.

Interview method was chosen due to its convenience, comprehensiveness and possibly of obtaining genuine information for collection of data. Hence, interview method was selected using an interview schedule. An interview schedule is the list of questions that helps to collect data from the field.This is generally filled by the researcher or the interviewer himself (Gupta, 2007).

The background information relating to age,education, type of family, number of family members,income of the family, anthropometric assessment, dietary pattern,three days recall method, frequency of food intakewas collected with the help of the interview schedule, presented in Appendix I.

Socio economic status is typically broken into three categories, high, middle and low economic status (National Center for Health Statistics, 2008).

Hence the interview method was used on 200 subjects of adolescent girls selected in the various colleges of Coimbatore city (Plate I).

1. Obtaining Ethical Clearance of the study

The application form explaining the design and the protocols used in the research study was subjected to the Institutional Ethical Committee and Ethics Clearance was obtained in Appendix II.

PLATE I

INTERVIEW WITH COLLEGE GOING GIRLS

D. ASSESSMENT OF NUTRITIONAL STATUS

Assessment of the nutritional status of the community is one of the first steps in the formulation of public health strategy to combat malnutrition. Nutritional status of an individual is assessed by using medical, nutritional and medication histories, physical examination, anthropometric measurement and laboratory data. Nutritional anthropometry is measurement of human body at different age's levels of nutritional status. It is based on the concept that an appropriate measurement should reflect any morphological variation occurring due to significant functional physiological change (Bamji, 2009).

1. Anthropometric measurement of the selected subjects

Anthropometry deals with physical measurement that provides an indirect assessment of body composition, growth and development. It also indicates the changes in an individual's nutritional status. This is considered to bethemost sensitive parameter for assessing the nutritional status (NIN, 2011).

Anthropometric measurements are physical measurements of the body, such as height and weight, hip circumference and waist circumference. The assessment of growth includes the evaluation of height, weight as well as allowing for the correction of those parameters of age. Assessment of nutritional status is based on body components relating to previous measurements and relating to values in a given patient to normal standards.(Insel etal., 2010).

The most commonly used anthropometry measurements to determine nutritional status are

- **a.** Measurement of height
- **b.** Measurement of weight
- **c.** Body mass index(BMI)
- **d.** Waist circumference
- **e.** Hip circumference
- **f.** Waist hip ratio(WHR)

a. Measurement of height

The height of an individual is principally a measure of skeletal, body tissues, leg, pelvis, spine and skull. Height is the simplest and quickest one to measure and the easiest to produce, provide simultaneously maximum information concerning a number of nutritional problems. The height is measured with a vertical measuring rod. The subject should stand erect on a leveled surface without shoes, looking straight with heels together and toes apart. An average three successive measurements is taken as the final measurement (Bamji*et al.,* 2009)(Plate II).

b. Measurement of weight

Body weight is the most widely used and the simplest method for assessing the nutritional status of people. It indicates the body mass and it is composite of all body constituents like water, minerals, fat, protein, bone etc. The individual were weighed with minimum clothing and without shoes. The individual should not lean against or hold any support, while weight was recorded (Bamji, 2009).

Body weight is an important anthropometric measurement in use. Use of lever- actuated balance with 100gm is recommended. The weighing scale should be placed on a firm and flat ground and zero- error has to be adjusted. The subject is made to stand on the platform of the balance without footwear and with minimal clothing and weight should be taken by the investigator (NIN, 2011) (Plate 2).

c. Body Mass Index (BMI)

Body mass index, a mathematical formula that correlates with body fat is expressed as weight in kilograms divided by height in meters squared (Mahan, 2008).

After the cessation of linear growth around the age of 21 years, weight for height indicates muscle fat mass in the adult body. Therefore BMI provides a reasonable indication of the nutritional status of adults. The BMI has good correlation with fatness. It may also be used as indicator of health risk (Bamji*et al*., 2009).The BMI was calculated by using the Quetelet's index for all the selected adolescents.

MEASUREMENT OF HEIGHT

MEASUREMENT OF WEIGHT

PLATE II

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

The BMI values of the adolescents were categorized according to nutritional status based on BMI as suggested by WHO (2009).

BMI (kg/m2)	**Classification**
<18.5	Underweight
18.5-22.9	Normal
23.0-24.9	Overweight
>25	Obesity

(WHO, **2009**)

d. Waist circumference

Waist circumference is measured using fibre reinforced plastic tape. The tape should pass mid way between the lower rib margin and iliac crest. Adult men with waist circumference ≥102 cms and adult women with ≥88 cms considered as having abdominal obesity (Bamji 2009).

The waist circumference is obtained by measuring the distance around the smallest area below the ribcage and above umbilicus (belly button) with the use of non stretchable tape measure. Waist circumference measurements assess abdominal fat content (Mahan, 2008)(Plate III).

e. Hip circumference

Hip circumference is measured with tape passing over maximum protuberance on buttocks. (Bamji,2009).

Place the tape horizontally over the buttocks and measure the circumference at the point yielding the maximum circumference in centimeters up to the nearest millimeter (NIN, 2011)(Plate III).

f. Waist hip ratio (WHR)

Waist hip ratio is used as a measurement of obesity, especially abdominal obesity, which in turn is a possible indicator of other more serious health conditions. The standard waist hip ratios (WHR) of 0.85 and greater have a risk of health problems in women. (WHO, 2006)

WAIST MEASUREMENT

HIP MEASUREMENT

PLATE III

The predominant distribution of fat in an obese patterns whether in the upper part or the lower part of the body may determine the disease pattern.Waist hip ratio (WHR) is defined as the waist circumference divided by the hip circumference (Lutz et al., 2007). The waist hip ratio of selected adolescents were calculated using the following formula of

$$WHR = \frac{\text{Waist Circumference (cm)}}{\text{Hip Circumference (cm)}}$$

2. Dietary survey

Diet is a vital determinant of health and nutritional status of an individual. The individual food intake can be obtained by the quantity of the food consumed. In diet survey, a set of “standardized cups” suited to local conditions are used. The cups are used mainly for the respondent to recall the quantities prepared and fed to the individual members. The procedure includes food frequency consumption of different foods through a questionnaire daily or number of times in a week or fortnight or occasionally (Bamji 2009).

Diet survey was conducted in adolescents to collect information on their food consumption pattern. Food and nutrient intake was recorded through three day recall method. The details on the dietary practice like food frequency pattern, type of diet taken, dietary recall method, consumption of sugar, consumption pattern of fast foods, and habit of skipping meals were collectedwith the help of questionnaire.

Nutrient intake was calculated by using nutritive value of Indian foods and compared with Recommended Dietary Allowances for Indians by ICMR (2010).

E. FORMULATION OF QUESTIONNAIRE TO ASSESS NUTRITIONAL KNOWLEDGE

A questionnaire was designed to elicit the information regarding nutritional knowledge of adolescents. Questionnaire included questions on nutrient content of foods, functions of food, deficiency diseases, and health benefits. Overall 28 questions were used for assessing the nutritional knowledge and is presented in Appendix III. Each question answered

correct was equivalent to one point. Wrong answers did not receive scores. The scores varied from zero to 28.

F. IMPARTING NUTRITION EDUCATION TO THE SELECTED SUBJECT

Nutrition education is combination of educational strategies, accompanied by environmental supports, designed to facilitate voluntary adoption of food choices and other food and nutrition behaviours conducive to health and well-being. Nutrition education delivered through multiple venues involves activities at the individual as well as community level. Nutrition education is any set of learning experiences designed to facilitate the voluntary adoption of eating and other nutrition related behaviours conductive to health and well-being (Martin and Oakley, 2008) (Plate IV).

Nutrition education is an effective tool when used properly on any target group and for a specific condition, can bring about positive results (World health Report, 1998).

Initial nutritional knowledge, attitude towards proper nutrition and health, eating habits and knowledge concerning nutrition facts of the adolescents were assessed through an interview schedule covering all facts of nutrition. The level of nutritional knowledge of 50 college going girls was assessed. Pamphlets were prepared comprising of all the information given through the visual presentation in English and distributed among the adolescent girls (Appendix IV).

The effectiveness of the nutrition education on nutrition knowledge of the adolescent girls was evaluated using the interview schedule after nutrition education and the results obtained were consolidated using scores. Comparison of initial and final scores was used to evaluate the impact of the nutrition education programme.

G. ANALYSIS AND INTERPRETATION OF THE DATA

The data collected were organized to obtain the desired results and interpreted scientifically (Gupta, 2007). The collected data was consolidated

tabulated and analyzed to see the knowledge and food consumption pattern of selected subjects.

IMPARTING NUTRITION EDUCATION

DISTRIBUTION OF PAMPHLETS

PLATE IV

IV RESULTS AND DISCUSSION

The results of the present study titled, **"Assessment of nutritional Knowledge and Food Consumption Pattern of College Going Girls",** are presented and discussed under the following headings:

E. Socio economic background of college going girls
F. Nutritional status of college going girls
G. Dietary pattern of college going girls
H. Assessment of nutritional knowledge of college going girls

A. Socio economic background of college going girls

The details pertaining to the socio economic background of college going girls are discussed as follows

1. Age of the college going girls

Table I presents the categorization of girls according to their age.

TABLE I

AGE OF THE COLLEGE GOING GIRLS

(N=200)

Age (years)	Number	Percent
17	22	11
18	66	33
19	46	23
20	32	16
21	34	17
Total	**200**	**100**

Among the 200 girls selected for the study, 11 percent belonged to the age of 17 years, 33 percent in the age of 18 years, 23 percent in the age of 19 years, 16 and 17percent in the age group of 20 and 21 years respectively.

2. Type of family

Details regarding type of family the girls belonged to are presented in Table II.

TABLE II

TYPE OF FAMILY

g(N=200)

Type of family	Number	Percent
Nuclear	178	89
Joint	22	11
Total	**200**	**100**

With regard to the type of family, majority (88 percent) of the college going girls belonged to nuclear families and the remaining 11 percent only were from joint families. This data shows the disappearance of joint family system in India and the girls are brought up without the influence of their grandparents and other family members.

3. Family size

Details regarding family size of the selected girls are presented in Table III.

TABLE III

FAMILY SIZE OF THE SELECTED GIRLS

(N=200)

Number of family members	Number	Percent
2-4	114	57
4-5	68	34
Above 6	18	9
Total	**200**	**100**

Among the 200 girls, majority (57 percent) belonged to the families consisting of two to four members, 34 percent belonged to the families consisting of four to six members, followed by nine percent belonged to the families consisting of above six members.This reflects the fact presented in

Table II. Greater the number of nuclear families smaller will be the size of the family. As the girls live in nuclear families, the number of members in the families is also less.

4. Educational status

Table IV presents data on the Educational statusof the girls

TABLE IV

EDUCATIONAL STATUS OF THE SELECTED GIRLS

(N=200)

Educational status	Number	Percent
UG(undergraduate)	150	75
PG(Postgraduate)	50	25
Total	**200**	**100**

Out of the selected girls 75 percent of them were in their undergraduate course, while 25 percent of the girls were doing their post graduation studies.

5. Place of residence

Table V depicts the distribution of students according to the place where they reside.

TABLE V

DISTRIBUTION OF THE STUDENTS ACCORDING TO THE PLACE OF RESIDENCE

Place of residence	Number	Percent
Urban	126	63
Rural	74	37
Total	**200**	**100**

The data in the table reveal that 63 percent of the girls live in urban area, while 37 percent only come for education from rural areas. Higher education is more accessible to urban girls when compared with their rural counterparts.

6. Religionof the college going girls

Religion to which the college going girlsbelonged is presented in Table VI.

TABLE VI

RELIGION OF THE COLLEGE GOING GIRLS

Religion	Number	Percent
Hindu	174	87
Christian	16	8
Muslim	10	5
Total	**200**	**100**

Majority of 87 percent of selected girls wereHindus, eight percent of them were Christians and onlyfivepercent of the girls were Muslims.

7. Total Income of the family

Income of the family of the selected girls is presented in table VII

TABLE VII

TOTAL INCOME OF THE FAMILY

Total income of the family in Rupees	Number	Percent
<`5000	10	5
`5000-10,000	18	44
`10,000-20,000	54	27
>`20,000	48	24
Total	**200**	**100**

Out of the selected girls only 5 percent of them belonged to the family with an income of less than Rs.5000 per month, while 44 percent girls family had an income of `5000-10,000, while 27 percent and 24percent belonged to families with an total income of `10,000-20,000 and above `20,000 respectively.

B.NUTRITIONAL STATUS OF COLLEGE GOING GIRLS

The nutritional status of the college going girlswas assessed by anthropometric measurements and dietary survey.

i. Anthropometric measurement

a. Mean height and weight of college going girls

Table VIII presents the distribution of the college going girls according to height and weight classification. The individual height and weight of the selected girls is present in Appendix V.

TABLE VIII

HEIGHT AND WEIGHT OF THE SELECTED COLLEGE GOING GIRLS

(N=200)

Details	Number	Percent
Height (cm)		
<145	12	6
146-150	22	11
151-155	48	24
156-160	58	29
>160	60	30
Weight (kg)		
<40	18	9
41-50	76	38
51-60	70	35
61-70	28	14
>70	8	4

Table VII indicates that six percent of the girlswere less than 145 cm of height. Eleven percentof selected subjects were between146-150 cm of height. Twenty four and 29Percent of the girls were between 151-155 cm of height and 156-160 cm respectively.

With regardto weight, nine percent of the girls were underweight and theirbody weight was less than 40 kg. While 38 percent of girls were in the

range of 41-50 kg, a little above underweight, 35 percent of the girl'sbody weight was in the range of 51-60 kg, 14percent were in the weight range of 61-70 kg and four percent weighed more than 70 kg.

b. Body mass index (BMI)

Table IX and Figure 1presents the Body Mass Index of the selected subjects.

TABLE IX

BODY MASS INDEX OF THE SELECTED SUBJECTS

Parameters	BMI classification	Number	Percent
Underweight	<18.5	46	23
Normal	18.5-22.5	102	51
Overweight	23.0-24.9	30	15
Obese	>25	22	11

WHO(2009)

Out of the selected subjects51percent of the girls had normal height and weight hence their BMI was also within the normal range as the data on weight indicated, 23 percent of the girls had a BMI of less than 18.5 and they were underweight. The remaining students (i.e.) 15percent and 11 percent had BMI of range of 23.0-24.9 andgreater than 25 respectively and they were categorized as overweight and obese. The data reveals that only 50 percent of the subjects were in the normal weight range and the others were either underweight or overweight.

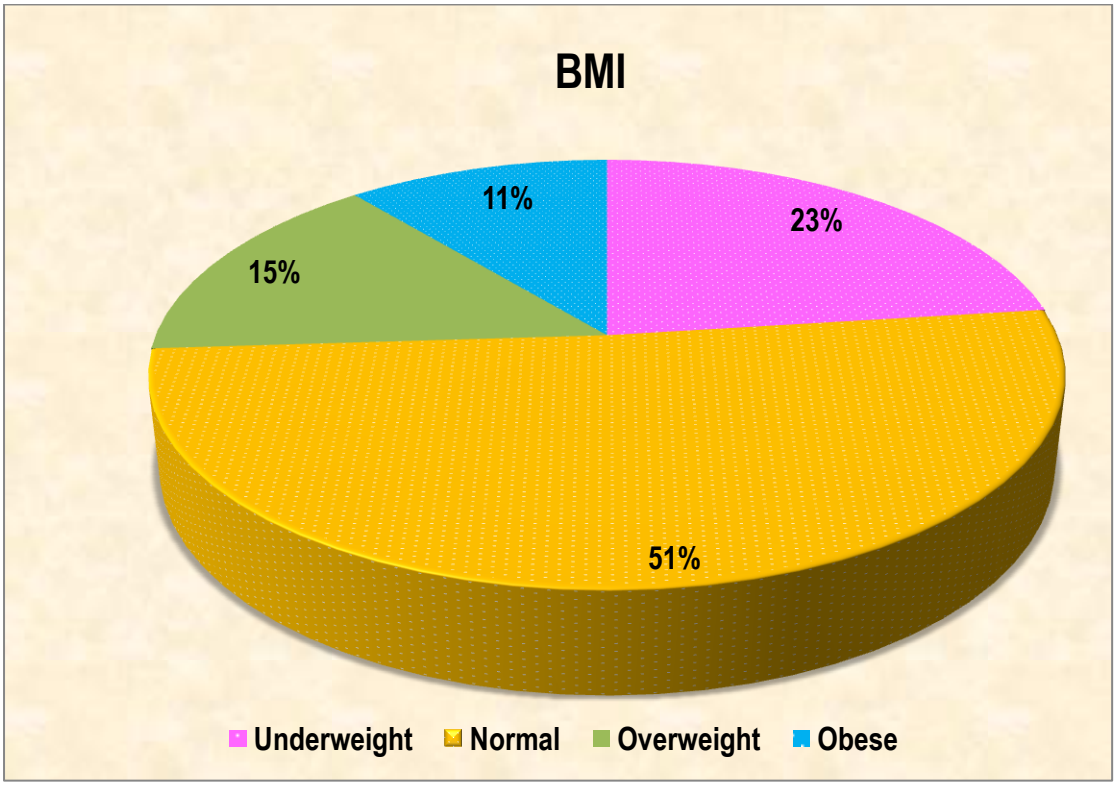

FIGURE I

BODY MASS INDEX

c. Waist – hip ratio

Table Xand Figure 2 show the waist hip ratio of the selected subjects.

TABLE X

WAIST HIP RATIO OF SELECTED COLLEGE GOING GIRLS

Waist hip ratio	Health risk	Number	Percent
<0.80	Low risk	132	66
0.81-0.85	Moderate risk	2	1
>0.85	High risk	66	33
	Total	**200**	**100**

WHO (2008)

The data shows that around 66 percent of the girls had waist hip ratio values within the low risk range i.e. (0.81-0.85) and only onepercent of them had WHRmoderate risk, 33 percent of them high risk range (i.e.)>0.8. This data is accordance with the data in Table IX which indicated that around 26 percent were overweight and obese. Hence WHR is also in high risk category for 33 percent of the students.

C. DIETARY PATTERN OF COLLEGE GOING GIRLS

Details regarding the dietary pattern of the selected college going girls are discussed under the following headings

1. Type of diet consumed

The type of diet consumed by the girls is presented in Table XI.

TABLE XI

TYPE OF DIET CONSUMED

(N=200)

S.No	Type of diet	Number	Percent
1.	Vegetarian	48	24
2.	Non vegetarian	140	70
3.	Ova vegetarian	12	6
	Total	**200**	**100**

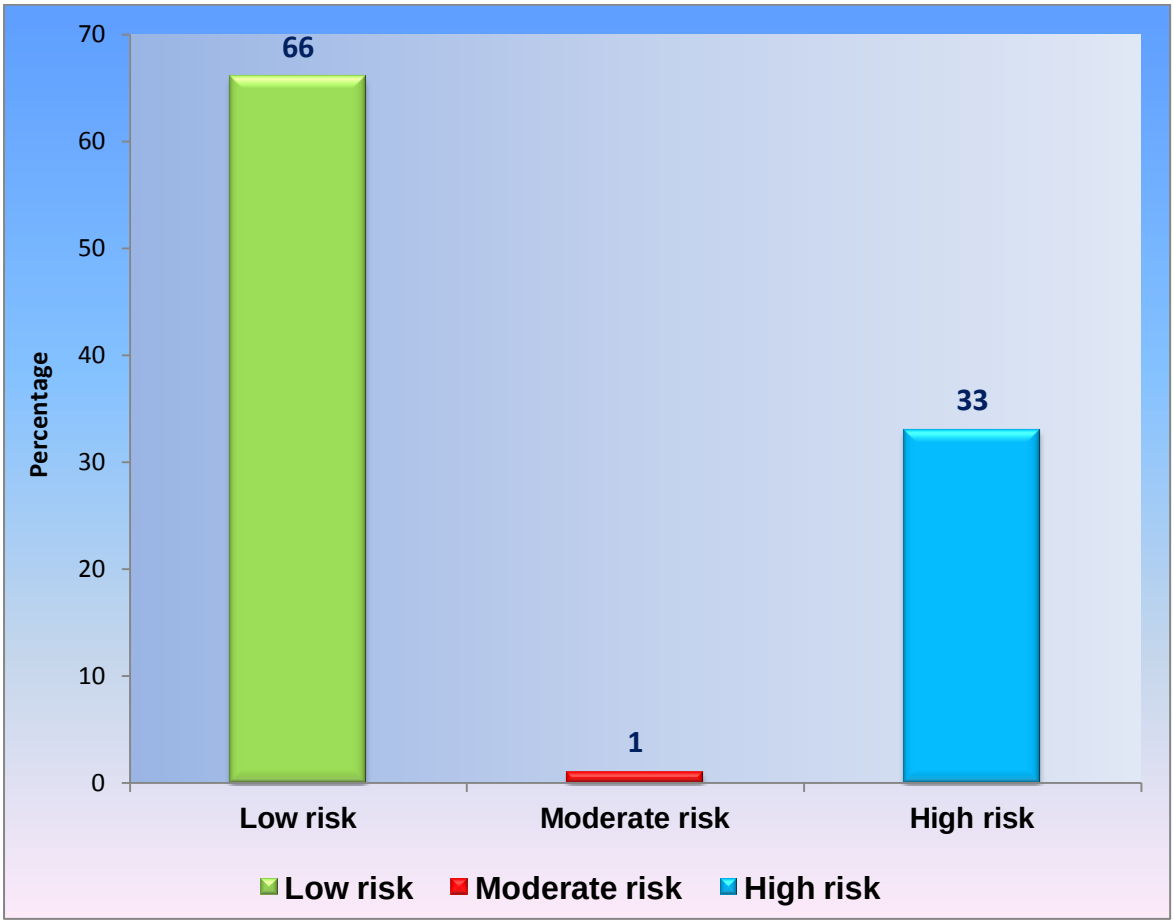

FIGURE 2

WHAIST HIP RATIO

Information on the general food consumption pattern from Table X revealed that 24 percent of them consumed vegetarian and only 70 percent of them preferred non vegetarian foods in their diets. Around six percent of them were ova vegetarians.

2. Meal pattern

Meal pattern of the selected college going girls is given in Table XII.

TABLE XII

MEAL PATTERN OF SELECTED COLLEGE GOING GIRLS

(N=200)

S.No	Number of meals	Number	Percent
1.	2	22	11
2.	3	168	84
3.	4	10	5
	Total	**200**	**100**

Out of 200 girls, majority of 84 percent followed a three meal pattern, while 11 percent followed a two meal pattern and five percent of them followed the meal pattern of having food four times a day. Out of the selected girls majority of them had good dietary habit by eating three meals a day without skipping food item.

a. Pattern of Skipping meals by college going girls

Skipping meal pattern of the girls is presented in Table XIII.

TABLE XIII

SKIPPING MEAL PATTERN

Skipping meal pattern	Number	Percent
Yes	60	30
No	60	30
Rarely	80	40
Total	**200**	**100**
If Yes, skipping meals/day		
Breakfast	80	57
Lunch	30	21
Dinner	31	22

About 30 percent of girls skip their meals and 30 percent girls did not skip any meals, and had the habit of taking food regularly at least less quantity, and 40 percent of girl's skipped meals very rarely.

Out of the girls who skipped meals about 57 percent of the girls, was skipping breakfast, 21 percent of them skipping lunch, and 22 percent were skipping dinner. In the present situation, college going girls have developed the habit of skipping meals due to one or other reason, either due to time taken for travelling or due to their studies or dislike for the food provided in the hostel or home.

b. Consumption of beverages

The data collected showed that, out of the selected girls, 55 percent preferred to consume tea and remaining 45 percent of girls preferred to consume coffee. Out of the girls who consumed tea and coffee, only six percent consumed coffee or tea more than four cups a day.

c. Consumption of soft drinks

Pattern of consumption of soft drinks by the students is presented in Table XIV.

TABLE XIV

CONSUMPTION OF SOFT DRINKS

(N=200)

Consumption of soft drinks	Number	Percent
Yes	154	77
No	46	23
If yes, Consumption of soft drinks		
Daily	8	5
Weekly	49	32
Twice a week	71	46
3-4 times a week	5	3
Rarely	21	14

The data in the table revealed that about 77 percent of girls preferred to consume soft drinks and only 23 percent girls did not consume any type of soft drinks. Out of the students who consumed soft drink about five percentof the girls, consume soft drinks daily, 32 percent of them consumed weekly once, 46percent consumed twice a week, three percent of adolescent girls consumed three to four times a week and 13 percent of them consumed soft drinks, very rarely. This data shows that though soft drinks are only empty calorie foods many prefer to have these drinks in place of health drinks.

d. Bottled drinks commonly preferred

Bottled drinks commonly preferred by the students is presented in Table XV.

TABLE XV

BOTTLED DRINKS COMMONLY PREFERRED

Name of the bottled drink	Number*	Percent
Fruit juice (fresh)	98	49
Fanta	48	24
Mazza	58	29
Slice	54	27
Soda	28	14
Coca cola	20	10
Limca	9	4
7 up	46	29

*Multiple response

The cold beverages consumption pattern revealed that around 49 percent of the students preferred to drink fresh fruit juice depending upon the season, availability and cost.Fresh fruit juice was followed by consumption of bottled drinks likefanta, mazza, slice, soda, coca cola and seven up with 24, 29, 27, 14, 10 and 29 percent of girls respectively. Limcawas the beverage least preferred by the girls (four percent).

e. Consumption of milk

The Consumption pattern of milk is presented in Table XVI

TABLE XVI

CONSUMPTION PATTERN OF MILK

Consumption of milk	Number	Percent
Yes	124	62
No	76	38
If yes, frequency of milk consumption/ day		
200 ml	90	73
400 ml	31	25
600 ml	3	2

From the data presented, it is clear that only 38 percent of the girls did not consume milk and majority of 62 percent had the habit of drinking milk.Out of majority of girls consuming milk 73 percent consumed only 200 ml, while 25 percent and two percent consumed 400 mland 600 mlof milk respectively.

f. Consumption pattern of fast foods

The consumption of fast foods for meals and snacks is very popular among adolescents. Fast foods include food from bakeries, convenience foods and franchised food restaurants. Fast food consumption among adolescent girls is one of the important issues of concern in the adolescent health care.

Consumption pattern of fast foods and Fast foods commonly preferred by college going girls is presented in Table XVII.

TABLE XVII

CONSUMPTION PATTERN OF FAST FOODS

Consumption of fast foods	**Number**	**Percent**
Weekly once	48	28
Twice a week	28	16
Rarely	95	56
Name of the fast foods	**Number ***	**Percent**
Pizza	44	22
Panipoori	136	68
Burger	30	15
Sandwich	24	12
Chat	52	26
Subway items	24	12

*Multiple response

About 28 percent of thegirls consume fast foods weekly once, 16 percent consumed twice a week, and 56percent of them consumed the fast foods rarely. None of them consumed fast foods daily.

Panipoori was the most preferred item among 68 percent of the girls, followed by pizza, burger, sandwich, chat and subway items with 22, 15, 12, 26 and 12 percent of girls respectively. Majority of the participants consumed fast foods without knowing the health impacts and its long term health implications.

g. Consumption pattern of bakery foods

Bakery foods commonly preferred by the selected college going girls is presented in Table XVIII.

TABLE XVIII

CONSUMPTION PATTERN OF BAKERY FOODS

(N=200)

Consumption of bakery foods	**Number**	**Percent**
Yes	170	85
No	30	15
Total	**200**	**100**
Bakery foods commonly preferred	**Number***	**Percent**
Cake	110	55
Puff	120	60
Bread	95	48
Vegetable cutlet	71	35
Coconut bun	64	32
Biscuit	94	47
Samoza	75	38

*Multiple response

About 85 percent ofgirls consumed one or other bakery foods everyday and 15 percent college going girls did not consume bakery foods regularly.

Puffwas the most preferred bakery item among 60 percent of the college going girls, followed by cake, bread, vegetable cutlet, biscuit and samozawith 55, 48, 35, 47 and 38 percent of girls respectively. Coconut bun

was preferred by 32 percent of the girls. The study highlighted the dangers of the trap adolescents are in.

h.Food frequency pattern

Food frequency pattern of college going girls is presented in Table XIX.

TABLE XIX

FOOD FREQUENCY PATTERN OF COLLEGE GOING GIRLS

Foods	Daily		Thrice a week		twice a week		Weekly once		Occasional-ly	
	No.	%	No.	%	No	%	No	%	No.	%
Cereals										
Boiled rice	200	100	-	-	-	-	-	-	-	-
Wheat	-	-	-	-	40	20	147	74	13	7
Maida	-	-	-	-	-	-	83	42	117	59
Maize	-	-	-	-	-	-	45	23	155	78
Vermicelli	-	-	-	-	-	-	178	89	22	11
Ragi	-	-	-	-	-	-	114	57	78	39
Others	-	-	-	-	-	-	-	-	-	-
Pulses										
Red gram dhal	200	100	-	-	-	-	-	-	-	-
Black gram dhal	145	73	27	14	23	12	-	-	5	3
Bengal gram dhal	76	38	54	27	12	6	14	7	44	22
green gram dhal	-	-	-	-	-	-	123	62	56	28
roots and tubers										
Potato	21	11	43	22	132	66	35	18	12	6
Carrot	8	4	-	-	52	26	135	68	32	16
Onion	200	100	-	-	-	-	-	-	-	-
Raddish	-	-	-	-	20	10	180	90	-	-
Beet root	-	-	-	-	18	9	182	91	-	-
green leafy vegetables										
Amaranth	-	-	-	-	-	-	130	65	60	35
Drumstick leaves	-	-	-	-	-	-	96	48	101	51
Others	-	-	-	-	-	-	-	-	-	-
other vegetables										
Brinjal	-	-	3		13	7	165	83	10	5
Beans	-	-	8		11	6	142	71	21	11
Pumpkin	-	-	-	-	-	-	137	69	23	12
Ladies finger	-	-	-	-	24	12	166	83	7	4
Tomato	200	100	-	-	-	-	-	-	-	-
Others	-	-	-	-	-	-	-	-	-	-

Fruits										
Guava	-	-	-	-	-	-	86	43	98	49
Papaya	-	-	-	-	-	-	34	17	109	55
Apple	38	19	-	-	44	22	56	28	76	38
Orange	12	6	-	-	9	4.5	43	22	64	32
Pomogranate	21	11			4	2	65	33	92	46
Seethapal	-	-	-	-	-	-	-	-	78	39
Musambi	54	27	-	-	-	-	34	17	87	44
Amla	61	31	-	-	-	-	76	38	54	27
Others	-	-	-	-	-	-	-	-	-	-
fleshy foods										
Mutton	-	-					59	29	97	49
Fish(fresh)	-	-	12		34	17	85	43	23	12
Fish(dry)	-	-	-	-	-	-	14	7	112	56
Chicken	-	-	-	-	19	10	78	39	32	16
Egg	31		-	-	11	6	102	51	16	8
milk and milk products										
Milk	200	100	-	-	-	-	-	-	-	-
Curd	103	52	-	-	54	27	-	-	36	18
Butter milk	24	12	-	-	-	-	103	52	-	-
Ghee	18	9	-	-	-	-	-	-	180	90
Others	-	-	-	-	-	-	-	-	-	-
sugar and Jaggery										
Sugar	200	100	-	-	-	-	-	-	-	-
Jaggery	-	-	-	-	-	-	36	18	164	82
processed foods										
Pickles	25	13	-	-	-	-	-	-	175	88
Papads	-	-	-	-	-	-	121	61	50	25
Sweets	28	14	-	-	32	16	40	20	102	51
Noodles			-	-	-	-	82	41	112	56
Ready to eat chappathi	-	-	-	-	-	-	-	-	200	100

Cereal grain provides more energy and they are rich source of vitamins, minerals, carbohydrates, fats and protein. The cereals consumption was 100 percent by the girls and they consumed rice every day, followed by this 40 percent and 74 percent consuming wheat twice and once a week respectively. With regard to Ragi consumption 57 percent girls consumed it as Ragidosa or Ragi vermicelli. Maize was consumed by 78 percent occasionally as sweet corn in different flavours. Vermicelli was consumed by 89 percent once in a week.

With regard to pulse consumption red gram dhal and Black gram dhal was consumed more frequently. Since red gram dhal was used for

sambarpreparation, followed by black gram dhal, green gram dhal which was consumed weekly once. Bengal gram dhal was used by 38 percent and seven percent of the girls daily and weekly once. Green gram dhal was consumed by 62 percent and 28 percent weekly once and occasionally.

Only very few girls consumed vegetables, roots and tubers and leafy vegetables on all days other than tomatoes and onions. Potato was consumed by 11 percent and 22 percent every day and thrice a week, followed by this 66 percent and 18 percent consuming potato twice and once a week. With regard to carrot consumption four percent and 26 percent girls consumed daily and twice a week. 68 percent and 16 percent of them consumed carrot once in a week and only occasionally.

Green leafy vegetables were consumed weekly once and occasionally. 65 percent and 35 percent girls consumed amaranth once a week and occasionally. Drumstick leaves was consumed by 48 percent and 51 percent once in a week and occasionally.

All the selected subjects consumed fruits like guava, papaya, apple, orange, pomegranate, seethapal, musambi and amla weekly once and only occasionally. Apple was consumed daily, weekly once, twice a week and occasionally by 19, 28, 21.5 percent and 38 percent respectively. With regard to consumption of orange 11, four, two and 46 percent of girls consumed daily, weekly once, twice a week and occasionally. 39 percent of the adolescents consumed seethapal occasionally. 31 percent of girls consumedamla daily.

Most of the girls consumed fleshy foods weekly once. Mutton was consumed by 29 percent and 49 percent once a week and occasionally. Fresh fish was consumed by 43 percent once a week, followed by this seven percent and 56 percent consuming dry fish weekly once and occasionally. With regard to consumption of chicken 10 percent and 39 percent consumed twice a week and once a week.Egg was consumed by 16 percent and six percent daily and twice a week, and 51 percent of girls consumed egg once a week.

All the girls consumed milk in one form or other daily. Milk is added to either tea or coffee or they drink milk at least during bed time. 52 percent, 27 percent and 18 percent of them consumed curd daily, twice a week and occasionally. Buttermilk was consumed by 12 percent and 52 percent daily and once a week. Ghee was used by 90 percent of the girls occasionally.

All the selected subjects consumed sugar and jaggery everyday along with tea and coffee as these beverages was consumed every day. Majority of them consumed processed foods occasionally. 13 percent of girls enjoyed eating pickles daily, 88 percent of them consumed pickles occasionally. Papads was also used by 61 percent of girls weekly once. Consumption of sweets and noodles was by 51 percent and 56 percent of girls occasionally.

5. Food and Nutrient intake of the selected subjects

a. Mean food intake by the selected college going girls

Themean food intakes of the selected subjects are presented in XX and Figure 3.

TABLE XX

MEAN FOOD INTAKE OF THE SELECTED COLLEGE GOING GIRLS

Food groups	RDAICMR (2010)(g)	Actual food intake	% of RDA Excess/Deficit
Cereals	330	375	+13.6
Pulses	60	80.3	+34.2
Green leafy vegetables	100	103	+3
Roots and tubers	100	138.6	+38.6
Other vegetables	200	142.5	-29
Fruits	100	60.8	- 39.2
Milk and milk products	500	260	- 48
Fats and oils	40	51	+27.5
Sugar and jaggery	20	27.6	+38

*ICMR (2010) “Dietary guideline for Indian’s”-National Institute of Nutrition

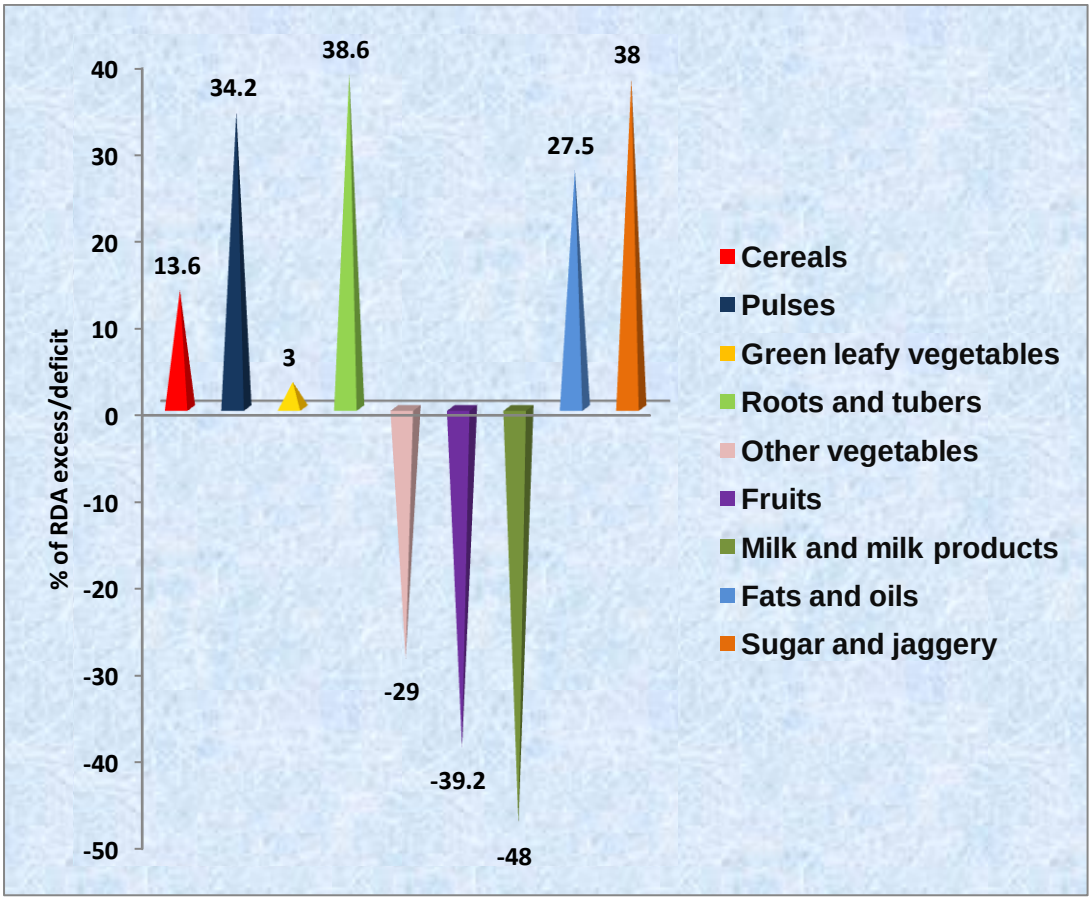

FIGURE 3

MEAN FOOD INTAKE BY THE SELECTED COLLEGE GOING GIRLS

With regard to the consumption of foods and food groups, cereals, pulses, roots and tubers, fats and oils were found to be excess in amount than the recommended dietary allowances given by Indian Council of Medical Research (2010). The intake of roots and tubers and sugar and jaggery was maximum with an excess of 38.6 percent and 38 percent, followed by pulses (34.2 percent) and fats and oils (27.5 percent) than cereals (13.6 percent). The intake of milk and milk products was very much deficient (i.e.) 48 percent, followed by fruits (39.2 percent) and vegetables (29 percent). This data reveals the faulty dietary habits of the young students with deficient intake of the essential foods that provide micro nutrients which prevent anemia and other adolescent problems.

b. Mean nutrient intake by the selected subjects

The nutrient consumption of the selected college going girls in comparison with ICMR (2010) recommended allowances are presented and discussed in the Table XXI and Figure 4.

TABLE XXI

MEAN NUTRIENT INTAKE OF THE SELECTED SUBJECTS

(N=20)

Nutrients	RDA(2010)	Actual intake	Percent deficit/excess
Energy (kcal)	2440	2913	+19.4
Protein(gm)	55.5	79.8	+43.7
Fat(gm)	35	54.8	+56.5
Calcium(mg)	800	692	-13.5
Iron(mg)	26	12.9	-50.6
Vitamin A(mcg)	4800	2673	- 44
Vitamin C(mg)	40	32	-20
Thiamin (mg)	1.0	1.21	+21
Riboflavin (mg)	1.2	1.43	+23
Niacin (mg)	14	16.3	+16.5
Vitamin B6(mg)	2.0	2.1	+5

*ICMR (2010) “Dietary guideline for Indian’s”-National Institute of Nutrition

The food intake of the selected subjects reflects on the nutrient intake also. Here again except for the macronutrients,the micronutrients like calcium iron and vitamin A were deficient. The intake of energy was excess by about +19.4 percent. Protein intake was excessby about+43.9 percent compared to ICMR allowances. Fat intake was excess by about 56.5 percent. The intake of all the micronutrients were very less since the consumption of green leafy vegetables, other vegetables and fruits where not in adequate quantity, hence calcium, iron, vitamin A and vitamin C was deficit by 13.5, 50.6, 44and 20 percent respectively.

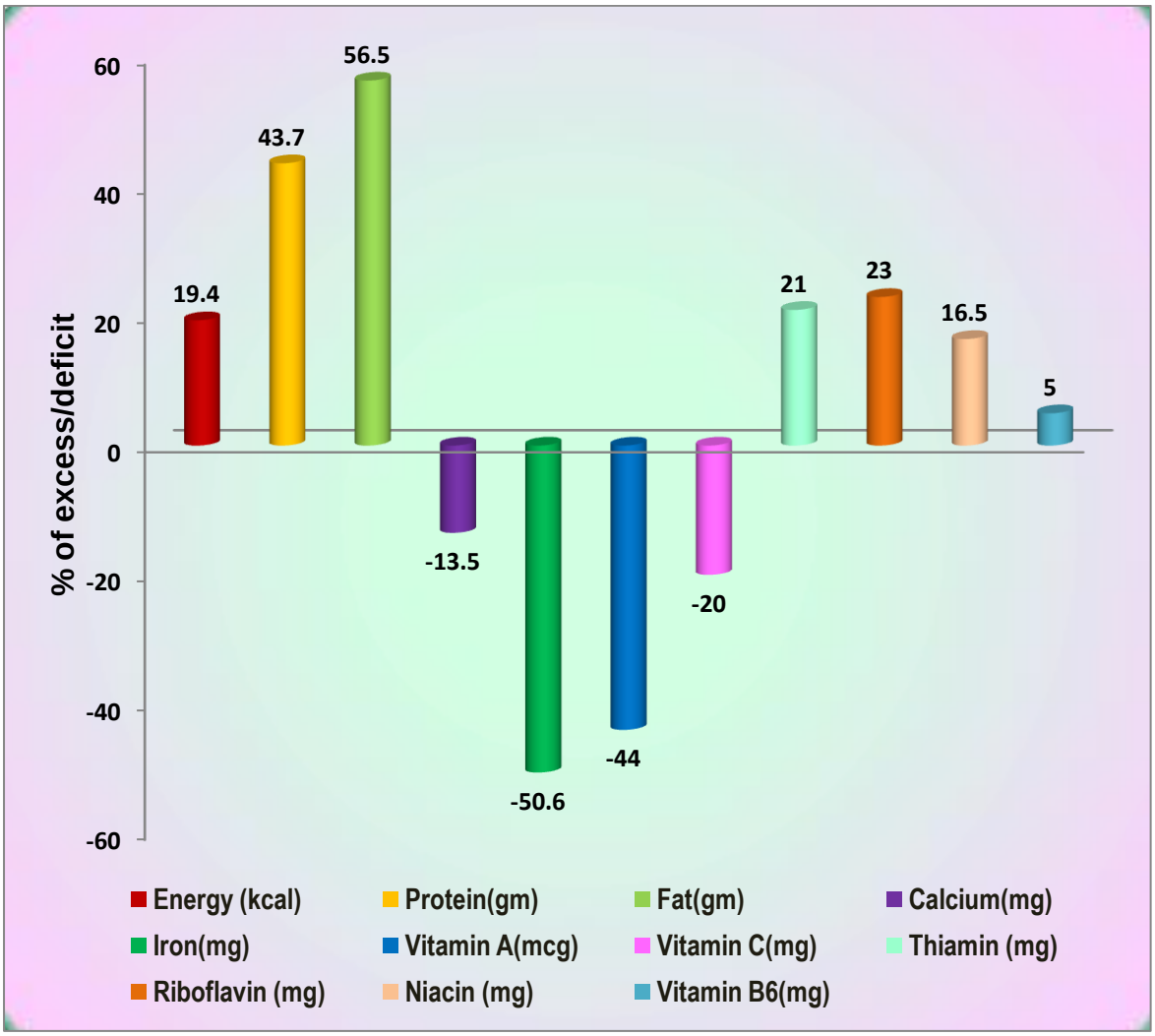

FIGURE 4

NUTRIENT INTAKE OF SELECTED SUBJECTS

D. ASSESSMENT OF NUTRITIONAL KNOWLEDGE OF COLLEGE GOING GIRLS

Assessment of nutritional knowledge of college going girls is presented in Table XXII and Figure 5.

TABLE XXII

ASSESSMENT OF NUTRITIONAL KNOWLEDGE OF COLLEGE GOING GIRLS

Nutritional knowledgeMarks	Before education		After education	
	Number	Percent	Number	Percent
Low (0 -9 marks	56	28	12	6
Middle(10-19 marks)	108	54	62	31
High (20-28 marks)	36	18	126	63
Total	**200**	**100**	**200**	**100**

According to Contento (2011), the role of nutrition education is to target audience with new information about nutrition, with the assumption that this information will lead to changes in knowledge, which in turn will result in improved dietary behaviour or practices.

All the selected girlsknowledge was assessed before education and also after education based on scores. Before imparting education 54 percent, 28 percent and 18 percent scored marks in the level of middle, low and high respectively. After education the percentage of the girls who scored high marks was increased to 63 percent. While the girls (28 percent) who scored less marks was decreased to 6 percent. The individual scores obtained for each question is presented in Appendix VI.

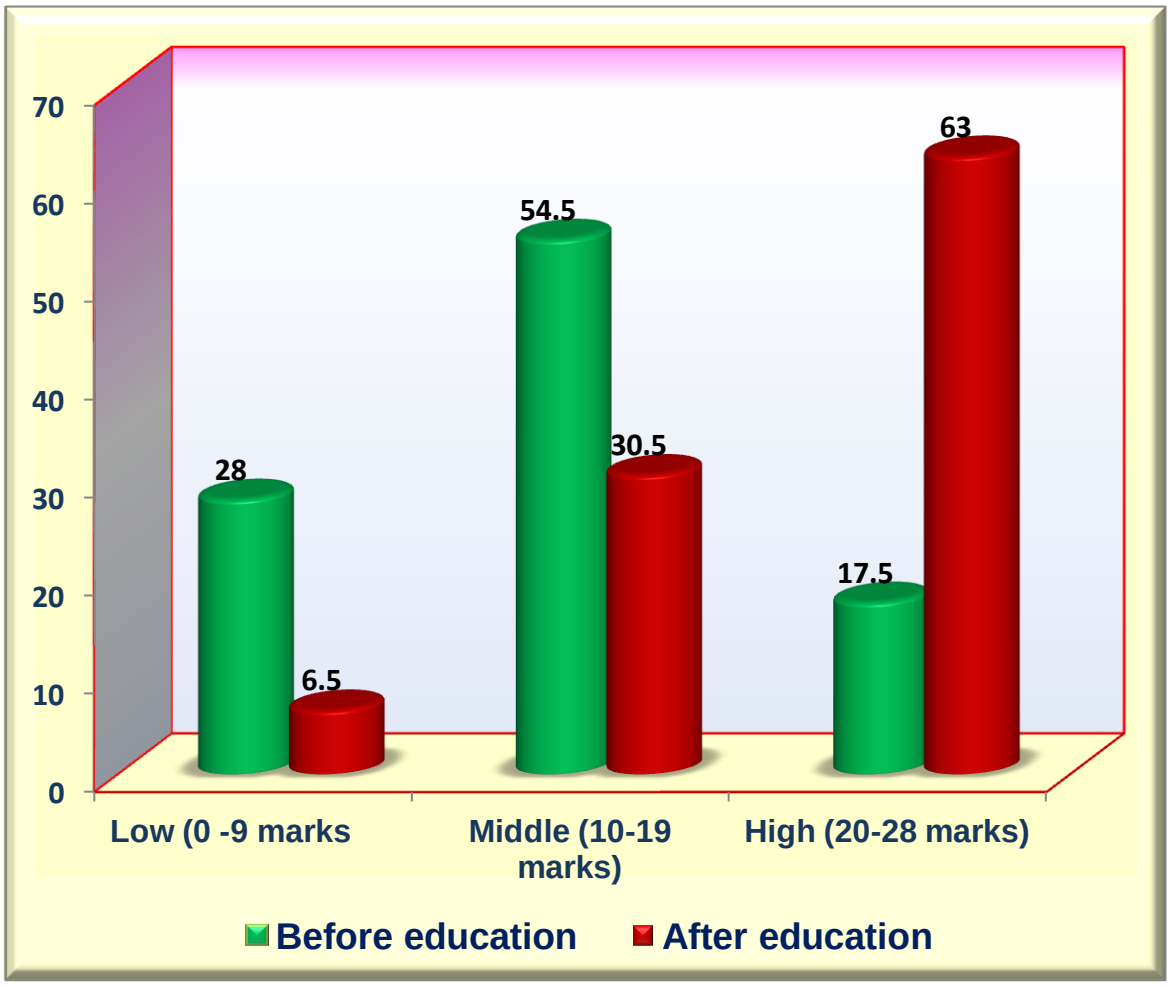

FIGURE 5

ASSESSMENT OF NUTRITIONAL KNOWLEDGE OF COLLEGEGOING GIRLS

V SUMMARY AND CONCLUSION

The title entitled **"Assessment of Nutritional Knowledge and Food Consumption Pattern of College Going Girls"** is summarized as follows.

Adolescence is a time of many transitions for the children in terms of physical growth, psychological development and emotional maturity. This phase is characterized by exceptionally rapid rate of growth.Nutrition during adolescence is one of the vital aspects as adolescence comprises the second and last growth spurt period and adolescents are susceptible to develop faulty eating behaviour leading to malnutrition.

Nutrition education is an integral way to impart knowledge to the public. Nutrition education plays an important role in developing health and nutrition for a better living. Nutrition education as one of the important practical aspects of nutrition knowledge, play an important role in raising public awareness and ultimately health of society.

A total of 200 adolescent girls were selected from various colleges in Coimbatore city. An interview schedule was formulated and data regarding socio economic background, dietary pattern and consumption of foods were collected from the selected college going girls. The socio economic status was evaluated using an interview schedule. Anthropometric parameters namely height, weight, waist circumference and hip circumference were determined using standard procedures, from which indices such as BMI and Waist Hip Ratio were calculated.

Nutrition education was given regarding proper nutrition and health for college going girls and impact was recorded through knowledge questionnaire.

Salient findings of the study:

The salient findings of the study are given below;

- Among the 200 girls selected for the study, 11 percent belonged to the age of 17 years, 33 percent in the age of 18 years, 23 percent in the age of 19 years, 16 and 17 percent in the age group of 20 and 21 years respectively.

- Majority (88 percent) of the college going girls belonged to nuclear families and the remaining 11 percent only were from joint families.
- Among the 200 girls, majority (57 percent) belonged to the families consisting of two to four members, 34 percent belonged to the families consisting of four to six members, followed by 9 percent belonged to the families consisting of above six members.
- Out of the selected girls 75 percent of them were in their undergraduate course, while 25 percent of the girls were doing their post graduation studies.63 percent of the girls live in urban area, while 37 percent only come for education from rural area.
- Out of the selected girls five percent of them belonged to the family with an income of less than Rs.5000 per month, while 44 percent girls family had an income of Rs. 5000 -10,000, while 27 percent and 24 percent belonged to families with an total income of `10,000-20,000 and above `20,000 respectively.
- Six percent of the girls were less than 145 cm of height. Eleven percent of selected subjects were between146-150 cm of height.
- With regard to weight, 9 percent of the girls were underweight and their body weight was less than 40 kg. While 38 percent of girls were in the range of 41-50 kg, 35 percent of the girl's body weight was in the range of 51-60 kg, 14 percent were in the weight range of 61-70 kg and four percent weighed more than 70 kg.
- 51 percent girls BMI was also within the normal range, 23 percent of the girls had a BMI of less than 18.5 and they were underweight. The remaining students (i.e.) 15 percent and 11 percent had BMI of range of 23.0-24.9 and greater than 25 respectively and they were categorized as overweight and obese.
- Sixty six percent of the girls had waist hip ratio values within the low risk range i.e. (0.81-0.85) and only one percent of them had WHR moderate risk, 33 percent of them high risk range (i.e.) >0.8.

- Twenty four percent of them consumed vegetarian food and 70 percent of them preferred non vegetarian foods in their diets.
- Seventy seven percent of girls prefer to consume soft drinks and 23 percent girls did not consume any type of soft drinks.
- The cold beverages consumption pattern revealed that around 50 percent of the students preferred to drink fresh fruit juice depending upon the season, availability and cost. Fresh fruit juice was followed by consumption of bottled drinks like fanta, mazza, slice, soda, coca cola and seven up with 24, 29, 27, 14, 10 and 29 percent of girls respectively.
- Thirty eight percent of the girls did not consume milk and 62 percent had the habit of drinking milk. Out of the girls consuming milk 73 percent consumed only 200 ml, while 25 percent and twopercent consumed 400 ml and 600 ml of milk respectively.
- About 30 percent of girls skip their meals and 30 percent girls did not skip any meals.
- Out of the girls who skipped meals about 57 percent of the girls, was skipping breakfast, 21 percent of them skipping lunch, and 22 percent were skipping dinner.
- About 28 percent of the girls consume fast foods weekly once, 16 percent consumed twice a week, and 56 percent of them consumed the fast foods rarely.
- Panipoori was the most preferred item among 68 percent of the girls, followed by pizza, burger, sandwich, chat and subway items with 22, 15, 12, 26 and 12 percent of girls respectively.
- About 85 percent of girls consumed one or other bakery foods everyday and 15 percent did not consume bakery foods regularly.
- Food consumption pattern revealed that 100 percent girls consumed rice regularly every day. With regard to pulse consumption red gram dhal was consumed by all every day.

- The intake of vegetables, roots and tubers and leafy vegetables was less. None of them consumed any of the vegetables every day other than tomatoes.
- All the selected subjects consumed fruits like guava, papaya, apple, orange, pomegranate, seethapal, musambi and amla weekly once and occasionally.
- All the selected subjects consumed sugar and jaggery everyday along with tea and coffee as these beverages were consumed every day. Majority of them consumed processed foods occasionally.
- The intake of foods in comparison with RDA revealed that roots and tubers and sugar and jaggery was maximum with an excess of 38.6 percent and 38 percent, followed by pulses (34.2 percent) and fats and oils (27.5percent) and cereals (13.6 percent). The intake of milk and milk products was very much deficient (i.e.)48 percent, followed by fruits (39.2percent) and vegetables (29percent).
- The intake of energy was excess by about +19.4 percent. Protein intake was excess by about +43.9 percent compared to ICMR allowances. Fat intake was excess by about 56.5 percent. The intake of all the micronutrients were very less since the consumption of green leafy vegetables, other vegetables and fruits where not in a adequate quantity, hence calcium, iron, vitamin A and vitamin C was deficit by 13.5, 50.6, 44.3 and 20 percent respectively.
- Before imparting education 54 percent, 28 percent and 18 percent scored marks in the level of middle, low and high respectively. After education the percentage of the girls who scored high marks was increased to 63 percent. While the girls (28 percent) who scored less marks was decreased to six percent.

CONCLUSION

Nutrition education had an impact on nutritional knowledge of the target group.The salient findings of the study revealed that in the present situation dietary habits of the college going girls, have changed and they have developed the habit of skipping meals due to one or other reason, either due to time taken for travelling or due to their studies or dislike for the food provided in the hostel or home. The faulty dietary habits of the young students with deficient intake of the essential foods that provide micro nutrients which prevent anemia and other adolescent problemsis on the rise. Impact of nutrition education program is helps to improve nutritional knowledge and food intake pattern of the college going girls.

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APPENDIX I

INTERVIEW SCHEDULE ON FOOD CONSUMPTION PATTERN OFCOLLEGE GOING GIRLS

I. Socio-Economic Background

1. Name of the student :

2. Age :

3. Type of family : Nuclear ☐ Joint ☐ Extended ☐

4. Number of members in the family:

5. Address :

6. Place of residence :urban ☐ rural ☐

7. Educational level :

8. Residing in, Hostel ☐ days scholar ☐

9. Blood group :

10. Religion : Hindu ☐ Christian ☐ Muslim ☐

11. Income of family per month

- Below Rs.5000
- Rs. 5000-10000
- Rs. 10000-20000
- Above Rs.20000

II. Anthropometric measurements:

12. Height (cm) :

13. Weight in (kg) :

14. Body mass index :

15. Waist measurements in (cm) :

16. Hip measurements in (cm) :

17. Waist hip ratio :

III. Dietary Pattern

18. Dietary habit : ☐ Veg ☐ Non veg ☐ ova veg

19. Daily meal pattern

a) 2 meals/ day
b) 3 meals/ day
c) 4meals/ day

20. Do you drink Milk/ Coffee/ Tea : ☐yes ☐No

If yes,

Do you drink more than 4 cups of tea / coffee per day? ☐ Yes ☐ No

21. Do you consume soft drinks? ☐ Yes ☐ No

If yes,

a) Daily
b) Twice a week
c) Once a week
d) 3-4 times a week

22. Which bottled drink you prefer most?

- Fruit juice ☐ Soda ☐
- Fanta ☐ Coca cola ☐
- MaazaLimca ☐ ☐
- Slice ☐ 7 up ☐

23. Do you consume milk daily? ☐ Yes ☐ No

If yes, how many cups of milk do you consume?

(A) 200 ml (b) 400 ml (c) 600 ml (d) more

24. Do you have the habit of skipping meals? ☐ Yes ☐ No ☐ Rarely

If yes, which meals do you skip?

(a) Breakfast (b) lunch (c) Dinner

25. How often do you consume fast foods outside?

(a) Daily (b) once a week (c) Twice a week (d) rarely

26. What are the fast foods you eat?

- Pizza ☐ Burger ☐
- Panipoori ☐ Chat ☐
- Sandwich ☐ Subway items ☐

27. Do you consume bakery foods? ☐ Yes ☐ No

28. What are the bakery foods you eat?

- Cake ☐ Coconut bun ☐
- Puff ☐ Biscuit ☐
- Bread Samosa ☐ ☐
- Vegetable cutlet ☐

V. Food frequency pattern:

	Foods	Daily	Weekly	Twice a	Thrice a	Occasionally

			Once	**week**	**week**	
I	CEREALS					
	Boiled rice					
	Wheat					
	Maida					
	Maize					
	Vermicelli					
	Ragi					
	Others					
II	PULSES					
	Red gram dhal					
	Black gram dhal					
	Bengal gram dhal					
	green gram dhal					
III	ROOTS AND TUBERS					
	Potato					
	Carrot					
	Onion					
	Raddish					
	Beet root					
	Others					
IV	GREEN LEAFY VEGETABLES					
	Amaranth					
	Drumstick leaves					
	Others					
V	OTHER VEGETABLES					
	Brinjal					
	Beans					

	Pumpkin					
	Ladies finger					
	Tomato					
	Others					
VI	FRUITS					
	Guava					
	Papaya					
	Apple					
	Orange					
	Pomogranate					
	Seethapal					
	Musambi					
	Amla					
	Others					
VII	FLESHY FOODS					
	Mutton					
	Fish(fresh)					
	Fish(dry)					
	Chicken					
	Egg					
	Others					
VIII	MILK&MILK PRODUCTS					
	Milk					
	Curd					
	Buttermilk					
	Ghee					
	Others					
IX	SUGAR&JAGGERY					
X	PROCESSED FOODS					
	Pickles					

	Papads					
	Sweets					
	Noodles					
	Ready to eat chappathi					

3 Days Recall Method

	I DAY	II DAY	III DAY
EARLY MORNING			
BREAKFAST			
LUNCH			
EVENING			
DINNER			

APPENDIX II

ETHICAL CLEARANCE

INSTITUTIONAL HUMAN ETHICS COMMITTEE

Avinashilingam
Institute for Home Science and Higher Education for Women
University
(Estd. u/s 3 of UGC Act 1956)

2nd January 2014

To
R. Priyadharshini,
Department of Food Science and Nutrition ,
Avinashilingam Institute for Home Science and
Higher Education for Women,
Coimbatore – 641 043.

Dear Madam,

Ref : Your proposal AUW.IHEC. 2013:26 entitled "Assessment of nutritional knowledge and food consumption pattern of college going girls" submitted for approval of the IHEC on 6th December 2013

The Institutional Human Ethics Committee of our University hereby grants approval to your research proposal AUW.IHEC. 2013:26 entitled "Assessment of nutritional knowledge and food consumption pattern of college going girls" submitted by you. The Approval number for the same is AUW/IHEC-13-14/XMT-03.

We wish you all the best in your research endeavours.

Regards,
2/1/14
Dr.P.R.Padma
Member Secretary

Institutional Human Ethics Committee

APPENDIX III

INTERVIEW SCHEDULE ON ASSESSMENT OF NUTRITIONAL KNOWLEDGE OF COLLEGE GOING GIRLS

1. What are the functions of food?

(a) Growth (b) fight infection (c) provide energy (d) all the above

2. A diet that contains all the nutrients in correct amount is called a _____

(a) High calorie diet (b) balance diet (c) normal diet (d) special diet

3. What is nutritional deficiency?

(a) Loss of vision (b) bone malformation (c) skin lesion (d) deficiency of nutrients

4. Cereal is rich in_____

(a) Protein (b) fat (c) vitamins (d) carbohydrates

5. Pulses are rich in _____

(a) Protein (b) fat (c) vitamins (d) carbohydrates

6. Vitamin c rich food is _____

(a) Lemon (b) apple (c) pomegranate (d) pine apple

7. Milk is rich in _____ nutrient

(a) Zinc (b) calcium (c) phosphorus (d)selenium

8. Vitamin a rich foods are _____

(a) Beetroot (b) carrot (c) drumstick (d) all the above

9. Foods that promote hair growth _____

(a) Cereals (b)pulses (c) green leafy vegetables (d)other vegetables

10. Foods rich in iron _____

(a) Rice flakes (b) goat liver (c) dates (d) all the above

11. _____ Is a good source vitamin D

(a) Fruits (b) vegetables (c) sun light (d) milk

12. Which nutrient helps to absorb iron?

(a) vitamin A (b)vitamin D (c)vitamin c (d)vitamin B

13. Which nutrient helps to absorb calcium?

(a) vitamin A (b)vitamin D (c)vitamin c (d)vitamin B

14.Which food will you prefer to eat when you feel tired?

(a) Fruit juice (b)water (c)soft drinks (d)milk

15. If you happened to know that you are having problem in eye site. Which foods will you prefer?

(a) Vitamin A rich foods (b) vitamin D foods(c)vitamin c foods (d)iron rich foods

16. What is the significance of eating greens?

(a) for good eye site and prevention of disease (b) body building

(c)energy yielding (d)to reduce weight

17. What is the common deficiency disease observed in women?

(a) Menopause (b) anemia (c)osteomalasia (d) osteoporosis

18. Foods that help in milk secretion _____

(a) Fish (b) garlic (c) fenugreek (d) all the above

19. Ragi is a good source of _____

(a) Magnesium (b) phosphorus (c) calcium (d) zinc

20. High protein foods are _____

(a) Green leafy vegetables (b) vegetables (c) fruits (d) egg

21. Insufficient amount of water leads to _____

(a) Hydration (b) dehydration (c) weight gain (d) weight loss

22. Losses of calcium in bone lead to_____

(a) Osteoporosis (b) anemia (c) goiter (d) PEM

23. the most important functions of vitamin is _____

(a) Provide energy (b) growth (c) maintain water balance

(d) protect and maintain body functions

24. Identify fat soluble vitamin _____

(a)vitamin B1 (b)vitamin B2 (c)vitamin D (d)vitamin c

25. Vitamin A is soluble in _____

(a) Fat (b) water (c) acid (d) salt solution

26. Which nutritional deficiency causes Goiter?

(a) Iodine (b) phosphorus (c) calcium (d) zinc

27. The prevalence of vitamin A deficiency is high among _____

(a) Children (b) Aged (c) adolescents (d) Men

28. Carotene present in plant source is converted to which vitamin in our body?

(a) vitamin A (b)vitamin D (c)vitamin c (d)vitamin

APPENDIX IV

PAMPHLET FOR NUTRITION EDUCATION

NUTRIENTS

Nutrients are organic and inorganic Complexes contained in food. A nutrient is a source of nourishment, an ingredient in a food.

Food is defined as anything solid or liquid which when swallowed, digested and assimilated nourishes the body.

The main nutrients in foods are,

- Protein
- Carbohydrate
- Fat
- Vitamins
- Minerals
- Fiber
- Water

Nutrients are divided into,

I. Micronutrients
II. Macronutrients

* **MACRONUTRIENTS:**

These are nutrients required large quantities. Macronutrients are,

- Protein
- Carbohydrate
- Fat

* **MICRONUTRIENTS**

These are nutrients required small quantities. Micronutrients are,

VITAMINS	MINERALS
VITAMIN A	IRON
B COMPLEX VITAMINS	ZINC
VITAMIN C	SELENIUM
VITAMIN D	CALCIUM
VITAMIN E	PHOSPHORUS
VITAMIN K	SODIUM

BALANCED DIET:

A BALANCED DIET is one which contains different types of food in such quantities and proportions so that need calories, proteins, fats, vitamins, minerals, are adequately met.

S. NO	FOODS	NUTRIENTS
1	CEREALS, GRAINS AND PRODUCTS: Rice, wheat, ragi, bajra, jowar	Carbohy-drate, Energy, Protein
2	PULSES AND LEGUMES: Bengal gram Black gram Horse gram Cow pea, Peas	Carbohy-drate, Energy, Protein
3	MILK AND MEAT PRODUCTS: Milk, curd, Cheese, skimmed milk Chicken, Liv-er, fish. Meat, egg	Calcium, Energy, Protein
4.	**FRUITS AND VEGETABLES Mango, Guava, Tomato, Papaya, Orange, Sweet lime**	**Vitamin c, Vitamin A, fiber**
5.	GREEN LEAFY VEGETABLES: Amaranth, Spinach, Drumstick leaves	**Vitamin A, fiber, folic acid, calcium**
6.	OTHER VEGETABLES: Carrot, Onion, Brinjal, Ladies finger, Beans, Cauliflower, drumstick	**Vitamin c, Vitamin A, fiber**
7.	FATS AND SUGARS: FATS: Butter, ghee, cooking oils Sugar and jaggery	Energy, jaggery has got iron

FOOD PYRAMID:

A **food guide pyramid** is a pyramid shaped guide of healthy foods divided into sections to show the recommend-ed intake for each food group .

ASSESSMENT OF NUTRITIONAL KNOWLEDGE AND FOOD CONSUMPTION PATTERN OF COLLEGE GOING STUDENTS

NUTRITION EDUCATION FOR ADOLESCENTS

By
R. Priyadharshini

Guided by
Dr. (Mrs).A.Thilakavathy
Assistant professor
Food science and nutrition

Avinashilingam Institute For Home science And Higher Education For women
Coimbatore
2014

APPENDIX V

ANTROPOMETRIC VALUES OF SELECTED SUBJECTS

S.No	Height	Weight	Body mass index	Waist hip ratio
1.	157	60	24.3	0.78
2.	162	47	17.9	0.70
3.	150	47	20.9	0.75
4.	163	47	17.7	0.81
5.	145	57	27.1	0.73
6.	159	80	31.6	0.72
7.	158	55	22.0	0.77
8.	158	42	16.8	0.70
9.	155	45	18.7	0.74
10.	157	52	21.1	0.71
11.	163	50	18.8	0.74
12.	155	54	22.5	0.72
13.	160	45	17.6	0.72
14.	152	48	20.8	0.67
15.	149	41	18.5	0.72
16.	157	49	19.9	0.67
17.	153	57	24.3	0.81
18.	160	56	21.9	0.76
19.	155	39	16.2	0.69
20.	154	43	18.1	0.72
21.	154	47	19.8	0.65
22.	153	60	25.6	0.77
23.	171	55	18.8	0.69
24.	167	52	18.6	0.74
25.	156	65	26.7	0.75

26.	146	62	29.1	0.91
27.	154	43	18.1	0.53
28.	154	67	28.3	0.80
29.	156	65	26.7	0.90
30.	152	47	20.3	0.74
31.	156	60	24.7	0.69
32.	137	61	32.5	0.78
33.	158	85	34.0	0.80
34.	159	63	24.9	0.91
35.	155	49	20.4	0.92
36.	149	49	22.1	0.86
37.	149	55	24.8	0.98
38.	157	60	24.3	0.81
39.	170	54	18.7	0.91
40.	165	62	22.8	0.89
41.	161	43.5	16.8	0.84
42.	144	42	20.3	0.89
43.	167	50	17.9	0.88
44.	158	55	22.0	0.94
45.	158	46	18.4	0.90
46.	156.5	55.5	22.7	0.88
47.	172	72	24.3	0.76
48.	163	54	20.3	0.89
49.	154	65	27.4	0.84
50.	155	36	15.0	0.83
51.	150	43	19.1	0.85
52.	165	55	20.2	0.86
53.	158	48	19.2	0.80
54.	152	54	23.4	0.84
55.	161	41	15.8	0.82
56.	162	50	19.1	0.79
57.	159	41	16.2	0.89
58.	161	55	21.2	0.89

59.	156	51.5	21.2	0.92
60.	163	43	16.2	0.73
61.	160	61	23.8	0.83
62.	158	85	34.0	1.01
63.	170.5	67	23.0	0.73
64.	161	67.1	25.9	0.87
65.	151	55	24.1	0.77
67.	149	40	18.0	0.91
68.	162	48	18.3	0.95
69.	163	60	22.6	0.95
70.	155	41	17.1	0.75
71.	160.5	45	17.5	0.88
72.	156	65	26.7	0.95
73.	157	44	17.9	0.85
74.	159	85	33.6	0.93
75.	160.5	66	25.6	0.83
76.	152.5	45	19.3	0.89
77.	152	40	17.3	0.95
78	160	55	21.5	0.91
79.	158	47	18.8	0.89
80.	152	46.5	20.1	0.89
81.	152	46.5	20.1	0.87
82.	159.5	56	22.0	0.86
83.	161	58.5	22.6	0.85
84.	150	48	21.3	0.89
85.	159	45	17.8	0.89
86.	157	51	20.7	0.93
87.	162.5	57	21.6	0.91
88.	167	58	20.8	0.81
89.	160	45	17.6	0.83
90.	171	67	22.9	0.84
91.	159	72	28.5	0.88
92.	163.5	51	19.1	0.76

93.	152	58.5	25.3	0.84
94.	162.5	44	16.7	0.94
95.	160	46	18.0	0.92
96.	149	39	17.6	0.85
97.	163	64	24.1	1.03
98.	158	45	18.0	0.91
99.	168	48	17.0	0.94
100.	153	71	30.3	0.88
101.	154	48	20.2	0.81
102.	157.5	66	26.6	0.69
103.	162	46	17.5	0.71
104.	159	55	21.8	0.87
105.	151	49	21.5	0.96
106.	152.5	43	18.5	0.92
107.	171	61	20.9	0.91
108.	167	47	16.9	0.89
109.	150	39	17.3	0.90
110.	165	77	28.3	0.75
111.	159	60	23.7	0.76
112.	157	41.5	16.8	0.69
113.	153	43	18.4	0.74
114.	161.5	46	17.6	0.80
115.	155	36	15.0	0.70
116.	147	37	17.1	0.80
117.	151	37.5	16.4	0.78
118.	145	50	23.8	0.81
119.	158	45	18.0	0.81
120.	161	38.5	14.9	0.78
121.	156	92	37.8	0.76
122.	155	46	19.1	0.72
123.	165	50	18.4	0.80
124.	157	40	16.2	0.74
125.	159	46	18.2	0.88

126.	157	47	19.1	0.84
127.	150	45	20.0	0.80
128.	160	42	16.4	0.85
129.	156	60	24.7	0.78
130.	145	35	16.6	0.79
131.	169	59	20.7	0.77
132.	142	56	27.8	0.81
133.	149	42	18.9	0.71
134.	154	46	19.4	0.72
135.	167	47.5	17.0	0.75
136.	160	51	19.9	0.89
137.	158	57	22.8	0.67
138.	148	43.5	19.9	0.78
139.	148	43.5	19.9	0.79
140.	151	48	21.1	0.75
141.	149	41	18.5	0.80
142.	160	46	18.0	0.80
143.	161	50	19.3	0.84
144.	155	50	20.8	0.79
145.	153	45	19.2	0.75
146.	154	38	16.0	0.82
147.	157	42	17.0	0.80
148.	153	45.5	19.4	0.84
149.	163	63	23.7	0.74
150.	153	62.5	26.7	0.76
151.	159	57	22.5	0.86
152.	152	55	23.8	0.90
153.	157	61	24.7	0.80
154.	162	46	17.5	0.81
155.	148	36	16.4	0.81
156.	154	69	29.1	0.67
157.	134	45	25.1	0.67
158.	153	55.5	23.7	0.71

159.	156.8	60	24.4	0.78
160.	143	39	19.1	0.74
161.	165	62	22.8	0.78
162.	155	46	19.1	0.74
163.	154	65	27.4	0.83
164.	143	41	20.0	0.66
165.	154	32	13.5	0.72
166.	166	54	19.6	0.74
167.	157	32	13.0	0.76
168.	143	23	11.2	0.71
169.	169	65	22.8	0.88
170.	167	62.5	22.4	0.75
171.	165	44	16.2	0.78
172.	159	54	21.4	0.67
173.	165	54	19.8	0.79
174.	153	45	19.2	0.70
175.	154	48	20.2	0.91
176.	155	39	16.2	0.69
177.	161	55	21.2	0.66
178.	159	57	22.5	0.85
179.	162	61	23.2	0.88
180.	146	55	25.8	0.84
181.	167	54	19.4	0.85
182.	157	57	23.1	0.68
183.	156	56	23.0	0.67
184.	147	45	20.8	0.69
185.	170	67	23.2	0.75
186.	153	48	20.5	0.66
187.	152	47	20.3	0.70
s188.	149	51	23.0	0.69
189.	154	51	21.5	0.87
190.	158	57	22.8	0.67
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194.	165	67	24.6	0.82
195.	158	59	23.6	0.74
196.	167	56	20.1	0.80
197.	156	51	21.0	0.64
198.	156	49	20.1	0.84
199.	143	39	19.1	0.87
200.	154	50	21.1	0.74

APPENDIX VI

INDIVIDUAL MARKS ON NUTRITION EDUCATION

S.No	Questions	Before education		After education	
		Number	Percent	Number	Percent
1.	functions of food	113	56.5	134	67
2.	A diet that contains all the nutrients in correct amount	67	33.5	87	43.5
3.	nutritional deficiency	65	32.5	102	51
4.	Cereal is rich in	102	51	135	67.5
5.	Pulses are rich in	87	43.5	140	70
6.	Vitamin c rich food	64	32	155	77.5
7.	Milk is rich in nutrient	43	21.5	112	56
8.	vitamin A rich foods are	56	28	152	76
9.	foods that promote hair	12	6	157	78.5
10.	growth	14	7	143	71.5
11.	Foods rich in iron	23	11.5	110	55
12.	Good source vitamin D	45	22.5	102	51
13.	Nutrient helps to absorb	37	18.5	127	63.5
14.	iron	29	14.5	98	49
15.	Nutrient helps to absorb calcium	105	52.5	152	76
16.	food will prefer feel tired	78	39	107	53.7
17.	foods prefer to problem in eye site	40	20	167	83.5
18.	significance of eating	28	14	129	64.5
19.	greens	83	41.5	178	89
20.	common deficiency disease observed in women	17	8.5	92	46
21.	foods that help in milk secretion	55	27.5	150	75

22.	Ragi is a good source	34	17	129	64.5
	High protein foods are				
23.	Insufficient amount of	65	32.5	109	54.5
24.	water leads to	19	9.5	162	81
25.	Losses of calcium in bone				
	lead to	23	11.5	115	57.5
26.	The most important	31	15.5	102	51
27.	functions of vitamin is				
	Identify fat soluble vitamin	36	18	172	86
28.	Vitamin A is soluble in				
	Nutrient deficiency causes	15	7.5	97	48.5
	Goiter				
	The prevalence of				
	vitamin A deficiency is				
	high among				
	Carotene present in plant				
	source is converted to				
	which vitamin in our body				