NUTRITIONAL STATUS AND NUTRITION COGNITION OF ADOLESCENT GIRLS IN THE COASTAL AREA OF THIRUVANANTHAPURAM

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(2009-16-108)

THESIS

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DECLARATION

I hereby declare that this thesis entitled **"Nutritional status and nutrition cognition of adolescent girls in the coastal area of Thiruvananthapuram"** is a bonafide record of research done by me during the course of research and that the thesis has not previously formed the basis for the award of any degree, diploma, fellowship or other similar title, of any other university or society

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LIST OF ABBREVATION

BMI	Body Mass Index
BPL	Below Poverty Level
CED	Chronic Energy Deficiency
dl	Decilitre
FPAI	Family Planning Association of India
g	gram
ICDS	Integrated Child Development Services
ICMR	Indian Council of Medical Research
IUHPE	International Union for Health Promotion and Education
Kg	Kilogram
KSY	Kishori Shakti Yojana
M	Metre
MICS	Multiple Indicator Survey
NFHS	National Family Health Survey
NIN	National Institute of Nutrition
NNAP	National Nutrition Anaemia Programme
NNMB	National Nutrition Monitoring Bureau
NSI	Nutritional Status Index

PHC	Primary Health centre
RCH	Reproductive Child Health
TST	Triceps Skinfold Thickness
USDA	United States Dietetic Association
WHO	World Health Organisation

Dedicated

to

my father and mother

Introduction

1. INTRODUCTION

The term 'adolescence' is derived from the Latin word 'adolescere' which means to grow into maturity (Macmillan, 2000). It is the transitional period from child hood to youth and represents a period of rapid changes in many parameters such as physical growth, sexual development and personality pattern.

Adolescence is a crucial phase of growth since it offers the second and last chance for the catch up growth in the life cycle especially girls. Adolescence is one of the fascinating periods in the human life that mark transition from being a dependent child to independent child. It is the period when manifold changes takes place in the physical structure, psychological and endocrine functioning, pattern of thinking, attitude towards concepts and in their moral standards and values.

Adolescence is a particularly unique period in life because it is a time of intense physical, psychosocial, and cognitive development. At this time they stand at the threshold of adulthood. Because of rapid growth in stature, muscle mass and fat mass during the peak of the adolescent growth spurt, some dietary requirements are as high or higher in adolescents than in other age groups (WHO,2000). Increased nutritional needs at this juncture relate to the fact that adolescents gain up to 50 per cent of their adult weight, more than 20 per cent of their adult height, and 50 per cent of their adult skeletal mass during this period (WHO, 2002).

Adolescent constitute about 115 crore of the world population and they form about 22.80 per cent of Indian population (Indira, 2001) and 8.25 to 8.70 per cent of Kerala population (Chandrika, 2001). In fact they are the pillars of our nation and from the point of view of quality of future generation they are the most important segment of our population.

Adolescent girls plays an important role in determining the health of future population. Adolescence in girls has been recognized as a special period in their life cycle that requires specific and special attention. This is most significant in girls since they are the future mothers. Health and nutritional needs are mostly

ignored. Adolescent girls constitute nearly ten per cent of Indian population (Govt of India, 2001). They form the most crucial segment of our society from the point of view of quality of future generation who are just on the threshold of marriage (Varsha and Rohini, 2007)

However it has been observed that little attention has been paid to adolescents so far, and adolescent nutrition has received inadequate attention in research as well as in programming for adolescent health. If adolescents are well nourished, they can make optimal use of their skills, energies and talents today, and be responsible parents of healthy babies tomorrow. To accomplish such a task, a special focus for overcoming malnutrition in adolescence is needed, in order to break the intergenerational cycle of malnutrition (WHO, 2002)

Safe and successful child bearing depends on most of all on the health and readiness of the mother to be. So special attention should be paid to be health, feeding and education of adolescent girls (FPAI, 1993).More over the onset of menarche which is a complex of growing up is a period of stress among adolescent girls (Sangita,2004). Adolescence is a period of high nutritional risks especially among girls when increased demand for nutrients is often met with poor choices of food, unhealthy eating habits and deficient intake of calories, protein, vitamins and minerals. The wrong food choices made by adolescents negatively influence their growth and development, their future reproductive capacities and health of their children.

The majority of rural and coastal adolescent girls lack knowledge of the nutritional value of different food items. Considering their future roles in maintaining the health and nutrition of their family members, especially their children, female adolescents should be the focus of nutrition interventions aimed at promoting nutrition knowledge and practices (Ahmed, 2000)

Nutrition surveys carried out in India indicated that incidence of dietary inadequacy is higher during adolescence. The surveys also revealed that the adolescent girls of the coastal areas do not adequate access to vital health and nutrition information services. The unhygienic environment and poor housing

facilities in the coastal areas also contribute to the poor nutritional status of this group.

It has been observed that nutritional knowledge of adolescent girls was not good enough and can cause nutritional deficiencies, in generation supposed to be future mother. Here comes the importance of counselling programme. Counselling is an absolute necessity for control and prevention of any deficiency (Esfarjani et al., 2003)

Though a few intervention programmes are being implemented in the state the studies indicate that they have not made much impact on the nutritional status of adolescent in these areas. The high prevalence of malnutrition amongst the adolescent girls in the rural coastal areas might lead to multiple health problems which in turn affect the quality of human resources. Hence the present study was undertaken with the objective of assessing the nutritional status and to enhance the nutrition cognition among adolescent girls of the coastal area in Thiruvananthapuram district through nutrition counselling.

Review of literature

2. REVIEW OF LITERATURE

The literature of the study entitled 'Nutritional status and nutrition cognition of adolescent girls in the coastal area of Thiruvananthapuram' is reviewed under the following headings.

2.1. Adolescence – significance and special characteristics

2.2. Food consumption pattern, dietary habits and nutritional status of adolescent Girls

2.3. Prevalence of malnutrition among adolescent girls

2.4. Studies on adolescent health and nutrition education or counselling

2.1. Adolescence – significance and special characteristics

Adolescence can be defined as transitional period from childhood to youth and represents a period of rapid changes in many parameters such as physical growth, sexual development and personality pattern. It is one of the crucial periods in the life span of an individual where both immediate and long-term effects on behaviour and attitude are important especially for their physical and psychological development. In fact they are the pillars of our nation and from the point of view of quality of future generation they are the most important segment of our population (Brown et al., 2002) (Larson, 2002).

WHO joint statement reports that adolescents comprise 20 per cent of the world's population and that there is increasing global agreement that adolescence is a distinct and important period in a person's life (WHO, 2001).

As on March 2001, adolescents accounted for 22.8 per cent of the population of India. There are around 239 million adolescents in India in the age group of 10- 19 years presently. Over the next two decades the number of adolescents is likely to increase further but their share to population will decrease marginally as per the projections (Planning Commission, 2001).

According to population projection of India for the decade 1996- 2016, the age group 10- 19 years constitutes 21.6 per cent of the total population in Kerala (Gopakumar, 2002).

Adolescence is a transitional stage of physical sex and mental human development generally occurring between puberty and legal adulthood (age of majority) (Elizabeth, 2000).Within all of these perspectives, it is safe to say that adolescence is viewed as a transitional period whose chief purpose is the preparation of children for adult ones.

'Adolescence is the stage which is considered as the most beautiful phase of one's life when there is lots of imagination, aspiration, zeal and potential outburst'. Everything is at its peak and the individual strives to accomplish everything he desires for. However if his desires are unfulfilled, he undergoes severe pain and even trauma which may lead him to negative repercussions. At that time it may become the worst phase of his life (Alpana singh,2010).

Adolescence is the time when an individual undergoes tremendous changes both physically, emotionally and psychologically. A profound and abrupt change is clearly perceptible into the development of the child who is neither too young nor too old. This sudden growth and development in the child is the unique characteristic of adolescence, an age which requires lots of care, affection, guidance, proper monitoring and motivation (Singh, 2010).

Next to infancy adolescence is the most crucial phase of growth since it offers the second and last chance for the catch up growth in the life cycle of girls. It is the only time following infancy when the growth rate is very rapid and an individual acquires 35 per cent of adult weight and 11- 18 per cent of adult height (WHO, 2000).

Jayanthini (2000) has classified the period of adolescence into three stages based on growth characteristics. They are pre- adolescence (10- 11 years), early

adolescence (11- 14 years), mid adolescence (14- 16 years), and late adolescence (17- 20 years).

Adolescence is one of the most challenging periods in human development especially girls as future mothers producing healthy children (Esfarjani et al., 2003).

Varsha and Rohini (2007) considered adolescent girls as the most crucial segment of our society from the point of view of quality of future generation who are just on the threshold of marriage.

Adolescence can be defined biologically, as the physical transition marked by the onset of puberty and the termination of physical growth; cognitively, as changes in the ability to think abstractly and multi- dimensionally; or socially, as a period of preparation for adult ones (Arnett, 2007).

Puberty is a period of several years in which rapid physical growth and psychological changes occur, culminating in sexual maturity. The average onset of puberty is at 10 or 11 for girls and age 12 or 13 for boys.

Every person's individual time table for puberty is influenced primarily by heredity, although environmental factors, such as diet and exercise, also exert some influence. These factors can also contribute to precocious and delayed puberty (Elizabeth ,2001 and Kaplowitz, 2001).

Puberty is the stage of maturation which is accompanied by pubertal growth spurt along with the development of sexual characteristics resulting in the attainment of reproductive capability and finally growth ceasation (Sangita, 2004).

The onset of menarche which is a complex of growing up is a period of stress among adolescent girls (Sangita, 2004).

Menarche is one of the significant milestones in a women's life. It represents a concrete symbol of shift from a girl to a woman (Danii et al., 2005. Tiwari et al., 2005).

Adolescence is a time of search unrealism. They have a tendency to look at life through rose tinted glasses (Helstela et al., 2001).

Adolescence can be a confusing and unsetting time for young adults. Changes to their bodies, their interests, and their social relationships cause them to question who they are and how they fit into the dynamic and confusing world around them. They question their place in their family, with their friends, with others around them. This is a time of increased self- awareness, self-identity, self-consciousness, pre occupation with image and concern with social acceptance (Slater and Tiggermann, 2002).

Adolescence is regarded as the period of stress and strain, storm and strike. It is because of the changes the child undergoes, stress and strain start ensuing. He starts behaving as a grown-up person but at times behaves childishly. There is frequent change in the behavioural act of the child at this stage. There is too much of eagerness as well as restlessness. The hormonal changes have an acute impact on the personality of the child. It results either in pride or shame, overexcitement or humiliation. Pimple and acne formation, genital development and increase in height and weight are the instinctive physical changes. Attraction towards opposite sex, being secretive in nature, group formation and active participation in mature discussion are some of the emotional changes the child undergoes. However indulgence in untoward activities, aggressiveness, emotional imbalance, fickle-mindedness are some of the negative changes in the adolescent that need to be properly eyed. Such features differ from individual to individual in meagre or large (Singh, 2010).

It is a period of stress and strain associated with growth spurt, hormonal changes and emotional adjustments. Girls have added strain associated with menarche (Agarwal, 2002).

Adolescence is a period of likes and dislikes especially those associated with food choice and eating habits. They are highly influenced by their peer group and by external forces than by their own family members. This influences their diet, health and nutritional status. Adolescents have been observed to skip meals especially breakfast carry poor lunch, dislike leafy vegetables and milk. They are more interested in snacks rather than normal diet; they have self-imposed dieting and irregular eating habits and resist advices (Davidson, 2000 and Senderowitz, 1995).

It is a stage characterised by lots of turmoil and period with physical, psychological and emotional instability (Soman, 2001).

Adolescence is also a stage when young people extend relationships beyond their parents and family. It is a time of intense influence of peers, and the outside world in the society. A desire to experiment and explore can manifest in a range of behaviours-exploring sexual relationships, alcohol, tobacco and other substances abuse. The anxiety and stress associated with achievement failure, lack of confidence etc are likely to lead to depression, anger, violence and other mental health problems. Adolescents as they mature cognitively, the mental functioning process becomes analytic, capable of abstract thinking leading to articulation and independent ideology. These are truly the years of creativity, empathy, idealism and with bountiful spirit of adventure. Thus, if nurtured properly, youth can be mobilized to contribute significantly to national development (Verma and Saraswathi, 2002).

Peer groups are especially important during adolescence. It is a period of development characterised by a dramatic increase in time spent with peers and a decrease in adult supervision. Adolescents also associate with friends of the opposite sex much more than in childhood and tend to identify with larger groups of peers based on shared characteristics (Brown, 2004).

In a study done by Elizabeth (2001) revealed that many adolescent girls resort to dieting and starvation to become slim and to get appreciated by their friends.

Typical eating patterns among adolescents are meal skipping, snacking, eating away from home, fast food consumption for meal and snack consumption and unconventional dietary patterns such as adopting vegetarian diet, specific weight loss diet and on overall reduction of food intake (Saviage et al., 2007, Shi et al.,2005 and WHO, 2005).

Healthy eating behaviours during adolescence are not only imperative for physical and psychosocial growth and development as well as for cognitive performance, but also important for the prevention of diet- related chronic diseases in adulthood (Quatromoni et al.,2002). Western culture norms and expectation about female beauty is a major source of risk for development of eating disorders (Eister and Hersen, 2000).

2.2 Food consumption Pattern, Dietary habits and Nutritional status of Adolescents

Adolescence is a significant period for physical growth and sexual maturation. Nutrition, being an important determinant of physical growth of adolescents, is an important area that needs attention. Growth retardation is one of the most important health concerns for adolescents and their parents as well as health care workers (SHAHN survey, 2002).

Inadequate nutritional intake during adolescence can have serious consequences throughout the reproductive years and beyond. Poor nutrition during adolescence can impair the work capacity and productivity of adolescent boys and girls in their later years. Further, an undernourished girl is at the risk of developing complications during pregnancy and the chances of her giving birth to a low birth weight baby increases, thus perpetuating a vicious cycle of malnutrition and ill-health, and an intergenerational effect (WHO,2005).

Increased nutritional needs at this juncture relate to the fact that adolescents gain up to 50 per cent of their adult weight, more than 20 per cent of their adult height, and 50 per cent of their adult skeletal or bone mass during this period. Adolescent girls also need additional requirement of iron to compensate for menstrual blood loss and calcium which gives strength to bones. Sub-optimal nutrition slows the growth process and the rate of sexual maturation (NCCFN, 2005).

Adolescence is marked as a period of growth spurt and maturation. The extent of physical growth is not determined by genetic, heredity factors alone but also on availability of adequate nutrition, micronutrients in the diet and access to health services. Inadequate nutrition during adolescence can have serious consequences throughout reproductive years and beyond. Extra nutritional requirements include increased intake of calcium, iron, iodine, minerals and proteins. Unmet nutritional needs lead to several public health problems such as stunted and retarded growth, impaired mental development, anaemia, complications during pregnancy and low birth weight babies (Abraham,2000).

It is one of the most vulnerable periods of life with various health risks. Life style variations expose adolescents to different health promoting and health damaging behaviour. Adolescence is a period of high nutritional risks when increased demand for nutrients is often met with poor choices of food, unhealthy eating habits and deficient intake of calories, protein, vitamins and minerals. The wrong food choices made by adolescents negatively influence their growth and development their future reproductive capacities and health of their children.

Both boys and girls were found to have different food habits. A study shows that adolescents are found to fast and binge alternatively to get peer acceptance (Bartell, 2000).

Missing meals especially breakfast is extremely common (SHAHN survey, 2002) among Delhi school students. The study revealed that 30 per cent boys and 40 per cent girls skip one meal every day and breakfast is the commonest causality (54 per cent).

Snacks are eaten by over 75 per cent of all adolescents and provide them a fourth to a third of their calorie intake. SHAHN survey- 2002 revealed that 40 per cent girls and 50 per cent boys consumed junk foods in last 24 hours.

During adolescence, the influence on eating habits is numerous. The growing independence of adolescents, increased participation in social life and a generally busy schedule of activities have a great impact on food intake. The eating of particular set of food items by a person always depending on taste and availability of raw food materials is called food habits (SHAHN survey-2002).

The food habits of adolescents are mainly influenced by urban life style, mass media and peers. Adolescence is a period of high nutritional risk. Increased demand for nutrients is often met with poor choice of food, unhealthy eating habits and deficient intake of calories, proteins, vitamins and minerals. Soft drinks kill the appetite and promote skipping of meals and finally resulting in nutritional deficiency (Elizabeth, 2001).

Kanchwala and Husian (2003) observed that some important indices of food habit like regularly in meal timing, associated activities with eating, speed of eating etc. have been assessed to find out the impact of counselling on food habits of overweight adolescents.

Nutritional disorders impede the economic development of the country. Socio economic and demographic factors play an important role also on the pattern of consumption of food and nutrition (Rahman and Rao, 2002).

As pointed out earlier, adolescent are one of the most important groups of any society because they have an influential effect on the future socio-economic and cultural status of the society (Pourmoghim and Aminpour, 2003).

Nutritional deficiency is known to co- exist with infection due to lack of food, super imposed infection and infestation, which are the cumulative result of poverty and under nutrition (Leela and Priya, 2002).

Study by Pereria et al. (2000) on adolescent girls revealed that variation in socio economic status causes much difference in their anthropometric measurements confirming the impact of socio economic status.

Rahman and Rao (2001) reported that food choices, intake and consumption pattern are also related to socio economic status, activity of daily living and education.

A study done in Kerala Agricultural University by Kavitha (1999) showed that the food habits among adolescents indicated that about 94.67 per cent of adolescents ate confectionaries at least once in a day.

Ushadevi and Nath (2003) pointed out that in order to meet the daily requirement and to improve their health and nutritional status there is a need to increase the nutrient intake through foods. Obesity is a common eating disorder associated with adolescence.

According to Davidson (2000) nutritional requirement of adolescents were conditioned primarily by spurt in growth and the additional food requirements are met through increased appetite.

Previous studies found that the rapid changes in physical growth and psychological development have placed adolescents as a nutritionally vulnerable group with unhealthy eating behaviours that did not meet dietary recommendations (Savige et al., 2007., Shi et al., 2005 and WHO, 2005).

According to Bhat and Wahray (2000) street foods were considered as an important source of economical and nutritious food particularly by urban poor.

Health is not a static phenomenon but a dynamic life process, which begins at birth and is governed by a genetic,nutritional and environmental factors throughout life (Thilakavathi and Purushothaman, 2001).

Prema (1999) revealed that dietary consumption of adolescents can be improved by directing food production strategies towards adequate production of quality of foods and making available the same at affordable prices to all people.

According to Nandini and Beatrice (2003) the food consumption pattern of the adolescence of better economic strata and on the significance of self-managed mess runs in hostels.

Breakfast is frequently neglected and omitted more often by teenagers. For teenage girls skipping lunches is generally taken to be away of controlling weight (Nickles et al., 2002).

Eating behaviour is an etiologic factor in the development of life style related diseases. Knowledge about stability of eating behaviour during the transition from adolescence to early adulthood has implication for dietary intervention for children and young adolescents (Lien et al., 2001).

Socio economic and demographic factor play a vital role on the variation in consumption of foods and nutrients. It is worth to verify the factors associated with the variation in dietary pattern and nutrient adequacy (Mujub- Ur- Rahman, 2001).

2.3. Prevalence of malnutrition among adolescent girls

Nutritional status of the population is critical to the development and well-being of the nation (Rao, 1999).

Malnutrition affects development - More than two thirds of the adolescent girls suffer from anaemia. Two thirds suffer from Chronic Energy Deficiency of the third degree with Body Mass Index (BMI) below 16. Married women aged 15-49 are also reported to have BMI below 18.5 (NFHS 2, 2005-2006). Iodine Deficiency Disorders can lead to growth retardation and retard mental development. Only half of the households are using iodized salt for cooking in India . Meal missing, junking and food fads are equal in rural and urban girls. Boys also have food fads which affect their health adversely. This is driven by

fancy towards role models and publicity from the media. Junking may cause both over nutrition and underweight. Anaemic adolescent mothers are at a higher risk of miscarriages, maternal mortality and giving birth to stillborn and underweight babies. Therefore, nutritional deficiency has an inter-generation effect also. To decrease low birth weight babies, take care of adolescents to support their growth.

The main nutritional problems affecting adolescent population include under nutrition and iron- deficiency anaemia besides other factors.

During adolescence, women's bodies develop and prepare for future child bearing. Low stores in young women of reproductive age make them susceptible to iron deficiency anaemia because dietary intake alone is insufficient in most cases to meet the iron requirements of pregnancy.

In India the prevalence of anaemia is 56 per cent in adolescent girls where as in Kerala it is 44 per cent. This shows Kerala is slightly better place with respect to anaemia (NFHS-3, 2005- 2006).

A recent study done in shanghai showed iron deficiency anaemia among 9. 48 per cent and 49- 80 per cent of 7- 17 year's children and adolescents respectively (Sun et al., 2003).

For young girls in India, poor nutrition, early bearing and reproductive health complications compound the difficulties of adolescent physical development. Anaemia is one of the primary contributors to maternal mortality (20 to 25 per cent) and is associated with compromised pubertal growth spurt and cognitive development among girls aged 10 to 19 years (Reshmi, 2007).

Devadas (1999) reported that in India two out of every three women suffer from iron deficiency anaemia.

Anaemia is one of the glaring deficiencies in adolescent girls, which they acquire from childhood and increase in extent and magnitude during the reproductive age (IUPHE, 2000).

According to Chandrakala et al. (2003) nutritional anaemia is the most serious public health problem especially during adolescence. Intervention at this stage would help to improve the iron status for future reproductive health.

Nutritional status index of the adolescent girls were carried out and revealed that the inmates of Agricultural College Ladies Hostel were better than the inmates in other hostel (Beatrice, 1999).

Kavitha (1999) in her study indicated that Thiruvananthapuram Taluk had the highest prevalence of anaemia of 52.00 per cent with the overall prevalence of 49 per cent among adolescent girl.

In order to assess nutritional status of adolescent girls of a slum community of Varanasi and factors influencing them, this study was carried out on 70 girls belonging to the age group of 13 to 18 years. However, lesser under nutrition in large families indicated role of familial support in prevention of under nutrition in adolescent girls (Singh and Misra, 2001).

A study by Anant (2001), adolescent girls between 13- 18 years of age show lower percentage of iron and with the onset of menarche become highly susceptible to anaemia.

According to Rao (2001), high prevalence of low birth weight, high mortality in children and poor maternal nutrition of the mother continue to be major nutritional concerns in India.

In addition the difference in nutritional status between genders was significant (Albano and Desouza, 2001).

One of the important causes for poor maternal and child malnutrition in India is lack of the mothers coupled with superstitions, which limit the food intake of mothers, discard colostrums and practice poor weaning and hygiene. Improving the mother's knowledge on these aspects and qualifying its effect in term of the growth pattern of their infants are the objective of the study(Yegammi et al., 2002).

A study aimed to determine that the over nutrition appears to more prevalent than under nutrition among the sample of Malaysian adolescents (Ong et al., 2003).

A recent study carried out by the National Nutrition Monitoring Bureau in rural areas of India on haemoglobin status indicated that the overall prevalence of anaemia among the rural adolescent girls was about 70 per cent (NNMB, 2003).

Girls aged 15 to 18 years need additional iron increasing lean tissue, increasing blood volume, and replacing menstrual blood loss. Their iron requirement may be twice as much as that of an adult woman (Beard, 2000).

2.4. Studies on Adolescent Health and Nutrition Education/counselling

A positive correlation between women's education, lower fertility, child mortality and other social development indicators is well established. Education acts as a catalyst for social upliftment enhancing the returns on investments for almost all aspects of developmental efforts, be it population control, health and hygiene, women empowerment or poverty reduction. Considering benefits of education, raising level of literacy and education of its people has received top priority in the agenda of national development in India (Census,2001).

According to Rao et al.(2007) and Nolan (2005) nutrition counseling is a key element in promoting sustainable healthy eating behaviour and should start from early stages of life. Nutrition counseling can be significantly improved their nutrition knowledge. It is well documented in the literature that nutritionally on counseling has been realized as one of the essential means of helping youngsters to improve or maintain their health. By improving the nutritional status of adolescents nutritional and health status of next generation can also improve.

Hemalatha (2002) in her study reported that nutrition knowledge assessment showed positive impact on counseling programme. The author has concluded that nutrition counseling programme can be used as one of the effective tools to bring about dietary changes and there by improve nutritional status in the society.

Effect of nutrition counseling for school going adolescents by Subha and Rao et al.(2007) revealed that the extent of improvement in the mean scores of the experimental group was significantly higher than the control group indicating positive impact of the intervention.

Educational programmes directed towards improving the reproductive health of adolescent population are being covered by integrated child development services recently. Adolescent reproductive health care needs vary with culture, age and marital status. But all adolescents need accurate and adequate information about sexual and reproductive health.

Educational level in the household is an important determinant of consumption of raw vegetables. A study aimed to examine the association between household educational level and consumption of raw vegetables among adolescents and to assess the influence of other determinants on the association such as family factors, school achievement, health behaviour, meal pattern and weight related fact.

A study by Esfarjani et al. (2003) showed that the nutritional knowledge of adolescent girls was not good enough and can cause nutritional deficiencies in generation supposed to be the future mothers. The teenagers are a time of change the child is becoming adult.

A study by Harshala and Prema (2000) on adolescent girl health covers mortality, morbidity, nutritional status and reproductive health and linked to these are environmental degradations, violence and occupational hazards, all of which have implications for adolescent girl health.

According to Salil (1991), education and training are important elements of programme intervention as they relate to increasing the capabilities of community to analyse the situation and enhance common understanding of the problem and knowledge or how to address the problem.

Ferrinho (1993) says that the basic elements in integrated community development can be regarded as educational success depends on continuous learning process studies on the effect of health and dietary practices.

Safe and successful child bearing depends on most of all on the health and readiness of the mother to be so special attention should be paid to the health, feeding and education of adolescent girl (FPAI, 1993).

USDA (1996) is one of the opinions that nutrition education is needed to literature and improves knowledge in the selection of safe and adequate diet of food production, processing, storage and handling techniques at all levels, especially in the household level. A special intervention has been devised for adolescent girls using the ICDS infrastructure. This intervention focus on school dropout girls to meet their needs of self-development, nutrition, health education, illiteracy, recreation and skill formation.

According to Talikoti and Goel (2003) adolescent health is the healthy life style of adolescent girls through nutrition and health education.

Nutrition awareness through education programme can be one of the important media to promote nutritional literacy among people (Krishnaswamy and Vijayaraghavan, 2000).

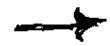
The nutritional stress of reproduction is super imposed on the poor nutritional status in adolescence. Hence in the life cycle approach adolescent girls, pregnant and lactating women and children 0- 36 months of age should be considered as one target group (Jane, 2003).

According to Vijayalakshmi and Ponnuraj (1990), majority of women in India are in the age group of 13- 49 years vulnerable to many health problems arising from reproductive causes. It is now universally expected that health status of women in reproductive age has an impact on health of their children, the family and the nation women's health is basic to women's advancement in all fields of

endeavour and as mother's health is the bulwark of her family, it is foundation of community and social progress.

Sexual health production and reproduction health problem is an important one for young people. Women have reproductive health problems from an early age and sex is not always a source. Adolescents are also concerned about privacy and confidentially regarding reproductive health care (Margeberer, 2002).

Based on review of literature and theory of assumptions, made are depicted in the conceptual diagram/theoretical orientation are summarised given below.



C = Cognition, P = Practice, NS- Nutritional status

XI = Family type, X2 = Family size

X3 = Educational status of the respondents, X4 = Family educational status

X5 = Family income, X6 = Social participation, X7 = Mass media

X8 = Participation in activities /programmes,

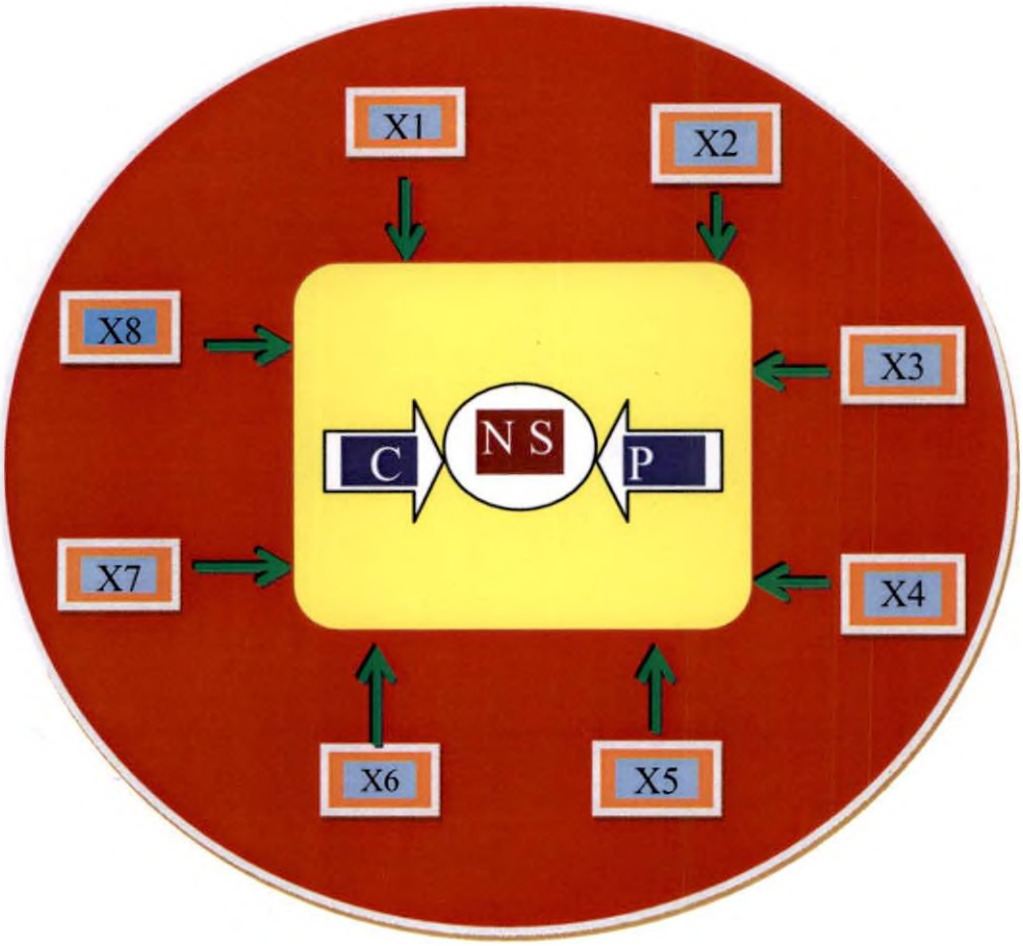


Figure 1 Theoretical orientation

Materials and Methods

3. METHODOLOGY

The study entitled 'Nutritional Status and nutrition cognition of adolescent girls in the coastal area of Thiruvananthapuram' is aimed to assess the nutritional status and to enhance nutrition cognition among adolescent girls of the coastal area through nutrition counseling .The impact of counseling was assessed by the changes with respect to gain in knowledge and adoption of better dietary practices of the respondents .A general description of the methodology followed in the conduct of the study is presented in this chapter under the following heads

3.1 Research design
3.2 Locale of the study
3.3 Selection of the respondents
3.4 Variables and their measurements
3.5 Statistical analysis

3.1 RESEARCH DESIGN

This is an experimental design. Here in this study the design followed is before and after design with no control . Counselling is the treatment to improve cognition and practice. Impact of counselling on cognition = after counselling (Yka) - before counselling (Ykb). And impact of counselling on health and nutrition practices = after counselling (Ypa) - before counselling (Ypb)

3.2 LOCALE OF THE STUDY

The study was conducted in two coastal areas of Thiruvananthapuram district viz.Vizhinjam and Vallakkadavu which were purposively selected for the study

3.3 SELECTION OF THE RESPONDENTS

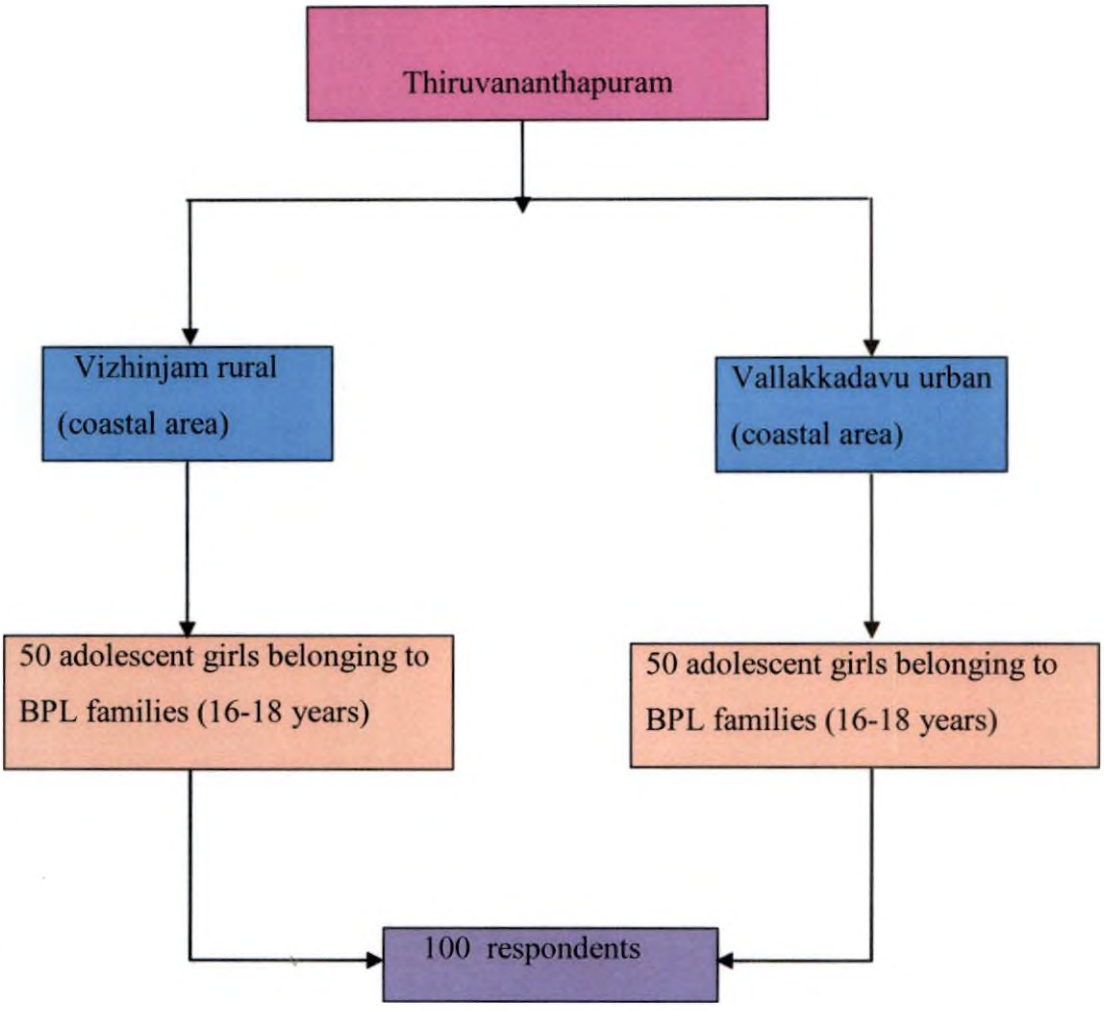


Figure 2: Flowchart showing selection of respondents

Fifty adolescent girls in the age group 16-18 belonging to BPL families (two coastal areas) were selected from each area through purposive random sampling thus forming a sample of 100.The guidance and assistance of local Govt. Higher Secondary Schools for girls and the anganwadi centers in the area were sought for identifying the sample.

3.4 VARIABLES AND THEIR MEASUREMENTS

For the conduct of the study the respondents identified in the area were interviewed with the help of standardized schedules. The methodology of the study is presented under the following headings.

3.4.1 Assessment of the socio economic and personal characteristics of the respondents

3.4.2 Assessment of extent of participation of respondents in various activities or programmes related to adolescent nutrition,health and hygiene

3.4.3 Assessment of the nutritional status of the respondents

3.4.4 Assessment of the existing awareness of respondents on adolescent nutrition, health and hygiene through cognition and practice studies

3.4.5 Formulation of the counselling programme

3.4.6 Conduct of nutrition counselling programme

3.4.7 Assessment of impact of the counselling programme

3.4.1 Socio economic and personal characteristics of the respondents

In order to elicit information regarding socio economic profile of the respondents details regarding type and size of the family, educational status of the respondents and the family members, family income, social participation and their mass media exposure were elicited using a standardized interview schedule.

3.4.1.1Family type

In this study family type means nuclear family or joint family. Nuclear family consists of husband,wife and their unmarried children whereas joint family is composed of grandparents and married sons and daughters with their spouses.

The respondents were asked to indicate the type of family whether nuclear or joint type. A nuclear family was given the score as 'one'and joint family score as 'two'.

Category	Score
Nuclear	1
Joint	2

3.4.1.2 Family size

In the present study family size was measured by taking into consideration the specific number of members in the family of the respondents and categorized under small, medium and large families

Category	No of the members	Scores
Small	1-4	1
Medium	5-7	2
Large	Above 7	3

3.4.1.3 Educational status of the respondents

Educational status of the respondent in the study refers to the formal education received by the respondent and was quantified by giving scores as

Educational status	Scores
Illiterate	0
Able to read and write	1
Primary School	2
Middle school	3
High School	4
Under Graduate	5

3.4.1.4 Family educational status

Family educational status in this study refers to the academic qualifications of all the members of the family was given the corresponding educational score as done earlier and overall educational score of the family was computed using the formula followed by as family educational score.

$$\text{Family education score} = \frac{\text{Total educational score of the family members}}{\text{Total number of family members}}$$

3.4.1.5 Family Income

Total monthly income of the respondents was assessed by adding the salary of family members as well as income from other source.

As per BPL survey , 2011 the total monthly income for a BPL family is Rs 2250/-.In the present study the total family income was categorized from less than 1000,1000-1500,1500-2000 and 2000-2500. The variables were measured by assigning scores as shown below.

Monthly income range	Scores
<1000	1
1000-1500	2
1500-2000	3
2000-2500	4

3.4.1.6 Social Participation

Social participation of the respondent was operationalized as the social experience gained by the respondent by participating in formal organizations either as a member or as an office bearer. Social participation score of an individual respondent will be the sum of products of scores and member of organisations in which she is a member or office bearer. This variable was measured by assigning scores as shown below.

Membership in organizations	score
Not a member of any organization	0
Member in an organization	1
Office bearer in any organizations	2

3.4.1.7 Mass media exposure

Mass media exposure refers to the exposure of the respondent to the different types of media like radio, television and newspaper, magazines etc extend of massmedia exposure was determined by responses were collected in a 5 point continuum viz; 'daily', ' twice or more in a week', 'once in a fortnight', 'once in a month' and 'never' bearing scores 4,3,2,1,0 respectively. Total score of the respondents on mass media exposure will be sum of the scores obtained for all the media.

3.4.2 Extent of participation of respondents in various activities or programmes related to adolescent nutrition,health and hygiene.

Extent of participation of respondents was operationalized as their involvement in the various activities or programmes related to adolescent health and nutrition in the study area. This was assessed by asking certain relevant questions to the respondents. Further a scale was constructed to assess the

participation of the respondents. For this, the following activities which involve the participation of the respondents were taken into account.

a) Membership in any organisations working for adolescents health and nutrition were categorized under yes or no questions
b) Consumption of foods or medicinal supplements supplied through these organisations were categorized under yes or no questions
c) Participation in the educational activities related to the programmes during the previous three months which was assessed from the frequency of their participation in various programmes organized by these organisations in the area and were categorized under the heading 'regularly','occasionally', and 'never'. When they attended almost all the programmes (above 80 per cent) it is treated as 'regularly' and if they attended less programmes (below 80 per cent) it is entered under 'occasionally' and if they never attended any it is entered under 'never'.

3.4.2.1.Participation index

Individual scores were summated to get the total score of each subject and the participation index was calculated using the formula.

$$\text{Participation index} = \frac{\text{Total participation score}}{\text{Maximum score possible}} \times 100$$

Based on the mean and standard deviation of the participation index, the respondents were classified into three groups as those having high level of participation, medium level of participation and low level of participation

3.4.3. Assessment of the nutritional status of the respondents.

3.4.3 1. Assessment through anthropometry

For assessing the nutritional status of the respondents, anthropometric assessment is considered as an effective measure. Nutritional anthropometry is measurement of human body at various levels of nutritional status, which provides information on the nutritional status of individuals.

Anthropometry provides the single most universally applicable, inexpensive technique for assessing the size, proportions and compositions of the human body. Anthropometry has been accepted as an important tool for the assessment of nutritional status (Vijayraghavan, 1987).Anthropometry measurement namely height, weight, triceps and skin fold thickness measurements of the respondents were taken in the present study to assess the nutritional status.

3.4.3.1.1 Height

The height of the individual is influenced by genetic and environmental factors. Height is affected only by long-term nutritional deprivation and it is considered as index of chronic or long duration malnutrition (Sreelakshmi, 2003)

In this study height is determined by stadiometer.The respondents were asked to remove their slippers and to stand with centre of the back touching the wall with feel paralleled and heels, buttocks, shoulder and back of head touching the wall. The head was held comfortably correct; the arms hanging close by the side. The moving head piece of the stadiometer was lowered to the rest flat on the top of the head and the measurement was taken. Height was read to the nearest 0.1cm.An average of the three measurements was taken as final measurement of height of the respondent.

3.4.3.1.2 Weight

Weight is the measurement of body mass (Rao and Vijayaraghavan, 1986). According to Kaul and Nyamongo (1990) a change in the body weight may be the result of changes in the health of an individual changes in food consumed or even changes in one's physical activity.

3.4.3.1.3 Computation of body mass index

Body weight is the most widely used sensitive and simplest reproducible anthropometric measurement. It indicates the body mass and is a composite of all body constituents like water , mineral ,fat ,protein, and bone.It reflects more recent nutrition (Sreelakshmi, 2003)

For ascertaining the weight of the respondents a platform weighing balance was used, as it was portate and convenient to use in the field. The weighing scale was adjusted to zero before taking each measurement. The

respondents were asked to stand on the platform, of the scale with the slippers removed without touching anything and looking straight ahead. The weight was recorded to the nearest 0.25 kg. Each reading was taken thrice and the average was taken as the actual weight.

Body mass index (BMI) = BMI of the respondents was computed using weight and height of the measurement using the formula

$$BMI = \frac{\text{Weight (kg)}}{\text{Height } (m^2)}$$

Based on the BMI the respondents were graded following the procedure cited by Bamji et al.,(2003). Based on BMI the adolescent girls were graded as below

Presumptive diagnosis	BMI classification
<16.0	Chronic energy deficiency grade III severe
16.0 -17.0	Chronic energy deficiency grade II moderate
17.0 -18.5	Chronic energy deficiency grade I mild
18.5 -20.0	Low weight Normal
20.0-25.0	Normal
25.0-30.0	Obese grade I
>30 .0	Obese grade II

(Source Bamji et al., (2003)

3.4.3.1.4 Triceps skin fold-thickness (TST)

According to Malina et. al.(1974) measurement of skin fold (fat fold)at triceps is one of the methods for assessing the amount of subcutaneous fat, which gives an indicator of the calorie reserves in the body of an individual and was determined using Lange's caliper. A length wise skin fold on the dorsal side of the left hand was firmly grasped and slightly lifted up between finger and thumb of

left hand. Care was taken not to include underlying muscle, the caliper was applied about 1 cm below the operators finger at a depth about equal to the skin folds, while the skin fold was still gently held throughout the measurement. The measurement was read to 0.1 mm accuracy. An average of three measurements was taken as final measurement of TST of the respondents and the respondents were graded following the procedure cited by Frisancho (1981)

Classifications	TST
<12	Low
12-14	Normal
>14	High

3.4.3.2 Bio chemical assessment

Bio chemical assessment is one of the most important tool for assessing the nutritional status of the subject. In the present study haemoglobin was estimated in order to assess the extent of iron deficiency among the respondents.

According to Park (1997) haemoglobin level is a useful index of the overall state of nutrition irrespective of its significance in anaemia.

Haemoglobin content was estimated from the blood samples of the respondents by cynanmethaemoglobin method (Appendix 5)

Based on the haemoglobin level, the respondents were classified in to different categories indicating the severity of iron deficiency anaemia as suggested by WHO (2001) as shown below

Classification of degree of anaemia

Classifications	Degree of anaemic level Hb level(gm/dl)
7.9	Severe
8.0-9.9	Moderate
10.0-11.9	Mild
>12	Non-anaemic

3.4.3.3 Clinical studies

Clinical examination is stated to be one of the most essential and simplest tools used in the evaluation of nutritional status (Gupta et al., 1989). It is a part of nutritional assessment through which direct information of signs and symptoms of dietary deficiency prevalent could be obtained (Swaminathan,1993)

The presence or absence of clinical deficiency symptoms which is an index of nutritional status was assessed by a qualified physician using a standardized schedule (Appendix 6)

3.4.3.4 Diet survey

Dietary habits of the respondents were assessed through diet survey, details regarding eating habits, frequency or timings of food, use of leftover food, food consumed during different stages of life cycle.

According to Swaminathan (1993) diet surveys constitute as essential part of any complete study of nutritional status of individuals or groups, providing information on nutrient intake levels, sources of nutrients and food habits.

Food consumption pattern is one of the most important determinants of nutritional status (Despande et al,2001). The food intake was measured following the 24 hour recall method.

3.4.3.5 Measurement of food intake by24 hour recall method

The 24 hour recall method was used to assess the actual food intake by the respondents. For this a set of cups and spoons were standardized by the investigator following the procedure given by Thimmayyamma and Rao (2003). The respondents were asked about the types of food preparations had for breakfast ,lunch, tea time and dinner and raw ingredients used for each of the preparations and the quantity consumed by them was assessed using the standardized cups. The cups used to aid the respondent to recall the quantities prepared and eaten. The food intake was converted into nutrients using the food consumption table (ICMR,1999).The food intake as well as nutrient intake was then compared with the RDA.

3.4.3.6 Developing Nutritional status index

Nutritional status index (NSI) of all the respondents was computed individually using the parameters such as energy, protein, iron, folic acid, haemoglobin level and BMI following the formula developed by Karuna and Saraswathy (1993) as detailed below.

Suppose if Xij be the observation corresponding to the j^{th} variable for the ith sample (respondent) wj is the inverse of the sample variance of the j^{th} variable- the weight assigned to the observation corresponding to the j^{th} variable the nutritional; status of the respondent was calculated as,

$$NSI_i = \sum_{j=1}^{k} WjXij$$

i =1,2,3.....n

j =1,2,3,.....n

n = no of respondents

k = no of variables

3.4.4 Cognition of respondents on adolescent nutrition, health and hygienic practices

The cognition or awareness of the respondents was elicited through cognition and practice studies. Cognition of the respondents was measured using a suitably structured and pre tested checklist (Appendix 13)

The level of cognition of the respondents on health and nutrition was assessed through a cognition test.

3.4.4.1 Construction of nutrition cognition test

Cognition is a body of understood information possessed by an individual or by culture, which is in accordance with established facts (Henerson,1987). In order to measure the knowledge level of the respondents regarding nutrition, health and hygienic practices a knowledge test was developed by means of a simple teacher made test constructed following the procedure adopted by Santhosh Kumar (1990) . Care was taken to ensure that the test covered the entire range of subject matter selected for the study. An item pool of 65 statements relevant to the subject matter was prepared. These statements were collected from relevant literature. Both positive and negative statements were formed. Care was also taken to use simple and clear statements with no ambiguity in language or idea to avoid confusion and doubts. A jury of subject experts analyzed the statements. In the light of the suggestions made by the experts' 38 statements were selected and were pretested in a non-study area. Based on the results of the test 8 statements were discarded and remaining 30 were selected for constructing the cognition test in appendix 13. The test was administrated to the respondents before the counselling programme and immediately after the counselling programme.

The responses were collected in a dichotomous pattern (yes/no).Each correct response was given a score of one and the incorrect response was given a score of zero. The total score of each respondent was obtained by summing up the

correct response. The possible score of this test ranged from a minimum of zero to maximum of thirty. The cognition test was administrated to the respondents.

3.4.4.2 The dietary and hygiene practices followed by the respondents

The existing dietary and hygiene practices of the respondents were also measured using a suitably structured and pre tested checklist as well as through food use frequency study.

A total of 50 statements were prepared for assessing the existing practices followed by the adolescent respondents on health and nutrition aspects and short listed to 15 statements based on the expert's judgement following the same procedure as for assessing the cognition score. The statements thus selected were pre tested among a non-respondent group of adolescent girls and finally a set of 10 statements were selected to be administered among the respondents (Appendix 14)

The test was administrated to the respondents before the counselling programme and immediately after the counselling programme.

The responses were collected in a dichotomous pattern (yes/no).Each correct response was given a score of one and the incorrect response was given a score of zero. The total score of each respondent was obtained by summing up the correct response. The possible score of this test ranged from a minimum of zero to maximum of thirty. The practice test was administrated to the respondents.

3.4.5 Formulation of the counselling programme

Based on the cognition and practice score obtained by the respondents the lacunae in the cognition and practice was ascertained and a need based counselling programme was formulated. The schedule followed is given in Appendix 13,14.

3.4.6 Conduct of Nutrition Counseling Programme

Based on the existing cognition and practice of the respondents obtained from the initial survey a nutrition counselling module was prepared. Accordingly a three day session module was formulated viz., 1) Adolescence and its significance 2) Nutritional status and prevalence of malnutrition among adolescent girls 3) Role of health and hygiene .Counselling modules were formulated after review of related literature and in consultation with experts in the field.

The counselling module comprised mainly of discussion classes with adequate support of suitable visual aids specially made for the counselling programme. Demonstration on preparation of an iron rich food supplement with local foods along with a nutrition game suitable for adolescent girls was included during nutrition counselling session for enhancing their participation in the programme. Recipe appended.(Appendix IV)

For the conduct of the counselling programme the selected 100 respondents were grouped in to four clusters. Each group consisted of 25 respondents. The date, time and venue for conducting the counselling programme in each group were finalized in consultation with the group members to suit their convenience.

Ice breaking techniques were used to make the respondents feel at ease and build up a rapport. While handling the classes, care was also taken to see that the audience could get a clear view of the visual aids used .Familiar communication strategies were applied.

Plate 1.Conduct of Education Classes

Plate 2.Measurement of Height

Plate 3.Measurement of weight

Plate 4 Biochemical assessment

3.4.7 Assessment of impact of the counselling programme

One of the main objectives of the study was to improve nutrition cognition among adolescent girls through nutrition counselling

The impact of the counselling programmes was assessed through post counselling assessment of cognition and practice adoption on nutrition, health and hygienic practices selected for the study.

3.4.7.1 Increase in level of cognition

To quantify the gain in cognition an index was worked out as follows

$$\text{Percentage gain cognition} = \frac{K1 - K_0}{K} \times 100$$

Where.,

K0 = pretest cognition score

K1 = posttest cognition score

K = maximum possible score

3.4.7.2 Retention of cognition

Retention of knowledge is the amount of cognition retained by an individual on a particular topic after a reasonable period of time.

The same teacher made test prepared for assessing the gain in cognition was applied here with a gap of 15 days after the exposure to such stimulation. The test is the post delay test.

Retention of cognition was computed by detecting percentage of loss of cognition due to post delay test from the percentage of net cognition gained using the formula.

Retention of cognition = percentage gain cognition - percentage loss of cognition in post delay test.

Percentage loss of cognition due to post delay test was computed as follows.

$$\text{Percentage cognition lost} = \frac{T_1 - T_2}{T_1} \times 100$$

Where.,

T_1 = first post counselling score

T_2 = second post counselling score

3.4.7.3 Adoption of better dietary and hygienic practices

Level of adoption of better dietary and hygienic practices was assessed one month after the counselling programme.

The difference in the adoption level of respondents between pretest and posttest indicated a measure of adoption of better dietary and hygienic practices.

$$\text{Adoption Percentage} = \frac{T_2 - T_1}{T} \times 100$$

Where.,

T_1 = pre counselling adoption score

T_2 = post counselling adoption score

T = total possible score

The extent of adoption of better dietary and hygienic practices was evaluated one month after the counselling programme.

3.3.7.4 The food use frequency study

Frequency of use of different food items in the dietaries of the respondents clearly indicate the approximate adequacy of the diets consumed by them. Moreover it also indicates the practice followed by them in choosing different food items in their daily diet.

In the present study food use frequency was measured using Raeburn's method. The locally popular foods from all the food groups and beverages were listed down and respondents use for each item was related separately.

The percentage of total score for each food group used by respondents as well as percentage score of the respondents for different food items were calculated separately using the formula suggested by Raeburn et al.,(1979).The food use frequency was measured on a "seven point"scale.On the basis of the frequency of use of different use of food items,scores were assigned as follows

Frequency of use	scores
Daily	7
Weekly thrice	6
Weekly twice	5
Once in a week	4
Fortnightly	3
Once in 4 month	2
Occasionally	1
Never	0

Based on the frequency of use of various food items the food use frequency scores were calculated as percentage of total score =

$$\frac{R_1S_1 + R_2S_2 + \ldots\ldots\ldots\ldots + R_nS_n}{N}$$

Where.,

S_I = scale of rating given for frequency of use of a food item (i=1,2,3,....7)

N = maximum scale for rating

R_I = percentage of respondents coming under each frequency group (i=1,2,3,4.....8)

Based on the percentage scores obtained the food articles were classified into four groups as 'most frequently used' ,'moderately used', 'less frequently used' and 'least frequently used'.

The food use frequency was assessed to study the existing patterns and repeated 30 days after counselling from among a micro sample of 30 respondents

3.5. STATISTICAL ANALYSIS

The statistical analysis such as frequency and percentage, mean, standard deviation, correlation analysis and paired 't' test were used.

Results

4 RESULTS

The main objective of the study is to assess 'the nutritional status and to enhance nutrition cognition among adolescent girls of the coastal area through nutrition counseling'. Keeping this in view the data were collected from 50 respondents each belonging to BPL families in Vizhinjam and Vallakadavu area respectively. The data were analyzed and the results of the study are presented under the following heads.

4.1 Personal and socio-economic characteristics of the respondents.

4.2 Level of participation of the respondents in the various programmes functioning in the area to improve adolescent nutrition,health and hygiene

4.3 Nutritional status of the respondents

4.4 Situation analysis of the respondents on adolescent nutrition, health and hygiene

4.5 Impact of counseling on variation in cognition and practice of the respondents to adolescent nutrition, health and hygiene.

4.6 Correlation between the cognition and practice scores of the respondents with the selected independent variables.

4.7 Comparison of the cognition and practice scores of the respondents before and after counselling.

4.1 Personal and socio-economic characteristics of the respondents

The socioeconomic profile of the selected respondents was studied with reference to their type of family, family size, educational status of the respondents

and the family members, family income, mass media exposure and their extent of social participation .The distribution of the respondents based on the above socioeconomic characteristics is presented in table 1

Table 1 Distribution of respondents based on their personal and socioeconomic characteristics.

(n=100)

SL.NO	Variables	Category	Frequency of respondents
I	Type of family	Nuclear	78
		joint	22
2	Size of family	Small (1-4 member)	83
		Medium (5-7 member)	17
		High (> 7 member)	00
3	Educational status of the respondents	Illiterate	6
		Able to read and write	20
		Primary school	25
		Middle school	48
		Under Graduate	01
4	Educational status of the family members	Low	81
		Medium	19
		high	00

It is revealed from table (1) that majority of the respondents (78 per cent) belonged to nuclear families and the remaining 22 per cent belonged to joint families.

Eighty three per cent of the respondents belonged to small family category with one to four members and the remaining seventeen per cent of the respondents belonged to the medium sized families with five to seven members.None of the respondents belonged to high families.

The educational status of the respondents when assessed was seen to range from illiterate level to under graduate level. The educational status of the respondents revealed that out of the 100 respondents selected only 6 per cent were illiterates,20 per cent were able to read and write,25 per cent had primary school level of education,48 per cent had medium school level of education, and remaining one per cent were having high school level of education.

Family educational status revealed that out of 100 respondents majority of the families (81 per cent) had low level of educational status and the remaining 19 per cent belonged to medium level of educational status.

Distribution of families based on their income level is presented in table 2

Table 2 Distribution of the respondents based on their family income.

(n=100)

Monthly income range	Frequency of respondents
< Rs 1000	20
1001-1500	26
1501-2000	24
2001-2250	30

It can be seen that 20 per cent of the families belonged to monthly income range below 1000 and only 30 families belonged to the higher range with in the BPL level.

Social participation

Table 3 Distribution of the respondents based on their social participation

(n=100)

Variable	Category	Score	Frequency of respondents
Social participation	No participation	0	60
	As office bearer	2	00
	As a member	1	40

From the table (3) it can be seen that with respect to social participation 60 per cent did not have membership in any of the social organizations, and remaining 40 per cent functioned as members of social organizations. However none of them functioned as office bearers in social organisations.

Mass media exposure

Distribution of the respondents based on mass media exposure is presented in table 4.4

Table 4 Distribution of the respondents based on mass media exposure

(n=100)

Mass media	Frequency of the respondents				
	Daily	Twice or more in a week	Once in a fort night	Once in a month	never
Radio	20	25	05	20	30
Television	24	22	20	30	04
Newspaper & magazines	23	10	15	20	32

Table (4) depicts that the respondents were exposed to different types of mass media including audio (radio) visual (television) and print media (newspaper, magazines).Mass media play a significant role in the transmission of new ideas and information. The table also shows that radio was listened by 20 per cent daily and 25 per cent listened to radio twice or more a week whereas 24 per cent of the respondents watched by television daily and newspaper was read daily by 23 per cent of the respondents.

4.2 Level of participation of the respondents in the various programmes functioning in the area to improve adolescent nutrition, health and hygiene

Participation of an individual in any programme is the sum total of his/her involvement in the various activities of the programme. The participation of the respondents in the programme was assessed by asking certain relevant questions to the respondents.

An insight into their involvement or participation in the various programmes functioning in the area to improve the adolescent nutrition and health revealed that 30 per cent of the respondents were members of anganwadi centers and 15 per cent were members of Kishore Shakti Yojana implemented through schools. Twenty per cent reported that they received food supplements from these organisations. Ten per cent of the respondents reported that they received medicinal supplements also along with food supplements from anganwadis or through primary health centers. A few respondents (25 per cent) received the supplements through schools. However only 10 per cent of the respondents reported that they consumed the medicinal supplements as per the instructions given by the field level workers of these organisations, while others did not bother to consume the medicinal supplements distributed to them. Participation of the respondents in the various educational activities through these programmes functioning in the area to improve adolescent nutrition and health is depicted in table 5

4.2.1 Participation in adolescent nutrition and health programmes

Table 5 Distribution of respondents based on their involvement in educational programmes

(n =100)

Organisations	Participation in the educational programmes (in frequency)		
	Regular	Occasional	Never
Anganwadi centers	15	50	35
Primary health centers	08	20	72
Schools	12	30	58

The respondents were asked to report the number of times they participated in the various educational programmes related to health and nutrition activities through the welfare organisations in the area and were categorized under the heading 'regular', 'occasional',and 'never'. When they attended almost all the programmes (>80 per cent) it is treated as 'regular'and if they attended less programmes (<80 per cent) it is entered under 'occasional' and if they never attended any it is entered under 'never'.

It can also be seen that only 15 per cent of the respondents had attended the educational programmes 'regularly' through anganwadis. Fifty per cent came under 'occasional' and 35 per cent reported that they never participated in any one of the programmes through the anganwadi centres. With regard to the participation in the Primary Health Centers,8 per cent came under 'regular' category and 20 per cent came under 'occasional' and the remaining 72 per cent never participated in the programmes under Primary Health Centers. In the schools under Kishore Shakti Yojana,12 per cent came under 'regular' and 30 per cent had involved 'occasional' and remaining 58 per cent of the respondents never involved in the educational activities of the programmes.

4.2.2 Distribution of the respondents based on participation index

Based on the involvement of the respondents in the above mentioned activities/ programmes related to adolescent nutrition and health, a participation index was developed and the respondents were classified as those with low, medium and high based on their participation of various activities or programmes (Table 6)

Table 6 Distribution of the respondents based on the participation index

(n=100)

Participation index	Frequency of the respondents
Low	42
Medium	50
High	08

Table 6 revealed that 50 per cent of the respondents were having medium participation index, 42 per cent were low participation index and remaining 8 per cent of the respondents were having high participation index.

4.3 Nutritional status of the respondents

The nutritional status of the respondents was assessed using anthropometry, food and nutrient intake, biochemical assessment and clinical studies.

4.3.1Anthropometric assessment

In this study the height and weight measurements of the respondents were taken and from these BMI was computed. Apart from height and weight triceps skinfold thickness was measured using skinfold caliper to study the fat deposit.

Table 7 Distribution of the respondents based on their BMI

(n=100)

BMI classification	Frequency of the respondents
<16 CED Grade 3 severe	01
16.0-17.0 CED Grade 2 moderate	27
17.0-18.5 Chronic energy deficiency Grade 1	21
18.5-20.0 Low weight	15
20.0-25.0 Normal	05
25.0-30.0 Obese Grade 1	22
>30.0 Obese Grade 2	09

(Source: Bamji et al., 2003)

From the table it can be observed that 27 per cent were having moderate chronic energy deficiency,21 per cent with mild chronic energy deficiency,22 per cent obese grade 1,15 per cent with low weight,and 9 per cent belonged to obese grade 2.

4.3.2Triceps skin fold thickness

This is one of the indicators to assess the nutritional status. Table 8 represents the distribution of respondents based on their skin fold thickness.

Table 8 Distribution of the respondents based on the triceps skin fold thickness

(n=100)

Triceps skinfold thickness	Frequency of the respondents
<12 Low	54
12 Normal	05
>12 High	31

(Source: Frisancho, 1981)

This results shows that majority of the respondents (54 per cent) belonged to low fat deposit,31 per cent were having high fat deposit and remaining 5 per cent were found to be normal.

4.3.3 *Biochemical assessment*

The biochemical assessment was conducted by estimating the haemoglobin level of the respondents. The haemoglobin level was compared with cut off level suggested by (WHO,2001) for assessing the degree of anaemia and grading.

Table 9 Distribution of the respondents based on their anaemic level

(n=100)

Degrees of anaemia : Hb level(gm/dl)	Frequency of respondents
Severe (< 7.9)	04
Moderate (8.0-9.9)	49
Mild (10.0-11.9)	46
Non-anaemic (>12)	01

(Source: WHO,2001)

From the table it is evident that majority of the respondents (99 per cent) were suffering from some forms of anaemia.ie. 49 per cent moderate anaemic,46 per cent mild anaemic. However 4 per cent were severely anaemic.

4.3.4 Clinical examination

Results of clinical examination carried out among the respondents are presented in table 10

Table 10 Distribution of respondents based on their incidence of clinical symptoms

(n=100)

Deficiencies	Frequency of the respondents
Anaemia	60
Pigmentation of skin	10
Angular stomatitis	08
Spongy bleeding gum	08
Teeth (dental carries)	05
No deficiency symptoms	09

The presence of clinical signs and symptoms of different deficiency disorders were assessed among the sample. Anaemia was found to be clinically visible among 60 per cent of the respondents,10 per cent were having skin problems, 8 per cent were suffering from angular stomatitis ,8 per cent were having bleeding gums, and 5 per cent suffering from dental carries. However 9 percent had no deficiency symptoms.

4.3.5 Diet survey

A diet survey was conducted to study the dietary profile of the respondents. The survey revealed that information regarding the food habits, food intake, nutrient intake as well as the food use frequency followed by the respondents.

Food habits of the respondents indicated that 100 per cent of the respondents were non vegetarians. The enquiry on meal timings of the respondents is given in table 11

Table 11 Distribution of respondents based on their meal timings

(n =100)

Food	Frequency of respondents
Break fast	
8-9.30 am	45
After 9.30 am	55
Lunch	
1-2 pm	49
After 2 pm	51
Tea	
4-5 pm	35
After 5pm	65
Dinner	
8-9 pm	38
After 9 pm	62

Table 11 shows that 45 per cent of the respondents were taking breakfast between 8 am and 9.30 am, while 55 per cent were having the breakfast after 9.30 am.Regarding lunch it was observed that 49 per cent were having it between 1 pm and 2 pm and 51 per cent of the respondents were taking lunch after 2 pm, 35 per

cent were taking tea in between 4 pm and 5 pm and 65 per cent taking tea after 5 pm.It was found that 38 per cent of the respondents were having their dinner between 8 am and 9 am and 62 per cent were having it after 9 am.

Regarding the consumption of leftover food it was observed that the left over food was not wasted and all respondents consumed food in the next day morning.

Enquiry on the details regarding the special foods given during different stages of life cycle revealed that majority of them (45 per cent) were not giving any special food. But however it was noted that 25 per cent of preschool children were given weaning food with banana powder or ragi.30 per cent of the respondents reported that at the time of first menstruation girls were given raw eggs, and rice flower mixed with gingelly oil.

The dietary intake of the respondents was assessed through the 24 hour recall method and the food as well as the nutrient intake was compared with the RDA suggested by (ICMR, 1999)

4.3.6 Food intake of the respondents

Table 12 Food intake of the respondents

(n = 100)

Food items	Mean food intake	RDA	Percentage RDA met	Percentage RDA deficit/excess
Cereals (g)	400.0	350	114.28	+14.28
Pulses (g)	40.1	50	80	-20
Green leafy vegetables (g)	29.2	150	19.3	-80.6
Other vegetables (g)	30.75	75	41	-59
Roots and tubers (g)	62.2	50	124.4	+24.4
Fruits (g)	20	30	66.6	-33.4

Fats and oils (ml)	43.9	40	109.75	+ 9.75
Milk and milk products (ml)	96	150	64	-36
Sugar and Jaggery (g)	15.7	30	52.3	-47.7
Meat and fish (g)	60	30	200	+100

(Source: ICMR, 1999)

The actual quantity of food intake of the respondents was determined and compared with the RDA and is presented in table 9. Percentage of RDA met by the consumption of cereals, pulses and roots and tubers by 114.28 per cent,80 per cent and 124.4 per cent respectively of RDA .Percentage of RDA met by the consumption of other vegetables and green leafy vegetables were 41 per cent and 19.3 per cent respectively. Fruit intake met about 66.6 per cent of RDA, while consumption of milk and milk products met only 64 per cent of RDA. Percentage of RDA met by sugar was 52.3 per cent and oil consumption met around 41.3 per cent. Meat and fish intake met by 200 percentage of RDA.On the whole deficit intake was observed in all the food items except cereals,roots and tubers, fats and oils and meat and fish in their diet.

4.3.7 Nutrient intake of the respondents

Table 13 Nutrient intake of the respondents

(n =100)

Nutrients	Mean intake	RDA	Percentage RDA met	Percentage RDA deficit/excess
Energy (kcal)	2225	2200	101.13	+1.13
Protein (g)	92.25	65	141.9	+41.9
Calcium (mg)	311.28	550	56.59	-43.41
Iron (mg)	19.5	35	55.71	-44.28
Vitamin C (mg)	24.2	40	60.5	-39.5
Folic Acid (µg)	40.1	100	40.1	-59.9

(Source: ICMR, 1999)

From table 13 it can be observed that the mean intake of the respondents was 2225 kcals, which was found to meet about 101.13 per cent of their recommended allowance. The mean protein intake was 92.25gm, which was 41.9 per cent higher than the RDA. The mean intake of calcium was almost 311.28 mg, which was found to meet 56.59 per cent of the RDA met. Nutrients like iron, vitamin C and folic acid was 19.5mg, 24.2mg and 40.1µg respectively which met only 55.71 per cent, 60.5 per cent and 40.1 percentage of RDA respectively. Thus from table 11 it can be seen that the mean percentage RDA deficit for calcium is 43.41 per cent, iron 44.28 per cent, vitamin C 39.5 per cent and folic acid 59.9 per cent.

4.3.8 Nutritional status index

A nutritional status index was computed with parameters such as energy, protein, haemoglobin level, BMI iron and folic acid intake and the respondents were classified as those with low, medium and high based on their nutritional status which was arrived from the mean scores and standard deviation.

Table 14 Distribution of respondents based on their nutritional status index

(n=100)

Nutritional status index	Frequency of the respondents
Low	31
Medium	55
High	14

Table 14 revealed that majority of the respondents had medium level of nutritional status index 55 per cent,31 per cent had low level of nutritional status index and remaining 14 per cent had high level of nutritional status.

4.4 Situation analysis of the respondents on adolescent nutrition,health and hygiene

Situational analysis in this study refers to the existing cognition and the existing dietary practices followed by the respondents on adolescent nutrition, health and hygiene

The existing cognition and practice of the respondents were assessed and from the information generated, lacunae in their cognition were identified and education programme of three days duration was planned and carried out. The cognition gain was assessed immediately after the counseling and adoption of better dietary and hygienic practices were studied 15 days after the education programme.

4.4.1 The existing level of cognition of the respondents on adolescent health and hygiene

A cognition test was conducted among the respondents to assess their cognition scores. The statements were categorized under three different aspects. Out of the 30 statements selected, 10 statements were related to general awareness on adolescent nutrition and health, twelve statements were related to importance of nutritious food and their role in maintaining health and the remaining eight statements were related to importance of health and role of hygienic practices to be followed to maintain proper health.

The response of the respondents for the thirty statements selected is given in Appendix (13)

The distribution of the respondents based on their response towards the 3 different aspects selected is presented in table 15

Table 15 Distribution of the respondents based on their existing level of cognition on adolescent nutrition, importance of nutritious foods and health and hygiene.

(n=100)

SL NO:	Modules	Total number of statements	Response of the respondents	
			Positive	Negative
1	General awareness on adolescent nutrition and health	10	42	58
2	Importance of nutritious food and their role in maintaining health	12	35	65
3	Importance of health and role of hygienic practices to be followed to maintain proper health	08	37	63
	Mean		38	62

It was seen that 42 per cent of the respondents had correctly answering on cognition about the statements included under general awareness on adolescent nutrition and health and 35 per cent of the respondents had correctly agreed on cognition about importance of nutritious food and their role in maintaining health and 37 per cent of the respondents were positively responding to importance of health and role of hygienic practices to be followed to maintain proper health.

4.4.2 The existing level of dietary and hygienic practices of the respondents

A practice test was conducted among the respondents to assess their practice scores. Out of the 10 statements selected, three statements were related to general awareness on adolescent nutrition and health, three statements related to importance of nutritious food and their role in maintaining health, and remaining four statements were related to importance of health and role of hygienic practices followed to maintain proper health.

The response of the respondents for the ten statements selected is given in Appendix 14

The distribution of the respondents based on their response towards the 3 different aspects selected is presented in table 16

Table 16 Distribution of the respondents based on their existing level of dietary and hygienic practices

(n=100)

SL NO:	Modules	Total number of statements	Response of the respondents	
			Positive	Negative
1	General awareness on adolescent nutrition and health	03	38	62
2	Importance of nutritious food and their role in maintaining health	03	36	64
3	Importance of health and role of hygienic practices to be followed to maintain proper health	04	43	57
	Mean		39	61

It was seen that 38 per cent of the respondents had correctly answering on practice about the statements included under general awareness on adolescent nutrition and health and 36 per cent of the respondents had correctly agreed on practice about importance of nutritious food and their role in maintaining health and 43 per cent of the respondents were positively responding to importance of health and role of hygienic practices to be followed to maintain proper health.

The scores of cognition and practice were assessed and categorized into three viz., low, moderate and high based on the mean scores and standard deviation.

4.4.3 Conduct of the counseling programme

Based on the data collected on the existing level of cognition and practice followed by the respondents the lacunae in the cognition and the dietary and hygienic practices followed were elicited and a need based counseling programme was formulated and conducted and impact of the counseling programme was evaluated through a post test.

4.5 Impact of counseling on variation in cognition and practice of the respondents to adolescent nutrition,health and hygiene

4.5.1 Respondents based on cognition scores.

The data on the distribution of respondents based on cognition scores are presented in table 17.A pre- post experimental design was used to study the impact of counseling on the cognition gain of the respondents. Gain in cognition was found out by working out the pre and post mean cognition scores.

Table 17 Distribution of respondents based on cognition scores

(n=100)

Category	Frequency of respondents	
	Pre-test (K0)	Post-test (K1)
Low	22	11
Medium	70	74
High	08	15

Table 17 revealed that 70 per cent of the respondents had medium level of cognition scores, while 22 per cent had low cognition scores and 8 per cent of the respondents had high cognition scores before participating the counseling programme.

The results of the post-test cognition K1 scores indicated that 74 per cent of the respondents had medium scores, 15 per cent had high scores and only 11 per cent had low scores after the counseling programme.

4.5.2 Respondents based on the practice scores

Table 18 shows the distribution of respondents based on the practice scores. Gain in practice was found out by working out the pre and post mean practice scores of the respondents.

Table 18 Distribution of respondents based on the practice scores

(n =100)

Category	Frequency of respondents	
	Pre-test (P0)	Post-test(P1)
Low	26	08
Medium	56	70
High	18	22

It was observed that 56 per cent of the respondents had medium level of practice scores, while 26 per cent had low level of scores and remaining 18 per cent of the respondents had high level of practice scores before participating the counselling programme.

After counselling programme, there is a gradual increase in results It shows that the post-test practice P1 scores indicated that 70 per cent of the respondents had medium scores, 22 per cent had high scores, and only 8 per cent had low practice scores.

4.5.3 Distribution of respondents based on the frequency of use of various food items (before counselling programme)

Data regarding the distribution of respondents based on their practice scores towards frequency of use of various food items in the daily diet is presented in table 19

The data revealed that parboiled rice was consumed daily by all the respondents. Wheat was consumed twice in a week by 30 per cent of the respondents. Sixty five per cent of the respondents were found to be using rice flakes occasionally in their diet. Frequency of consumption of ragi, which is a

good and cheap source of iron, was found to be low with 40 per cent consuming it occasionally.

Regarding the use of pulses, it was noticed that the black gram was included 30 per cent by weekly thrice, dhal was included by 50 per cent by once in a week, bengal gram by 50 per cent by once in a month, and green gram by 50 per cent once in a month in their diet. However it was interesting to note that none of them included sprouted pulses in their diet.

Focusing on the use of green leafy vegetables it was observed that green leafy vegetables were not regularly included in their diet, and it was reported that amaranthus was used by 60 per cent, coriander leaves was used by 60 per cent occasionally and drumstick leaves by 70 per cent occasionally. Ninety per cent of the respondents were found to be using curry leaves by daily in their diet.

Data regarding the use of other vegetables were not regularly included in their diet.It was observed that the use of cucumber by 40 per cent, plantain green by 50 per cent and tomato by 40 per cent once in a month. Consumption of ladies finger by 40 per cent and that of brinjal was 50 per cent occasionally by the respondents

Data revealed that the use of roots and tubers, carrot and potato was found to be by 60 per cent of the respondents followed by beetroot which was consumed by 60 per cent of the respondents once in a month. Tapioca was consumed by 50 per cent, and onion was included by 40 per cent of the respondents daily in their diet.

Table 19 Distribution of respondents based on the frequency of use of various food items

Food items	Daily	Weekly thrice	Weekly twice	Once in a week	Fortnightly	Once in a month	Occassionally	Never
Cereals								
Parboiled rice	100	-	-	-	-	-	-	-
Wheat flour	10	20	30	20	10	10	-	-
Rice flakes	-	-	-	25	-	10	65	-
ragi	-	-	-	-	-	30	40	30
Pulses								
Black gram	20	30	20	10	10	5	5	-
Dhal	-	-	10	50	10	10	10	10
Bengal gram	-	-	10	20	10	50	10	-
Green gram	-	-	-	-	10	50	40	-
sprouted pulses	-	-	-	-	-	-	-	100
Leafy vegetables								
Amaranthus	-	-	-	-	-	60	40	-
Coriander leaves	-	-	-	-	-	-	60	40
Drumstick leaves	-	-	-	-	-	-	70	30
Curry leaves	90	10	-	-	-	-	-	-
Other vegetables								
Cucumber	-	-	-	30	20	40	10	-
Ladies finger	-	-	-	10	12	38	40	-
Plantain green	-	-	-	-	-	50	50	-
Brinjal	-	-	-	-	-	40	50	10
Tomato	-	-	-	10	10	40	30	10
Roots and tubers								
Onion big	40	10	10	10	-	20	10	-
Carrot	-	-	20	20	-	60	-	-
Beetroot	-	-	-	-	-	60	40	-
Potato	-	-	-	20	10	60	-	10

Tapioca	50	10	-	5	5	-	30	-
Fruits								
Mango (ripe)	-	-	-	-	-	20	80	-
Pineapple	-	-	-	-	10	40	50	-
Orange	-	-	-	-	-	40	60	-
Jackfruit	-	-	-	-	-	45	55	-
Amla	-	-	-	-	-	20	80	-
Guava	-	-	-	-	10	20	70	-
Papaya	-	-	-	-	-	20	80	-
plantain ripe	-	-	-	-	15	35	50	-
Nuts and oil seeds								
Grount nut	-	10	15	32	28	5	10	-
coconut	30	10	10	20	-	20	10	-
Animal foods								
Egg	-	-	25	35	20	15	5	-
Meat	-	-	50	20	10	10	10	-
Fish	100	-	-	-	-	-	-	-
Others								
Jaggery	-	-	-	-	-	20	80	-
Tea /coffee	50	10	10	10	-	20	-	-

Data pertaining to the use of fruits revealed that none of the respondents included fruits daily or once in a week in their diet and fruits were included only by once in a month or occasionally. Among nuts and oilseeds only groundnut was found to be frequently used by 32 per cent once in a week.

Regarding the frequency of the use animal foods such as egg, meat and fish, it was observed that the fish consumed daily by all the respondents, egg is consumed by 35 per cent once in a week, meat by 50 per cent weekly twice. Frequency of use of other foods items such as jaggery by 80 per cent occasionally and milk by 50 per cent daily in their diet.

Based on the above data the food use frequency scores were calculated as suggested by Reaburn et al.,(1979) and is presented in table 20

Table 20 Frequency scores of various food items

Food items	Average scores	Percentage of total scores
Cereals		
Parboiled rice	7.00	100.00
Wheat flour	4.7	67.14
Rice flakes	2.6	37.14
Ragi	1.00	14.27
Pulses		
Black gram	5.5	72.14
Dhal	3.7	52.85
Bengal gram	2.7	38.57
Green gram	1.70	24.28
Sprouted pulses	-	-
Leafy vegetables		
Amaranthus	1.6	22.8
Coriander leaves	0.6	8.57
Drumstick leaves	0.7	10.0
Curry leaves	6.9	98.0
Other vegetables		
Cucumber	2.70	38.57
Ladies finger	1.52	21.71
Plantain green	1.50	21.42
Brinjal	1.60	22.85
Tomato	2.10	30

Roots and tubers		
Onion big	4.8	68.57
Carrot	2.90	41.42
Beet root	1.50	21.42
Potato	2.50	35.71
Tapioca	4.75	67.85
Fruits		
Mango (ripe)	1.2	17.14
Pineapple	1.6	22.85
Orange	1.4	20.00
Jack fruit	1.5	23.57
Amla	1.20	17.14
Guava	1.40	20.00
Papaya	1.20	17.14
plantain ripe	1.65	23.57
Nuts and oils		
Ground nut	3.63	51.85
Coconut	4.50	64.2
Animal foods		
Egg	3.60	51.42
Meat	3.90	55.71
Fish	7.0	100
Others		
Jaggery	1.0	14.28
Tea/coffee/milk	5.40	77.14

Based on the percentage frequency scores, foods consumed by the respondents were classified as most frequently used (percentage scores above 80), medium frequently used (percentage scores between 80-50), less frequently used (percentage scores between 50-30),and least frequently used foods(percentage scores below 30)and the details are shown in table 21.

Table 21 Classification of various food items, based on food use frequency scores.

Most frequently used(above 80)	Medium frequently used between 80-50	Less frequently used between 50-30	Least frequently used(below 30)
Parboiled rice, Fish, curry leaves	Wheat flour, Black gram, Dhal,Onion Tapioca, Ground nut, Egg, Meat,Milk	Bengal gram, Cucumber,Rice flakes, Carrot, Potato	Ragi, Green gram, Amaranthus, Coriander leaves, Drumstick leaves,Ladies finger, Plantain green, Brinjal, Tomato, Beet root , Mango ripe, Pineapple , Orange, Jack fruit, Amla, Guava, Papaya,Plantain ripe, Jaggery

From table 21 it can be seen that parboiled rice, fish and curry leaves were most frequently used by the respondents .Use of wheat flour, black gram, dhal, onion tapioca, ground nut, egg, meat and milk were found to be medium frequently used. Bengal gram,cucumber, carrot and potato were found to be less frequently used. Rice flakes, ragi, green gram, amaranthus, coriander leaves, drumstick leaves, ladies finger, plantain green, brinjal, tomato, beet root, mango ripe, pineapple, orange, jack fruit, amla, guava, papaya,plantain ripe and jaggery

were found to be the least frequently used food items in their diet. None of them used the sprouted pulses in their diet.

4.5.4 Distribution of respondents on the adoption of better dietary practices based on frequency of use of various food items before and after the counseling programme.

Fifteen days after the implementation of counseling, the frequency scores obtained were assessed and the details of the score before and after the counseling programme are presented below.

Table 22 Frequency of use of various food items before and after the counseling programme

Food items	Average scores		Percent of total scores	
	Before	After	Before	After
Cereals				
Parboiled rice	7.00	7.00	100.00	100.00
Wheat flour	4.7	4.6	67.14	65.70
Rice flakes	2.6	3.53	37.14	50.42
Ragi	1.00	2.25	14.28	32.14
Pulses				
Black gram	5.5	5.5	78.57	78.57
Dhal	3.7	3.81	52.85	54.4
Bengal gram	2.7	3.00	38.57	42.85
Green gram	1.70	2.27	24.28	32.42
Leafy vegetables				
Amaranthus	1.6	1.75	22.8	25.00
Coriander leaves	0.6	0.61	8.57	8.71
Drumstick leaves	0.7	0.7	10.00	10.00

Curry leaves	6.9	6.9	98.00	98.00
Other vegetables				
Cucumber	2.70	2.82	38.57	40.28
Ladies finger	1.52	2.12	21.71	30.28
Plantain green	1.50	2.35	21.42	33.57
Brinjal	1.60	2.20	22.85	31.42
Tomato	2.10	2.15	30.00	30.71
Roots and tubers				
Onion big	4.8	4.8	68.57	68.57
Carrot	2.90	3.50	41.42	50
Beet root	1.50	2.17	21.42	31.00
Potato	2.50	2.75	35.71	39.28
Tapioca	4.75	4.75	67.85	67.85
Fruits				
Mango (ripe)	1.20	2.18	17.14	31.14
Pine apple	1.60	2.25	22.85	32.14
Orange	1.40	2.21	20.00	31.57
Jack fruit	1.50	2.33	21.42	33.28
Amla	1.20	2.17	23.57	31.00
Guava	1.40	2.27	20.00	32.42
Papaya	1.20	2.25	17.14	32.14
Plantain ripe	1.65	2.15	23.57	30.71
Nuts and oils				
Ground nut	3.63	4.00	51.85	57.14
Coconut	4.50	4.50	64.2	64.2
Animal foods				
Egg	3.60	4.00	51.42	57.14
Meat	3.90	3.90	55.71	55.71

Fish	7.00	7.00	100.00	100.00
Others				
Jaggery	1.00	2.25	14.28	32.14
Coffee/tea	5.40	5.40	77.14	77.14

Based on the food use frequency scores, food consumed by the respondents were classified as most frequently used (percentage scores above 80), medium frequently used (percentage scores between 80-50), less frequently used (percentage scores between 50-30) and least frequently used foods (percentage scores below 30) and the details shown in table 23.

Table 23 Classification of use of various food items by the respondents before and after counseling programme

Particulars	Before counseling	After counseling
Most frequently used (above 80)	Parboiled rice, Fish, curry leaves	Parboiled rice, Fish, curry leaves
Medium frequently used (between 80-50)	Wheat flour , Black gram, Dhal, Onion, Tapioca, Ground nut, Coconut, Egg, Meat, Milk	Wheat flour, Rice flakes, Black gram, Dhal, Onion, Carrot, Tapioca, Groundnut, Coconut, Egg, Meat, Milk
Less frequently used (between 50-30)	Rice flakes, Bengal gram, Cucumber, Tomato, Potato	Ragi, Bengal gram, Green gram, Cucumber ,Ladies finger, Plantain green, Brinjal, Tomato, Beet root, Potato, Mango ripe, Pineapple, Orange, Jack fruit, Amla, Guava, Papaya, plantain ripe, Jaggery

Least frequently used (below 30)	Ragi, Green gram, Amaranthus, Coriander leaves, Drumstick leaves, Ladies finger , Plantain green, Brinjal, Beet root, Mango ripe, Pineapple, Orange, Jack fruit, Amla, Guava, Papaya , Jaggery	Amaranthus, Coriander leaves, Drumstick leaves

From table 23 it can be seen that parboiled rice, fish and curry leaves were found most frequently used by the respondents before and after counseling programme.It was also revealed that after counseling programme shift of the various food items was slightly increased . It was observed that majority of the respondents included rice flakes, ragi, amaranthus , drumstick leaves, coriander leaves, amla, and jaggery more frequently than before counseling programme. However even after the counseling programme use of sprouted pulses was not adopted by the respondents

4.6 Correlation between cognition and practice scores of the respondents with the selected independent variables

The relationship of the pre-test cognition and practice scores of the respondents with the selected independent variables viz., family size, family income, educational status of the respondents, food consumption pattern, nutritional status index and participation index. Correlation coefficient was computed and the results are presented in table 24

Table 24 Correlation between overall increase in cognition level, and adoption of practice of selected socio-economic variables

Sl. No	Independent variables	Overall gain in cognition(post test)	Adoption of practice (post test)
1	Family size	-0.0221	0.0274
2	Income of the family	0.0113	0.0142
3	Educational status of the respondents	0.1792	0.0290
4	Food consumption pattern	0.1342	0.0170
5	Nutritional status index	0.1838*	0.0211
6	Participation index	0.1967*	0.1239

*significant at 5 per cent level

The overall gain in cognition (post- test) and the selected variables viz., nutritional status index and participation index of the respondents were found to have significant relationship at 5 per cent level. With respect to adoption of practice (posttest) of the respondents and the selected variables viz., family size,income of the family,educational status of the family,food consumption pattern,nutritional status index and participation index were found to have no significant relationship.

Based on correlation observations made are depicted in the empirical diagram are represented given below.

= -ve correlation

= neutral

= +ve correlation

Where,C = Cognition,P =Practice.

X1 = Family size,X2 = Income of the family,

X3 = Educational status of the respondents,X4 = Food consumption pattern,

X5 = Nutritional status index,X6 = Participation index,

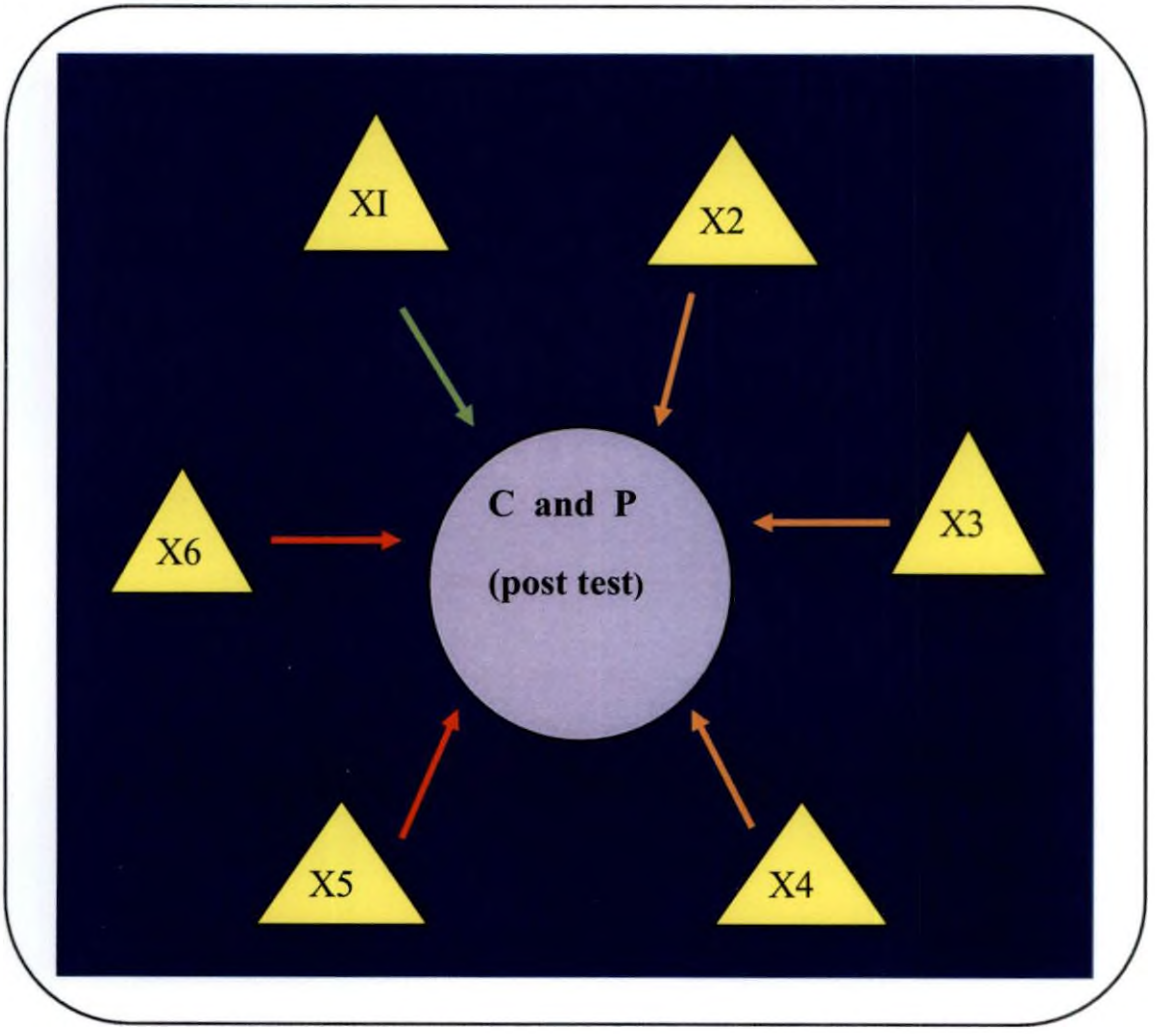


Figure -3 Empirical diagram

4.7 Comparison of the cognition and practice scores of the respondents before and after counseling

4.5 Comparison of the cognition scores of the respondents

Gain in cognition was assessed from the difference between pre and post score cognition by estimating't' value.

Table 25 Comparison of the cognition scores among the respondents

Knowledge	Mean score	Estimated ' t' value
Pre-test (K0)	11.64	
Post –test(K1)	12.73	2.556**
Gain percentage	3.63	

** Significant at 1 per cent level

The estimated't' value is significant at one per cent, which indicated that the counseling programme on awareness about nutritious foods and health and hygiene had a significant effect on the cognition of the respondents. The percentage gain in cognition score was 3.63.

4.5.1 Comparison of the practice scores among the respondents

Change in practice is assessed by the difference between the scores before and after the counseling programme.

Table 26 Comparison of practice scores among the respondents

Practice	Mean score	Estimated 't' value
Pre-post	3.73	
Post-test	4.22	2.088**
Adoption (percentage)	4.9	

**Significant at 1 per cent level

As depicted in table 26 the rate of adoption of the respondents based on the post-test practice score was found to be greater than pre- test practice score. Estimated 't'value of (2.088**) shows the significant effectiveness of the counseling programme on the rate of adoption. It was also seen that the percentage extend of adoption scores was 4.9.

Discussion

5. DISCUSSION

The results of the study 'Nutritional status and nutrition cognition of adolescent girls in the coastal area of Thiruvananthapuram' are discussed under the following heads.

5.1 Personal and socio economic characteristics of the respondents

5.2 Level of participation of the respondents in the various programmes functioning in the area to improve adolescent nutrition, health and hygiene

5.3 Nutritional status of the respondents

5.4 Situation analysis of the respondents on adolescent nutrition, health and hygiene

5.5 Impact of education programme or variation in cognition and practices of the respondents

5.6 Correlation between the cognition and practice of the respondents with the selected independent variables.

5.7 Comparison of the cognition, practice scores of the respondents before and after counseling

5.1 Personal and socio economic characteristics of the respondents

In the present study socio economic and personal variables such as type and size of the family, educational status of the respondents and the family members, family income, social participation and the mass media exposure were taken.

Socio economic status known to key determinants of health status of any individuals as it affects the educational status, food consumption pattern and other lifestyle behaviour factors (Cheng,2003).The health of adolescent girl is intricately related to the socio-economic status of the household to which they belong and their age and kinship status within the households(Anant,2001).A recent research revealed that socio economic and demographic factors play an important role in the food consumption pattern (Rahman and Rao,2002).Adolescents are one of the most important group of any society as they have an influential effect on the future socio economic and cultural status of the society.

The family backgrounds of the respondents were also studied in detail to understand their socio economic conditions. The type of family of the respondents revealed than an over whelming majority of the respondents were having nuclear families (Table1).

It is observed by many researchers that the concept of nuclear family is becoming more and more common in our society and joint family system is fast disappearing. Similar reports have been given by Renjini (2008) and Sheethal (2011) in their studies done in Thiruvananthapuram district.

Joint family is declining these days especially in the city like Trivandrum were dwellers are mostly working class people migrated from different parts of Kerala.NFHS-2-survey (2001) conducted in Kerala found that just over half of all households are of nuclear type.

Regarding the family size it could be seen that 83 percent of the respondent belonged to small family *i.e.*, one to four members while 17 percent of the respondent belonged to the medium sized families (5 -7 members).Park (1997) had reported that average family size in India is four .This may be because of the awareness about small family and its importance. Kerala is a state with high literacy and people are exposed to the benefits of having small family.

The findings of this study is in conformity with the studies reported by Jaimy (2001) and Bulliyya et al., (2002), Reshmi (2007) and Krishnendu (2012).

Educational status of the respondents in the present study revealed that out of 100 respondents 48 had medium level of educational status. This shows that present generation is better educated than the older generation .The findings of this study is in conformity with the studies reported by Razeena (2000), Jayanathan (2004) and Geetha (2008).

Education is life blood in any developmental activity and helps people to understand and practice the ideals preached. Literacy and educational attainments are the indicators of quantitative improvements in human resources and female literacy is said to hold the key to the coming generation of full genetic potentials pertaining to health and nutrition for family planning. Female literacy is also indicative of better nutritional status. However, information regarding the ways to improve the quality of life and to realize basic human rights including rights for better nutrition is not furnished through any educational programme (Sheela, 2004).

With regard to the family educational status majority of families (81percent) were found to be having low level of educational status. The results highlight the need to take up efforts to improve the educational status of the respondents and their family members.

Education is the present day world has been considered as the single most important means for the individuals for bringing about social and economic advancement through enlarging their available set of opportunities and choices which provides sustained improvement in well-being (Economic Review Kerala, 2003).

The findings of the present study are in line with the findings of Kavitha (1999) and Geetha (2008). National Family Health Survey (2005-06) also has reported that 4 per cent of the population in Kerala is found to be illiterates.

Family income is considered as an important determinant, since it determines the family status and socio economic position in the society to which they belong. In the case of family income of the respondents 20 per cent of the families belonged to monthly income range below Rs 1000 and only 30 families belonged to the higher range with in the BPL level. All the respondent belonging to BPL family had only very small land holdings and they earned only a negligible amount from subsidiary jobs. The study is in concurrence with the result of George and Krishna Prasad (2006), Dietary intake was found to be markedly influenced by income level as revealed in the diet survey conducted by NNMB (1996) and BPL survey (2011).

On assessing the social participation of the respondents it was found that 40 per cent of the respondents were members of some social organizations and remaining 60 per cent of the respondents were not members of any social organizations. However none of them were office bearers of any social organizations. The findings of the study found to be in concurrence with the studies of Sasankan (2004) and Bhuvanaswari (2007).

Mass media play a significant role in the spread of new ideas among women. In Kerala majority of the families had their own television sets and radio and 90 per cent of the respondents had regular exposure to media (NFHS 2005-06).The present study also revealed that majority of the families (88per cent) possesses television sets and radio in their homes. Similar findings were observed by Sheela (2004) and Bhuvaneswari (2007).

5.2 Level of participation of the respondents in the various programmes functioning in the area to improve adolescent nutrition, health and hygiene

High level of participation of the respondents in any programme is essential for the success of any developmental initiative. The health of the adolescent girl is vital as they are the future mothers. Various organizations such as ICDS and the recently started Kishore Shakti Yojana have various activities for the benefit of the adolescent girls especially those who are below the poverty

level. But however it was noted that only 30 per cent of the adolescent girls were found to be participating in the activities of ICDS and 15 per cent in Kishore Shakti Yojana. Primary Health Centers are responsible for providing medicinal supplement for the vulnerable group of our population where adolescent girls also belong. But however in the present study it was noted that very few of the respondents (10 per cent) received the medical supplements from ICDS or PHCs. The field level functionaries are responsible for distributing the supplements to the respondents. They may be made alert to ensure the supply of medicinal supplements to these vulnerable groups.

A study on NNAP conducted by Usha et al. (2006) in Karnataka revealed that 38 per cent did not receive any medical supplements from anganwadies. The result is almost similar in the present study.

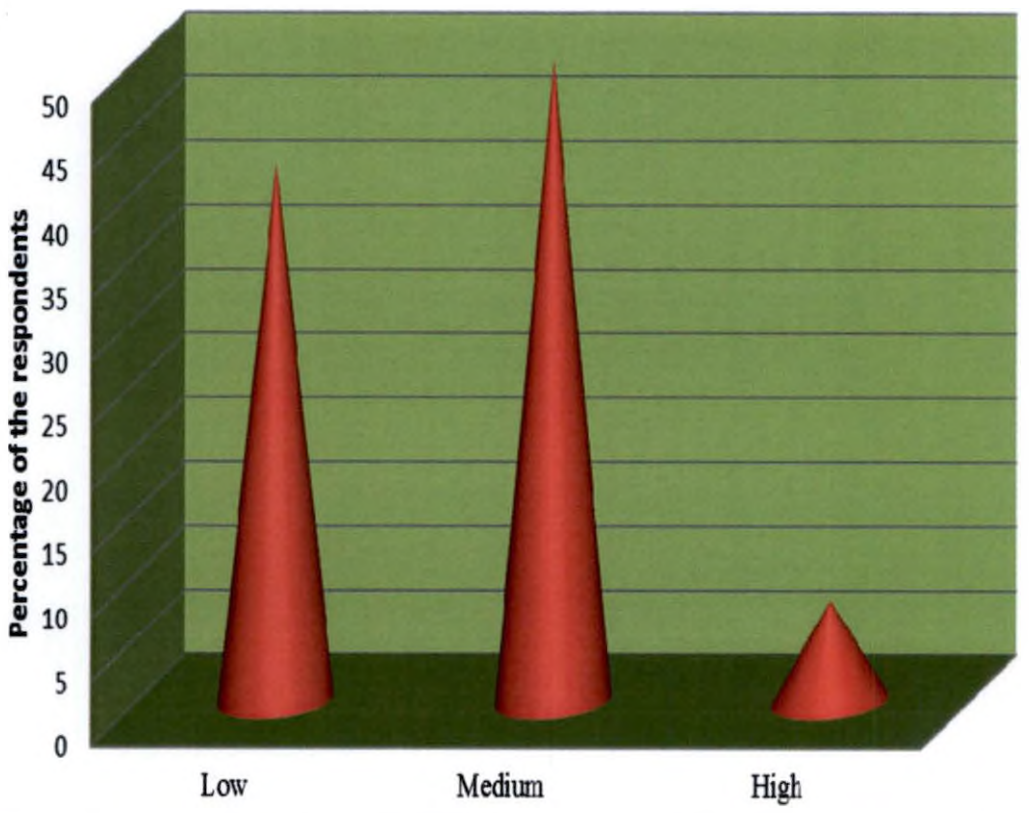
The exposure of the respondents to nutrition and health related educational programmes of the organisations such as ICDS, PHC and schools was ascertained and in the present study only less than 15 per cent of the respondents had participated in the programmes of ICDS. Programmes under ICDS, PHC and schools were attended occasionally by 50 per cent, 20 per cent and 30 per cent respectively. Whereas as remaining 35 per cent of the respondents never attended any of the programmes. Other reasons may be their pre-occupations related to their studies or their lack of interest in attending the programmes.Inconvenience of time and place were some of the difficulties expressed by the respondents.Ukkuru (1993) in her study on the participation of respondents in the ICDS Programme in Malappuram, found that only 63 per cent of the respondents regularly participated in the nutrition and health education classes.

The results of analysis on participation in nutrition, health and hygiene programmes revealed that 50 percent of the respondents were having medium participation index, 42 percent were having low participation index and remaining 8 percent of the respondents were having high participation. Prasanna kumari (2004) also found similar results in participation of ICDS beneficiaries in the

nutrition and health education activities where majority came under medium level of participation while only 20 per cent had high participation rate and 18 per cent had low participation levels. The low participation in the programme by the respondents may be due to their lack of awareness. This may also to the lack of effectiveness of the education programmes.

This revealed that periodic educational and awareness programmes through these organizations should be conducted, So that the participation of respondents could be enhanced to bring about the proper use of visual and visual media so as to conscientise them about the importance of nutrition and to motivate them for a healthy living. This will also help to reduce prevalence of malnutrition among the adolescent girls and to develop them as healthy mothers and healthy citizens. The findings of the study is in conformity with the studies reported by Bhuvaneswari (2007).

Figure 4 Distribution of respondents based on their participation index



5.3 Nutritional status of the respondents

As reported by Swaminathan (1998) to get an overall picture of the nutritional status of individuals as population groups it is better to use a combination of methods.

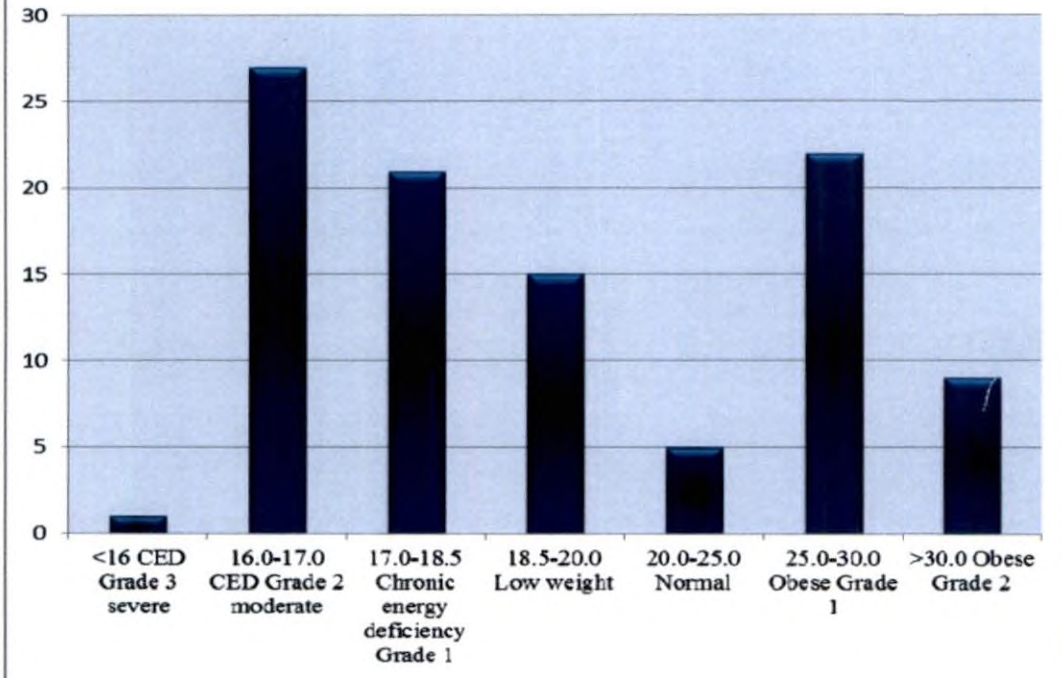
5.3.1 Anthropometric Measurement

Anthropometry is a method which involves measurement of human body and was taken as a primary method to assess the nutritional status of the subject. Anthropometry is also utilized to picturise the rate and direction of growth and to identify deviation if any from the pattern of growth of well-nourished adolescent girls . A nutritional status index was also worked out using the anthropometric measurements, which was used as a yard stick to find out the variations in the nutritional status of adolescent girls of BPL families belonging to 16 and 18 years of age groups.

Sreelekshmi (2003) observed that anthropometric measurement of adolescent girls (body weight and height) increased with an increase in the age from 13 to 18 years.

BMI (Body Mass Index) is the value in distinguishing the nutritional status of different groups, monitoring the adequacy of food and in specifying the proportion of malnourished in a population. BMI is an indicator of body's energy stores as reported by Choudhary and Solanki (1999).WHO (1995) revealed that under nutrition is used as an indicator of current nutritional status. Body Mass Index (BMI) expressed as ratio of weight to height square(wt./ht^2) and was used as a parameter for detecting chronic energy deficiency (CED) and for purposes of classifying the respondent's deficient energy intake . Findings indicated that 27 per cent were having moderate chronic energy deficiency,21 per cent mild chronic energy deficiency ,22 per cent belonged to obsess grade1,15 per cent with low weight and a per cent belonged to obese grade II. The findings of the present study are in the line with the findings of Krishnaroopa (2003).

Figure 5 Distribution of respondents based on their BMI



5.3.2 Triceps skin fold thickness

In the present study shows that majority of the respondents (54 per cent) belonged to low fat deposit,31 per cent had high level of fat deposit . The study is in line with the findings of Renjini (2008).

5.3.3 Bio chemical assessment

In the present study the results indicated that majority of the respondents (99 per cent) were suffering from some forms of anaemia, 46 per cent were mildly anaemic,30 per cent moderately anaemic,19 per cent were marginally anaemic and 4 per cent were severely anaemic (Table 9).

Anaemia is one of the glaring deficiency in adolescent girls, which they acquire from childhood and increases in extent and magnitude during the reproductive age.The present adolescent girls will be the future mothers (IUHPE, 2000).This result is in concurrence with the obsevations of (NFHS-3,2005-2006) where was reported that 56 per cent of the adolescent girls in India and 44 per cent in Kerala were anaemic.

The study is in line with the findings of Sajitha (2000), Nirmala (2002), Krishnaroopa (2003) and Reshmi (2007).

Figure 6 Distribution of respondents based on triceps skin fold thickness

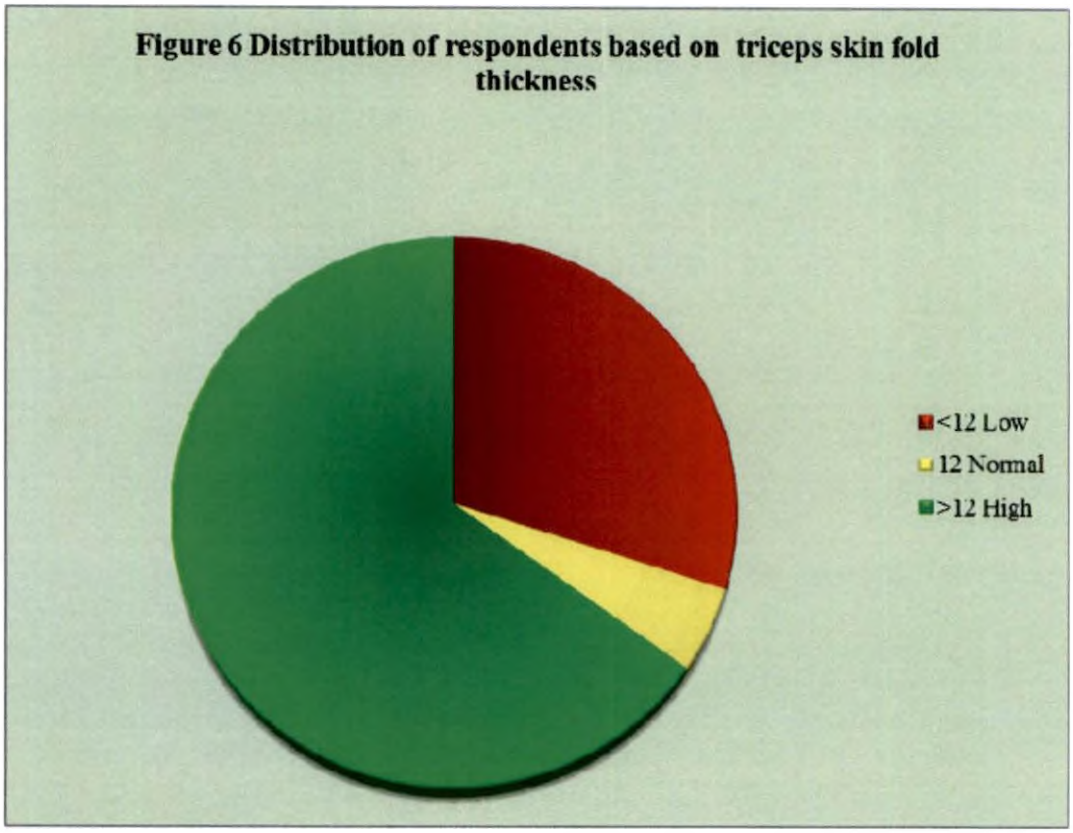
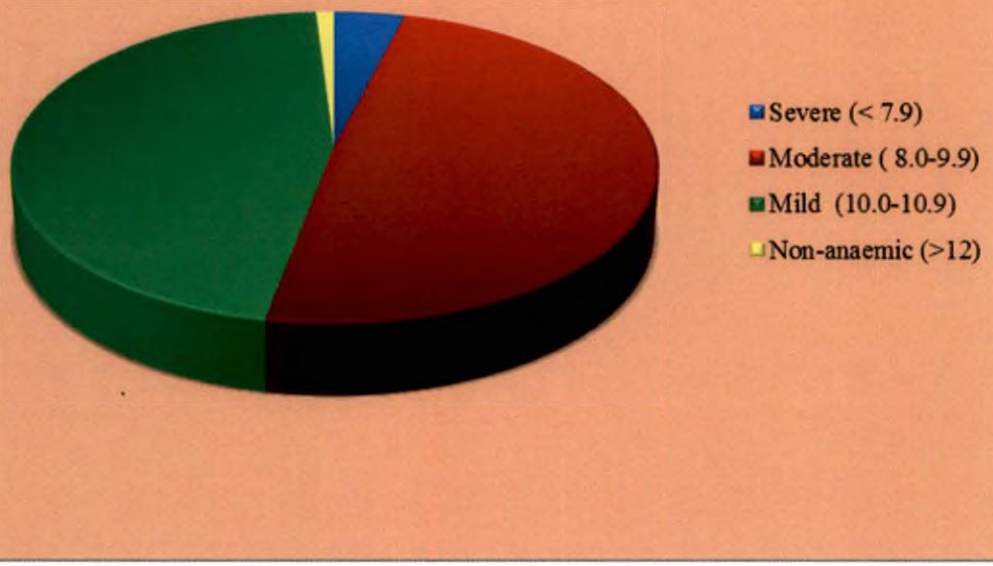


Figure 7 Distribution of respondents based on anaemic level



5.3.4 Clinical studies

Park (1997) observed that the ultimate objective of clinical examination is to assess levels of health of individual in relation to the food they consume .Anaemia is the most common nutritional deficiency symptom noted. Anaemia was found among 60 per cent of the respondents, 10 per cent of the respondents were having skin problems, 8 per cent were suffering from angular stomatitis,8 per cent were having bleeding gums and 5 per cent suffering from dental carries.

According to Kellong's Nutrition Advisory Service (1997) prevalence rate of anaemia among adolescent girls is very high in rural area than in urban area. Similar observations were made by Anjana (2003) among adolescent girls and Sheela (2004).

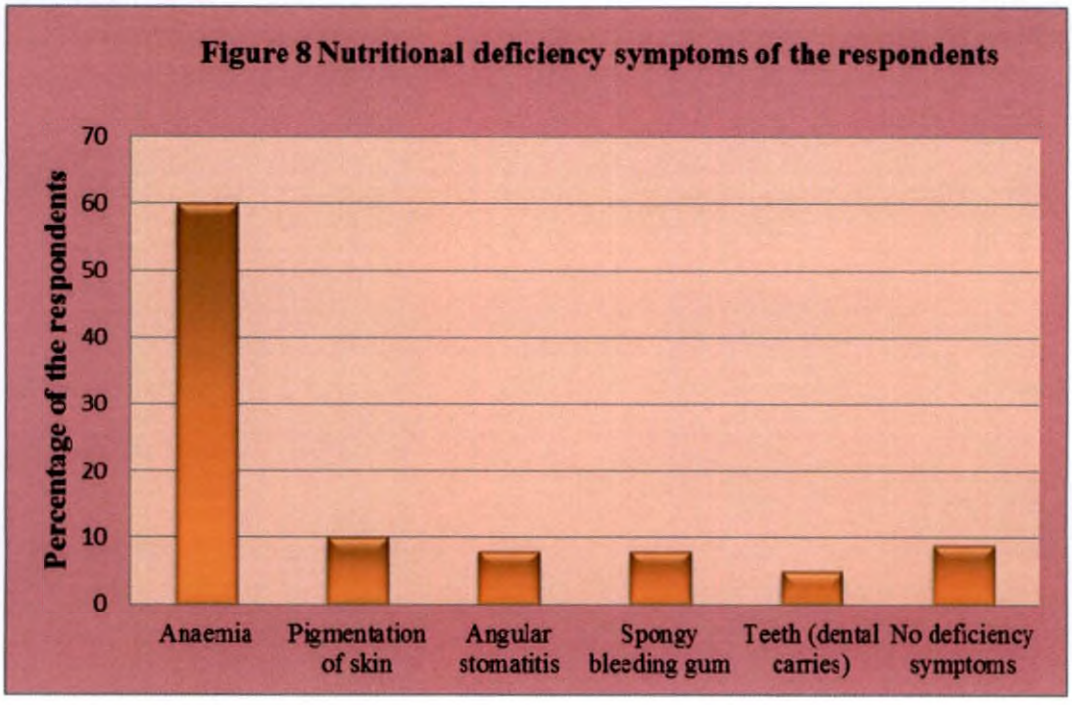


Figure 8 Nutritional deficiency symptoms of the respondents
Percentage of the respondents
70
60
50
40
30
20
10
0
Anaemia
Pigmentation of skin
Angular stomatitis
Spongy bleeding gum
Teeth (dental carries)
No deficiency symptoms

5.3.5 Diet survey

Food habits constitute one of the most obvious distinguishing features among population of different places. With regard to the food habits of the respondent's majority of them were non vegetarians. Similar result was obtained by Beatrice (1999) in her study undertaken in Thiruvananthapuram district where majority of adolescent sample were noted as non-vegetarians. Consumption pattern of keralites as reported by Kerala Statistical Institute (2000) revealed that 98 per cent of the Keralites are habituated to non-vegetarians.

Considering the meal timings of the respondents it was observed that majority of them were taking breakfast after 9.30 am. Lunch was taken by 51 per cent after 2 pm, 65 per cent were taking tea after 5 pm and having dinner by 62 per cent of the respondents after 9 pm. This study is in line with that of Khalil (2003) on the breakfast practices of adolescent girls.

The food habits of adolescents in the study are mainly characterized by irregular meal pattern as revealed earlier by Samuelson (2000). Lack of time is the main reason reported by them. Another observation was found that all the respondents used to consume left over food.

Regarding the special foods given during different stages of life cycle, it was noticed that 45 per cent were not given any special food.

5.3.6 Food intake of the respondents

The dietary intake of the respondents were computed from individual food consumption by 24 hour recall method .Nutritional status pertains to the conditions of health of the individual, affected by the quantum intake of foods and the mode of cooking consumption.

Data presented in Table 12 depicts that the intake of pulses, fruits, milk and milk products, vegetables were very poor among the respondents NNMB (1994) has reported that the consumption of fruits was much below RDA among the rural population of Thiruvananthapuram. But they consumed locally available

seasonal fruits .Regarding the consumption of green y vegetables, poor consumption was found among the respondents .A study done by kumara and Singh (2003) on secondary school children also reported that green leafy vegetables and other vegetables are inadequate in adolescent's diet.

Regarding the consumption of fleshy foods it was found that the respondents used to take this item in once in a week. Intake of fish was very high among the respondents. Apart from milk and pulse the major protein source of keralites seems to be fish .A study done in Bangladesh among urban adolescent girls revealed that next to cereals which dominate their diet is pulse and fish which are most frequently used food items (Mony, 1993 and jayanatha, 1993).

Fats and oils were found to be mainly used only for seasoning. In terms of percentage of RDA, oils and fats intake was 44.0 percent. Sugar was used on daily basis as an ingredient of tea, coffee or milk. The finding of the present study is to similar to that of Sheela (2004, Bhuvaneswari (2007).

5.3.7 Nutrient intake of the Respondents

The nutrient intake of the respondents was calculated using the values of composition of foods given in the nutritive value of Indian foods published by ICMR (1999). In order to meet the daily nutrient requirement and to improve their health and nutritional status, there is a need to increase the nutrient intake through foods (Ushadevi and Nath, 2003).

Detail on nutrient intake of respondents were presented in Table 13 reveals that intake of all nutrients expect energy was comparatively closer to RDA of ICMR. Energy consumption was comparatively higher than the other nutrients and this might be due to consumption of more cereals as they consider cereals as the staple food. Saurupriya and Mathew (2000) and Sunitha and Sushila (2003) were also found the similar results among tribal adolescents.

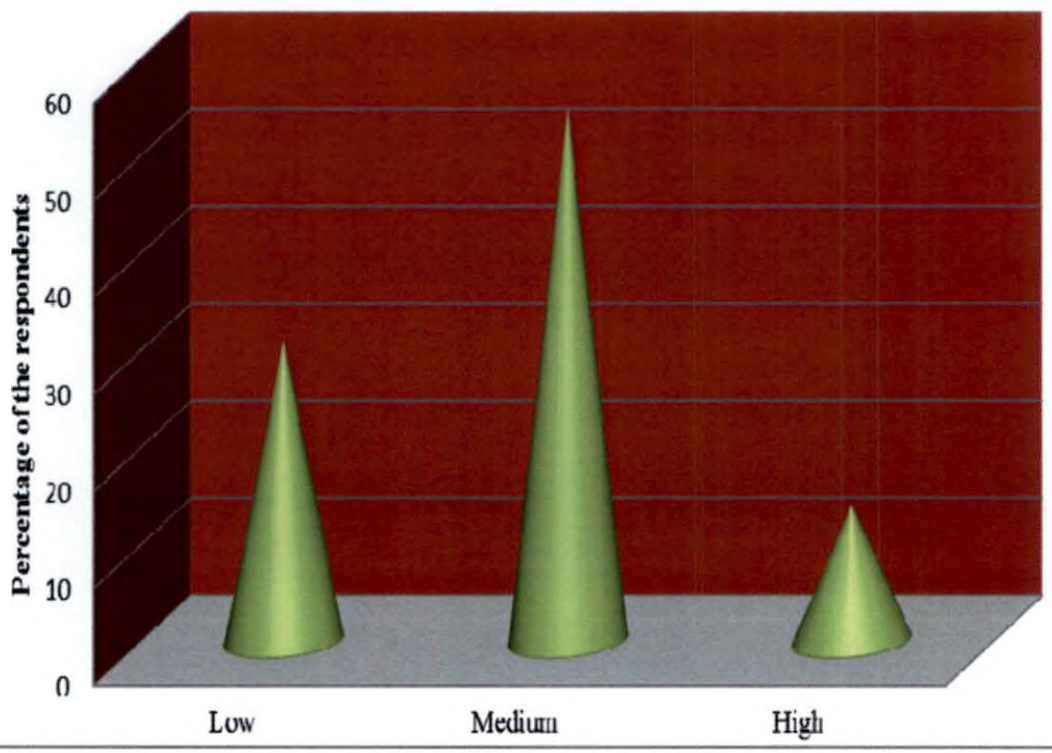
Calcium deficit was also found in adolescents. Intake of protein was comparatively closer to RDA. Similar observations were found by Rajni and Priti (2003).

5.3.8 Nutritional Status Index (NSI) of the respondents

The NSI of the respondents were computed, based on the various parameters such energy, protein, iron, folic acid, haemoglobin level and BMI. Majority of the respondents (55 per cent) had medium level of nutritional status index. While 31 per cent had low-level of nutritional status index and 14 per cent had high level of nutritional status index.

Adolescents form a significant part of our population and the assessment of nutritional status is relevant and healthy adolescents are a pre-requisite to a healthy adult life and a healthy future generation. ICMR (1994) reported that in the field studies to assess the nutritional status, heavy reliance must be placed in the measurement of external morphology of the body. Nutritional anthropometry is considered as one of the most frequently used method for assessing the nutritional status. Nutritional anthropometry is the measurement of human body at various ages and it is based on the concept that an appropriate amount should reflect any morphological variations due to significant functional and physiological changes Rao (1996) and Sreelekshmi (2003). Here major sample parameters like height, weight and BMI were measured to understand the nutritional status of the adolescents. In addition to this bio chemical investigation, clinical assessment of deficiency symptoms and dietary assessment were also carried out to get a complete picture of health and nutritional status of the sample. From the various methods of assessment it is clear that the adolescents under study do not project a good nutritional status. The sample showed deficit in anthropometrical measurements, poor haemoglobin level, possessing many of the nutritional deficiency symptoms and consume a diet inadequate in quantity and quality. The result is in line with the findings of Shanmuga priya (2005) and Bhuvaneswari (2007).

Figure 9 Distribution of respondents based on their nutritional status index



5.4 Situation analysis of the respondents on adolescent nutrition, health and hygiene

5.4.1 Cognition of the respondents on adolescent nutrition health and hygiene

In the present study 30 statements that is aimed primarily knowledge of the respondents on adolescent nutrition, health and hygiene was divided into three modules.viz. General awareness on adolescent nutrition, importance of nutritious food and health and hygiene.

It was seen that 42 per cent of the respondents had correctly answering on cognition about the statements included under general awareness on adolescent nutrition and health and 35 per cent of the respondents had correctly agreed on cognition about importance of nutritious food and their role in maintaining health and 37 per cent of the respondents were positively responding to importance of health and role of hygienic practices to be followed to maintain proper health. Similar observations were found by Bhuvaneswari (2007).

5.4.2 Better dietary and hygienic practice followed by the respondents

Ten statements that aimed at practice followed by the respondents on adolescent nutrition, health and hygiene was divided into three modules.viz., general awareness on adolescent nutrition, importance of nutritious food and health and hygiene.

It was found that 38 per cent of the respondents had correctly answering on practice about the statements included under general awareness on adolescent nutrition and health and 36 per cent of the respondents had correctly agreed on practice about importance of nutritious food and their role in maintaining health and 43 per cent of the respondents were positively responding to importance of health and role of hygienic practices to be followed to maintain proper health. Similar observations were found by Bhuvaneswari (2007).

5.5 Impact of counseling programme on variation in cognition and practices of the respondents

5.5.1 Increase in cognition level

From the findings of the present study, it was clear that the counseling programme had influence on increase in cognition level.Nishi (1997) opined that the purpose of the process of communication is to enable increase in perception, absorption and retention of messages initiated by the communicator. Education exposes the individual to a multitude of facts and information. As the education increases, individuals become more bothered about improved health practices.

The present study revealed that after counseling programme, there was significant increase in the cognition level and adoption on adolescent nutrition, health and hygienic practices are recommended. Earlier study conducted by Razeena (2000) has proven impact of educational programme as the gain in cognition and adoption of good practices. Education exposes the individual to a multitude of facts and information (Vishma, 2000).

5.5.2 Extent of adoption of better dietary practices

In the present study there was an improvement in the intake of frequency of use of various food items after the counseling programme. This was similar to a study conducted by Sheela (2004) which revealed that counseling programme on nutrition among girls enabled them to bring about remarkable improvement in the dietary habits. Modifying people's diet may involve imparting new cognition and practice of individuals.

After the counseling programmes the frequency of use of amaranthus, coriander leaves, drumstick leaves, ragi, riceflakes, amla and jaggery increased slightly. The results of the study indicated that the counseling programme brought about positive change on the adoption of better dietary practices. The results of the study are similar to a study conducted by Deshpande and Bargale (2006) and

Methi and Saraswathy (2006) which indicated improvement in the dietary habits after participation in the counseling programme.

The results of the present study is also supported by Hemalatha (2002), Kumar et al., (2003) and Annama et al.,(2003), Krishnaroopa (2003) , Sheela (2004) and Rao (2007).

5.5.3 Frequency of use of various food items (before counseling programme)

On assessing frequency of use of various food items it was found that cereals are consumed daily by the adolescents as cereal is the staple food of Indians and among this rice is consumed daily by an adolescent which is staple food of Keralites.Rice was used as a staple food among all the adolescents surveyed. The study is in line with the result of Kavitha (1999).Apart from rice, roots and tubers, nuts and oil seeds, fish, milk and milk products were the most perpetually used foods in the dietaries of all the responents.Similar results were obtained by Mony (1993) and Gayathri (2002) as the items are needed in small quantities daily for various culinary preparations. Next to cereals, milk, fish and roots and tubers were consumed almost daily by the adolescents. Milk is taken with tea or coffee daily along with breakfast. This study agrees with the earlier reports of Kavitha (1999) that the milk and the milk products are included in the daily dietaries of adolescent girls in Thiruvananthapuram district as they have the habit of drinking coffee or tea frequently.

5.6 Correlation between the cognition and practice of the respondents with selected independent variables

The overall increase in level of cognition of health and nutritional practices were analyzed and their relationships with selected socio- economic variables were discussed.

In the present study it can be seen that family size, family income, educational status of the respondents, food consumption pattern did not have any significant correlation. With respect to cognition score a positive correlation with

nutritional status index 0.1838* was observed. However significant association of participation index was 0.1967* in all the respondents at 5 per cent level with cognition score.The adoption of practice has no significant relationship with the selected socio economic variables with respect to post test. Prasana Kumari (2004) also found similar results.

The results of the present study is in tune with the findings of Bhatia et al (1998), Sheela (2004) and Bhuvaneswari (2007).

5.7 Comparison of cognition and practice scores of the respondents

Respondents of counseling programme were observed to be more enthusiastic and it was well reflected in their scores on cognition gain and showed better rate of adoption of dietary practices.The paired 't' test values indicate the impact of counseling programme among the respondents.

An evaluation of impact of nutrition counseling among adolescent girls revealed a significant improvement in cognition and practice scores among the subjects after the counseling programme (Kaur and Chawla ,2003).

The result of the study is in the line with the findings of Lakshmi (2000), Vishma (2000), Mathur (2001) and Mobsen (2003).

Figure 10 Comparison of the cognition scores of the respondents

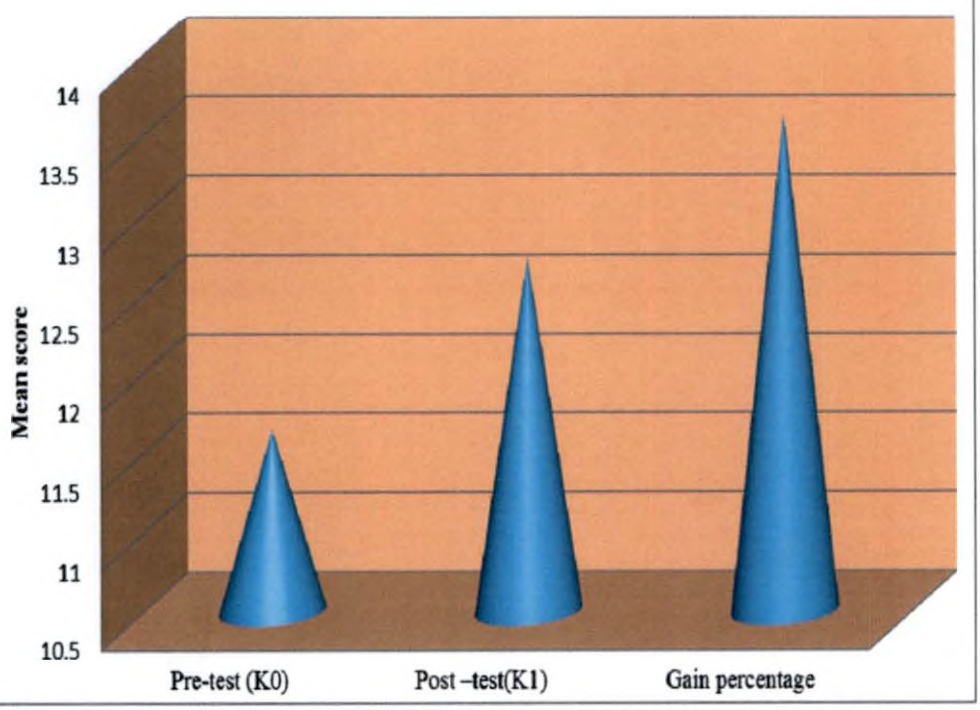
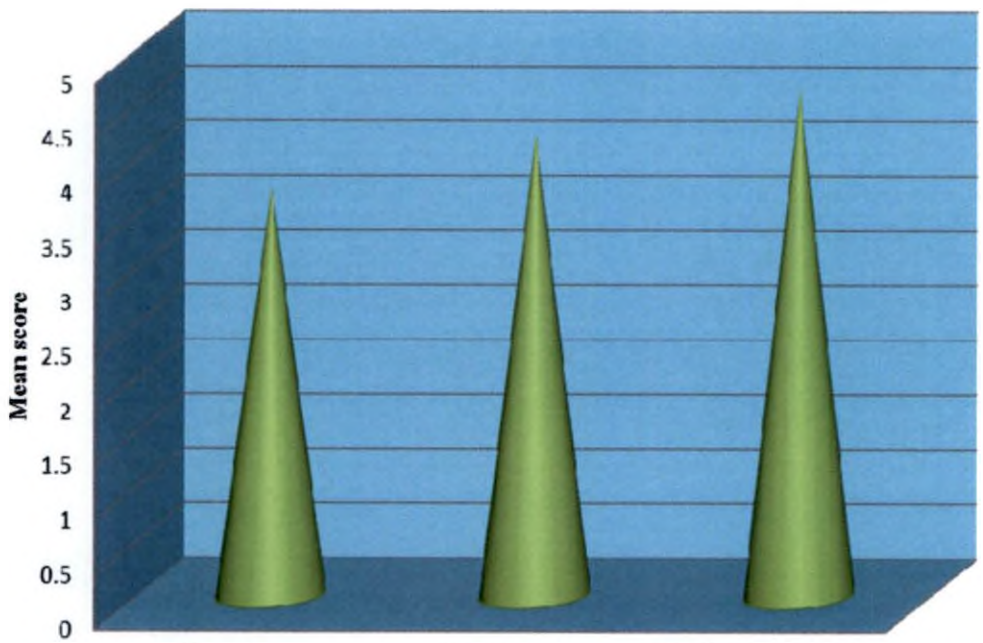


Figure 11 Comparison of practice scores among the respondents



Summary

6.SUMMARY

Adolescence is a unique period in life because it is a time of intense physical, psychological and cognitive development. The relatively uniform growth of childhood is suddenly altered by an increase in growth velocity during adolescence there by contributes to more than 20 per cent of total stature and 40-50 per cent of body weight. This sudden spurt is associated with changes in hormonal profile that results not only in the somatic growth but also brings about cognitive and emotional changes. The physiological changes create an increased demand for nutrients and make adolescents nutritionally vulnerable. Primarily requirements for calories dramatically increase due to physical growth and increased activities. Since this age is known to be highly active and energetic.

Next to infancy adolescent is a phase of rapid growth and development. The quality of food consumed by adolescence during this phase lays the foundation of their future adult life. Girls are more vulnerable as they are on the threshold of marriage and motherhood. Malnutrition especially anaemia during this period would affect not only their own health but also the health of the future generation too. Anaemia in adolescent girls also affects their physical, work capacity and reproductive physiology. It was felt that there is need to understand anaemia related perceptions of adolescent girls in our region. So that culturally sensitive and relevant counseling and communication strategies can be developed and implemented to enhance cognition and improve the nutritional status of the adolescent group.

The present study entitled 'nutritional status and nutrition cognition of adolescent girls in the coastal areas of Thiruvananthapuram was conducted among selected 100 adolescent girls which belonging to BPL families of (50 from each area) ie., Vizhinjam and Vallakkadavu area. The programme involved cognition and practice studies to improve the nutritional awareness of the respondents by means of a counseling programme and impact of the programme evaluated through change in cognition and practice of the respondents.

Information on the personal and socio-economic characteristics such as type and size of the family, educational status of the respondents and the family members, family income, social participation and mass media exposure, nutritional profile of the respondents and the participation in the various activities or programmes were ascertained. The existing knowledge and practice of the respondents were studied. Based on the pre- test scores on knowledge and practice lacunae in their knowledge was identified. Keeping this view a need based counseling programme was planned and carried out impact was studied through the knowledge gain, and adoption of better practices. Relationship of the selected independent variables such as size of the family, family income, educational status of the respondents, food consumption pattern, nutritional status index and participation index with the depended variables (knowledge and practice) were also studied.

The salient findings of the study are summarized and presented below.

The assessment of the personal and socio- economic characteristic revealed that majority of the respondents (78 per cent) belonged to nuclear families and 83 per cent of the families had size of 1-4 members. Analysis of the educational status of the respondents revealed that 48 per cent had middle school level of education. However 6 per cent were found to be illiterate.

Regarding the educational status, it was observed that 81 per cent families of the respondents had low level of educational status. Analysis of data on the family income revealed that 30 per cent of the families belonged to the higher range with in the BPL level Rs 2250. On assessing their social participation, it was found that only 40 per cent of them were members of some or other organisations. Exposure of respondents to mass media revealed that 88 per cent were found to be watching television daily and 20 per cent listening radio.

Participation index of the respondents in the various activities or programmes revealed that 50 per cent had medium level of participation index, 42 per cent had low level of participation index and only 8 per cent of the respondents were having participation index.

Anthropometric measurement of the respondents revealed that BMI of 95 per cent were found to fall in the normal range. Triceps skin fold thickness of the respondents 54 per cent was found to be low fat deposit.

Haemoglobin level of the respondents revealed that only one per cent were normal, 46 per cent were mildly anaemic and 49 per cent were moderately anaemic. However 4 per cent were severely anaemic.Clinical signs and symptoms of respondents indicated that anaemia was found to be clinically visible among 60 per cent of the respondents.

Food habits of the respondents revealed that majority of them were non vegetarians. Regarding meal timings of the respondents, majority of them were taking breakfast after 9.30 am, taking lunch by 51 per cent. Sixty five per cent of the respondents were taking tea after 5 pm and having dinner by 62 per cent of the respondents after 9 pm. Leftover food was consumed by all the respondents. Regarding the special foods given during different stages of life cycle revealed that majority of them (45 per cent) was not giving any special food. Food intake of the respondents revealed that the food groups which met the RDA least was pulse, green leafy vegetables, other vegetables followed by fruits, milk and milk products and sugar and jaggery. Nutrient intake of the respondents revealed that calcium, iron, vitamin C, and folic acid were found to be far below the RDA stipulated.

The nutritional status index of the respondents was computed incorporating relevant parameters such as energy, protein, iron, folic acid, Hb level and BMI. Medium and low nutritional status index was found among 55 per cent and 31 per cent of the respondents and 14 per cent of the respondents came in the high nutritional status index.

The pre-test scores revealed lack of cognition of the respondents about various aspects related to general awareness on nutrition, importance of nutritious food and health and hygiene. Based on the pre-test cognition on counseling programme of three days duration was conducted for the benefit of the respondents to impart required information on the above areas.

The counseling programme had significant effect on the increase in level of cognition as well as change in practice and extends of adoption of better dietary practices. Correlation between overall increases in level of cognition by selected independent variables revealed that the nutritional status index and participation index of the respondents had significant relationship. The adoption of practice of the respondents was found to have no significant relationship.

Comparison of cognition and practice scores among the respondents revealed that the counseling programme had significant improvement in the awareness of the respondents.

From the study it found that nutritional status of the nutritional status of adolescent girls in the two coastal areas were found to be medium.And nutrition cognition of adolescent girls were found to be medium.Before counseling nutrition cognition of adolescent girls were found to be low .However even after the counseling programme nutrition cognition of adolescent girls was slightly increased.

On the whole it was revealed that there was definite impact on the counseling programme in creating awareness among the respondents. However awareness among the respondents alone cannot make the programme fully successful. Attention must be paid to increase awareness on health and hygiene and importance of nutritious foods. Counseling can improve their attitude which might help to adopt better dietary practices. All these factors brought together can improve nutritional status and nutrition cognition among the vulnerable group of the population.

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Abstract

NUTRITIONAL STATUS AND NUTRITION COGNITION OF ADOLESCENT GIRLS IN THE COASTAL AREA OF THIRUVANANTHAPURAM

SUMA.N.S

(2009-16-108)

Abstract of the

thesis submitted in partial fulfilment of the requirement

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ABSTRACT

A study entitled the "Nutritional status and nutrition cognition of adolescent girls in the coastal areas of Thiruvananthapuram"was conducted to evaluate the nutrition counseling on the knowledge and adoption of health and nutrition practices by the adolescent girls.

The study was carried out in Vizhijam and Vallakkadavu in Thiruvananthapuram district. For pretest and posttest of cognition and practice, suitably structured pretested checklist was used. The dietary practice was assessed through food use frequency studies before and after the counseling programme.The data pertaining to the socio economic and personal characteristics, health and nutritional profile of the respondents were ascertained with the help of a structured and pretested interview schedule. The collected data were tabulated, analysed statistically and the results were interpreted.

Most of the respondents were from nuclear family with small family size and having medium level education. Majority of the families were having low level of educational status and low monthly income. Majority of the family possessed television and radio in their homes and only 40 per cent of the respondents were members of social organisations.

Participation index of the respondents in the programmes related to various organisations revealed that 50 per cent had medium level of participation index. Anthropometric measurement revealed that body mass index of 95 per cent of the respondents were found to be some forms of energy deficiency. Triceps skin fold thickness of the respondents indicated that 54 per cent of them were low fat deposit.

Hemoglobin level of the respondents revealed that only 46 per cent were mildly anemic 49 per cent forms of anaemia were moderately anaemic and 4 per cent were severly anaemic. Clinical examination of the respondents reported that majority of the respondents were having nutritional deficiency symptoms.

Food habits of the respondents revealed that majority of them were non vegetarians. Leftover food was consumed by all the respondents. Regarding the special foods given during different stages of life cycle revealed that majority of them were not giving any special food.

Food intake of the respondents revealed that the food group which met the RDA least was pulses, green leafy vegetables, fruits, milk and milk products and sugar and jaggery. Nutrient intake of the respondents revealed that calcium, iron vitamin C and folic acid were far below the RDA stipulated.

Nutritional status index of the respondents indicated medium and high nutritional status index among 86 per cent and only 17 per cent had low level of nutritional status index.

The pretest scores revealed the lack of knowledge of the respondents about various aspects of general awareness on adolescent nutrition, importance of nutritious foods and health and hygiene. The counseling programme of three days duration was conducted for the benefit of the respondents to impart required information on the above areas.

The counseling programme had significant effect on the gain in knowledge as well as change in adoption of practices. Correlation of selected independent variables of respondents on the cognition revealed that there was significant correlation with nutritional status index and participation index.

Comparison of mean score of pretest and posttest knowledge, and practice revealed that counseling programme had significant improvement in the awareness of the respondents.

Appendices

APPENDIX-1

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Schedule to elicit information on the Socioeconomic and personal profile of the respondents

1) Name of the respondent :

2) Address :

3) Age :

4) Class :

5) Religion :

6) Caste :

7) Type of family :

8) Family size :

9) Family composition

Sl No	Name of family members	Age	Sex	Relationship with the respondents	Educati-on	Occup-ation	Monthly income

10) Social participation : Membership in social participation
- As member
- As office member
- No member

10) Mass media exposure

Sl.No	Mass media	Daily	Twice or more in a week	Once in a fortnight	Once in a month	Never
1.	Radio					
2.	T V					
3.	News paper					
4.	Magazine					

APPENDIX - 11

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Schedule to elicit information on the

Participation of the respondents in the various healths

and nutrition activities related to adolescent health and nutrition

1) Are you a member of any of these organisations ?
   a) Anganwadi
   b) Kishore Shakti Yojana
   b) NNACP
   c) Others
2) Do you receive any food supplements through the organisations ? Yes/No
3) If yes, in which organization do you give and how much ?
4) Do you receive any medical supplements through the organisations ? Yes/No

   If yes,give details
5) Do you receive IFA tablets ?
6) How often you receive the tablets ?

   Daily/Weekly once/Once in a fortnight/Monthly/Occasionally/Never
7) Do you consume the tablets regularly? Yes/No

   If yes,give details
8) Do you participate in any of the educational programme through these organisations ?
9) How often? Always/Sometimes/Never

APPENDIX - 3

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Schedule to collect the information regarding the dietary habit and food consumption pattern of the respondents

20. Food habit of the family: vegetarian/non vegetarian

21. 24 hour recall method

Meal pattern	Type of food preparation	Raw quantity of each ingredient (gm)	Total cooked amount(gm)
Early morning			
Break fast			
Lunch			
Tea time			
Dinner			

22. Frequency of using different food items

Food items	Daily	Weekly thrice	Weekly twice	Once in a week	Fortnightly	Once in a month	Occassionally	Never
Cereals								
Parboiled rice								
Wheat flour								
Rice flakes								
ragi								
Pulses								
Black gram								
Dhal								
Bengal gram								
Green gram								
sprouted pulses								
Leafy vegetables								
Amaranthus								
Coriander leaves								
Drumstick leaves								
Curry leaves								
Other vegetables								
Cucumber								
Ladies finger								
Plantain green								
Brinjal								
Tomato								
Roots and tubers								
Onion big								
Carrot								
Beetroot								
Potato								
Tapioca								

Fruits Mango (ripe) Pineapple Orange Jackfruit Amla Guava Papaya								
Nuts and oil seeds Grount nut coconut								
Animal foods Egg Meat Fish								
Others **Jaggery** **Tea /coffee**								

23. Daily meal pattern of the respondents

Foods	Time
Break fast	
Lunch	
Tea time	
Dinner	

24. Do you consume left over food ?
Yes / No

25. Do you consume any special foods during different stages of life cycle ?
Yes / No

26.If yes, when ? a) Infancy b) Preschool c) School going d) Others

APPENDIX - 4

Formula for making food use frequency table

Score = $R_1S_1 + R_2S_2 \ldots\ldots\ldots\ldots + R_n S_n$

Where,

S_n = Scale of rating

R_n = Percentage of respondents selecting a rating

N = Maximum scale rating

APPENDIX - 5

Estimation of haemoglobin (Cyanmethaemoglobin method)

Principle

Haemoglobin is converted into cyanmethaemoglobin by the addition of KCN and ferricyanide. The colour of cyanmethaemoglobin is read in a photocaloricmeter against a standard solution. Since cyanide has the maximum affinity for hemoglobin, this method estimates the total hemoglobin.

Reagent

Drabkin's solution: Dissolve 0.05 g of KCN, 0.02 g of potassium ferricyanide and 1.00 g of sodium bicarbonate in 1 litre of distilled water.

Procedure

The procedure for estimation of haemoglobin is by taking 20 µl of blood measured accurately from a haemoglobin pippet and delieverd on to Whatman No.1 filter paper of size 2 × 4 cm.The filter paper is then air dried and labelled. This can be stored upto 1 week. The portion of the filter paper containing the blood is cut and dipped in 5 ml of Drabkin's solution taken in a test tube. Wait for 30 minutes.Mix the contents take the reading at 540 nm of unknown sample and that of standard of known haemoglobin content against a reagent blank (Raghuramulu et al.,2003). This procedure was followed here in the haemoglobin estimation of the sub sample and the reading obtained was tabulated for further investigation.

APPENDIX - 6

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Schedule to elicit the information regarding the nutritional assessement of the respondents

a.Anthropometric measurement

1. Weight

2. Height

3. BMI

b.Triceps skin fold thickness

c. Bio chemical assessement

haemoglobin

d.Clinical examinations

Sl. No.	Deficiency symptoms	No of respondents
1	Parotid enlargement	
2	Odema	
3	Emaciation	
4	Marasmus	
5	Conjunctival xerosis	
6	Bitot's spot	

7	Corneal xerosis / Keratomalacia	
8	Night blindness	
9	Photophobia	
10	Anaemia	
11	Tongue – red and raw	
12	Atropic lingual papillar	
13	Pellagra	
14	Craz pavement dermatosis	
15	Pigmentation	
16	Phrynoderma	
17	Koilonyehia	
18	Gums-spongy, bleeding	
19	Teeth carries	
20	Mottled enamel	
21	Thyroid enlargement	
22	Knock-knees or bowlegs	
23	Frongal and parietal bossing	
24	Naso –labial dyssrbacea	

APPENDIX - 7

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Participation index of the respondents

Sl.No		Sl.No		Sl.No		Sl.NO	
1	41.6	33	29.6	65	56	97	29.16
2	25	34	37.5	66	60	98	56
3	33.33	35	16.6	67	86	99	83
4	50	36	16.6	68	50	100	16.16
5	55	37	83.33	69	58.33		
6	16.66	38	16.6	70	50		
7	19	39	54	71	16.6		
8	58.33	40	16.6	72	29.16		
9	83.33	41	16.6	73	45.83		
10	23	42	25	74	48		
11	63	43	25	75	16.6		
12	44	44	55	76	83		
13	33.33	45	63	77	16.6		
14	50	46	16.6	78	16.6		
15	16.5	47	16.6	79	65		
16	56.7	48	16.6	80	17		
17	20	49	37.5	81	25		
18	37.5	50	25	82	37.5		
19	25	51	16.6	83	45		
20	28.5	52	17	84	37.5		

21	45	53	25	85	29.16		
22	23.6	54	86	86	16.6		
23	23.5	55	62.5	87	54.16		
24	25	56	29.16	88	51		
25	41.6	57	26	89	16.6		
26	24	58	65	90	61		
27	23	59	27	91	37.5		
28	86	60	55	92	55		
29	16.6	61	16.6	93	41.6		
30	29.6	62	88	94	27		
31	37.5	63	29.16	95	48		
32	16.6	64	25	96	86		

APPENDIX - 8

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Nutritional status index of the respondents

Sl.No		Sl.No		Sl.No		Sl.No	
1	46	33	72	65	43	97	22
2	63	34	54	66	54	98	67
3	88	35	23	67	47	99	82
4	43	36	64	68	85	100	62
5	27	37	26	69	58		
6	86	38	65	70	80		
7	40	39	21	71	56		
8	54	40	43	72	25		
9	64	41	83	73	54		
10	78	42	72	74	20		
11	65	43	18	75	52		
12	54	44	57	76	81		
13	87	45	88	77	46		
14	43	46	53	78	84		
15	25	47	54	79	56		
16	59	48	19	80	84		
17	60	49	58	81	57		
18	22	50	57	82	20		
19	47	51	23	83	67		

20	28	52	53	84	23		
21	25	53	54	85	82		
22	56	54	23	86	83		
23	46	55	56	87	28		
24	21	56	25	88	65		
25	34	57	56	89	25		
26	16	58	24	90	81		
27	51	59	89	91	27		
28	26	60	47	92	76		
29	47	61	28	93	25		
30	57	62	34	94	45		
31	55	63	26	95	25		
32	54	64	23	96	21		

APPENDIX - 9

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Body mass index of the respondents

Sl.No	BMI	Sl.No	BMI	Sl.No	BMI	Sl.No	BMI
1	16.5	33	17.33	65	16.3	97	17.78
2	25.72	34	26.66	66	28.76	98	18.75
3	24.55	35	16.2	67	16.5	99	16.6
4	16.5	36	36.6	68	18.35	100	18.35
5	25.22	37	19.87	69	25.77		
6	19.87	38	18.17	70	17.78		
7	16	39	38.8	71	36.6		
8	17.33	40	17.52	72	16		
9	26.31	41	15	73	25.80		
10	16.5	42	25.53	74	19.87		
11	18.35	43	19.90	75	26.31		
12	32.7	44	17.33	76	16		
13	18	45	26.31	77	18.75		
14	25.22	46	19.87	78	17.78		
15	16.6	47	17.33	79	26.66		
16	18.75	48	25.77	80	16		
17	17.33	49	18.75	81	19.87		
18	19.90	50	16.5	82	21.56		
19	16.35	51	20.23	83	19.90		
20	32.7	52	16.25	84	25.53		

21	19.87	53	26.31	85	19.87		
22	26.31	54	18.35	86	16.6		
23	16.9	55	21.92	87	28.76		
24	16.30	56	16.8	88	18.75		
25	18.35	57	32.7	89	25.80		
26	26.31	58	16.3	90	17.3		
27	16.5	59	36.6	91	32.7		
28	36.6	60	17.52	92	16.8		
29	17.52	61	16	93	25.53		
30	16.36	62	25.72	94	17.52		
31	20.42	63	16.8	95	25.80		
32	16.31	64	26.31	96	17.3		

APPENDIX - 10

Triceps skin fold thickness of the respondents

Sl.No		Sl.No		Sl.No		SLNo	
1	10	33	08	65	9	97	08
2	07	34	13	66	8.5	98	11
3	13	35	7.5	67	15	99	12
4	11.0	36	14	68	8.5	100	9.5
5	14	37	11	69	16		
6	10	38	15	70	10		
7	14	39	08	71	14		
8	8.8	40	12	72	10		
9	11	41	11	73	11		
10	16	42	13	74	13		
11	9.9	43	10	75	15		
12	14	44	11	76	08		
13	11	45	12	77	11		
14	12	46	11	78	16		
15	14	47	16	79	09		
16	9.5	48	10	80	13		
17	15	49	08	81	12		
18	14	50	15	82	11		
19	11.5	51	09	83	14		
20	15	52	14	84	08		
21	8.5	53	11	85	9.5		
22	17	54	10	86	13		
23	10.5	55	9.5	87	07		
24	16	56	15	88	14		
25	07	57	08	89	15		
26	08	58	11	90	09		

27	7.5	59	14	91	15		
28	7.5	60	07	92	16		
29	08	61	15	93	11		
30	15	62	09	94	14		
31	08	63	16	95	09		
32	9.5	64	11	96	13		

APPENDIX - 11

Cut off used for defining different degrees of Anaemia (WHO 2001)

Target group	Degree of anaemia	Cut off in terms of Hb level (g/dl)
Adolescent girls	Severe	< 7.9
	Moderate	8.0-9.9
	Mild	10.0-11.9
	Non-anaemic	>12

APPENDIX - 12

Haemoglobin level of the respondents

Sl.No	Gm %	Sl.No	Gm %	Sl.No	Gm %	SLNo	Gm %
1	8.3	33	9.8	65	11	97	10.6
2	10	34	11	66	10.4	98	9.8
3	11	35	7.5	67	9.8	99	9.4
4	9	36	10.5	68	8.5	100	8.2
5	7	37	9.5	69	12.5		
6	11.5	38	10.5	70	8.8		
7	10	39	9.5	71	9.6		
8	9.2	40	8.5	72	9.3		
9	6.5	41	9.6	73	9.6		
10	10	42	10.5	74	10.3		
11	8.7	43	8.5	75	8.6		
12	11	44	11.5	76	10.8		
13	9.5	45	8	77	8.6		
14	10	46	11	78	10.6		
15	9	47	8.7	79	9.2		
16	11	48	10.5	80	10.3		
17	9.5	49	9.5	81	9.5		
18	10.5	50	8.8	82	10.5		
19	8.8	51	11.6	83	8.6		
20	7.5	52	9.2	84	9.4		
21	10	53	6.8	85	10.2		
22	9.3	54	10.6	86	9.2		
23	10	55	8.8	87	10.3		
24	10.5	56	10.40	88	9.8		

25	9.5	57	10.2	89	9.2		
26	8.5	58	9.5	90	9.2		
27	11	59	10.8	91	8.2		
28	10.5	60	9.8	92	8.9		
29	10.2	61	10.2	93	10.4		
30	11	62	10.6	94	9.0		
31	10.5	63	6.9	95	8.8		
32	9.5	64	10.6	96	9.7		

APPENDIX - 13

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Statements to assess the cognition on adolescent nutrition, health and hygiene

Statements	Response of the respondents	
	Correct	Wrong
Adolescence is the most important period in the life span of a woman		
Drinking too much of water makes one fat		
Iron requirement is higher adolescent boys than in adolescent girls		
Iron and folic acid supplementation improves adolescent health		
With the onset of menstruation adolescent girls should not take iron rich foods		
Consumption of iron rich foods prevents to anaemia in adolescent girls		
Inadequate diet in adolescence can affect adolescent health		
Adolescence is a period of likes and dislikes associated with food choices and food habits		

Nutrition education during adolescence promotes good food habits		
Vitamin A is essential for proper functioning of eyes		
Adolescents have irregular eating habits and resist advices		
Green leafy vegetables are rich sources of fat		
Milk is an excellent source of iron		
Vitamin D is essential for the health of skin		
Fatty acids present in fish is harmful to health		
A mixed food of cereals and pulses will improve the protein quality of a diet		
Parboiled rice is more nutritious than raw rice		
During menstruation girls should bath at least two times		
Periodic deworming reduces anaemia		
Fats are not stored in our body		
Sea foods are rich in iodine		
Vitamin K helps in clotting of blood		
Drinking impure water leads to communicable diseases		
Ragi is equally superior as milk		
Washing and changing undergarments daily is not as important as taking bath		

Sprouting will increase nutrient content of grains and pulses		
Cleaning the face regularly helps to prevent pimples		
Girls should use clean sanitary napkin during menstruation		
Skipping breakfast is healthy		
Nails should be cut short to prevent infections		

APPENDIX - 14

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Checklist to assess the adoption level of the respondents

Statements	Response on the respondents	
	correct	wrong
Adolescent girls consume iron and folic acid tablets supplied through the anganwadis		
Main meals are not skipped		
Leafy vegetables are regularly included in their diet		
On the onset of menarche adolescent girls consume more iron rich foods		
Sprouted pulses are consumed regularly		
Adolescent girls consume foods that are more nutritious than adult food		
Mouth is cleaned thoroughly after every meal		
Only clean napkins are used during menstruation		
Daily bath is practiced by adolescent girls		
Wearing slippers prevent hookworm infestations		

APPENDIX - 15

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The counseling programme schedule for three days programme on adolescent nutrition health and hygiene

No of Days	Content	Method	Teaching aids	Evaluation
Day 1	**General awareness on adolescent nutrition and health** 1.Adolescence and its significance 2.Changes during adolescence and special features 3.Importance of adolescence girls and their food habits	Lecture cum group discussion	Chart and pictures	Post test
Day 2	**Importance of nutritious food and their role in maintaining health** 1. Importance of nutritious foods 2.Deficiency diseases 3.About anaemia , its prevalence and iron rich foods	Lecture cum group discussion	Chart and leaflet	Post test

Day 3	**Importance of health and role of hygienic practices to be followed to maintain proper health** 1 .Importance of clean health and hygienic practices 2. Importance of good habits and dietary guidelines	Lecture cum group discussion	Chart	Post test

APPENDIX - 16

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VELLAYANI
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Frequency of use of various food items by the respondents

Food items	Daily	Weekly thrice	Weekly twice	Once in a week	Fortnightly	Once in a month	Occassionally	Never
Cereals								
Parboiled rice	100	-	-	-	-	-	-	-
Wheat flour	10	20	30	20	10	10	-	-
Rice flakes	-	-	-	25	-	10	65	-
ragi	-	-	-	-	-	30	40	30
Pulses								
Black gram	20	30	20	10	10	5	5	-
Dhal	-	-	10	50	10	10	10	10
Bengal gram	-	-	10	20	10	50	10	-
Green gram	-	-	-	-	10	50	40	-
sprouted pulses	-	-	-	-	-	-	-	100
Leafy vegetables								
Amaranthus	-	-	-	-	-	60	40	-
Coriander leaves	-	-	-	-	-	-	60	40
Drumstick leaves	-	-	-	-	-	-	70	30
Curry leaves	90	10		-	-	-	-	-
Other vegetables								
Cucumber	-	-	-	30	20	40	10	-
Ladies finger	-	-	-	10	12	38	40	-
Plantain green	-	-	-	-	-	50	50	-
Brinjal	-	-	-	-	-	40	50	10

Tomato	-	-	-	10	10	40	30	10
Roots and tubers								
Onion big	40	10	10	10	-	20	10	-
Carrot	-	-	20	20	-	60	-	-
Beetroot	-	-	-	-	-	60	40	-
Potato	-	-	-	20	10	60	-	10
Tapioca	50	10	-	5	5	-	30	-
Fruits								
Mango (ripe)	-	-	-	-	-	20	80	-
Pineapple	-	-	-	-	10	40	50	-
Orange	-	-	-	-	-	40	60	-
Jackfruit	-	-	-	-	-	45	55	-
Amla	-	-	-	-	-	20	80	-
Guava	-	-	-	-	10	20	70	-
Papaya	-	- -	-	- -	-	20	80	-
plantain ripe	-		-		15	35	50	-
Nuts and oil seeds								
Grount nut	-	10	15	32	28	5	10	-
coconut	30	10	10	20	-	20	10	-
Animal foods								
Egg	-	-	25	35	20	15	5	-
Meat	-	-	50	20	10	10	10	-
Fish	100	-	-	-	-	-	-	-
Others								
Jaggery	-	-	-	-	-	20	80	-
Tea /coffee	50	10	10	10	-	20	-	-

APPENDIX - 17

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Demonstration on preparation of nutritious laddu

Ingredients :-

Roasted rice flour - 1 cup

Rice flakes crushed - 1 cup

Grated coconut - ½ cup

Raisins - 2 tsp

Cardamoms powdered - ½ tsp

Grated jaggery - 1 cup

Method of preparation :-

Mix together all the ingredients and make lemon sized balls.

Chart No-1

STANDARD HEIGHT AND WEIGHT OF ADOLESCENT GIRL

Age	*Weight kg*	*Height cm*
8	*26.1*	*126.8*
9	*29.7*	*132.3*
10	*33.5*	*138.5*
11	*36.5*	*144.1*
12	*42.6*	*150.3*
13	*44.4*	*153.0*
14	*46.7*	*155.1*
15	*48.2*	*155.3*
16	*49.8*	*155.4*
17	*49.9*	*156.4*
18	*50.0*	*157.2*

Chart-2

NUTRIENTS AND ITS IMPORTANCE

Nutrients	Important functions	Source	Deficiency
Vitamins and minerals			
A	Building and growth of all cells,Structure of myelin sheath,Proper tooth structure, Maintenance of normal vision in dim light	Butter,ghee,egg yolk, leafy vegetable (drum stick leaves),yellow fruits,liver	Bitots spots, prynoderma, hypervitaminosis
B	Maintenance of gastro intestinal cellular growth,Brain function, functioning of the skin intestinal and nervous system,growth of blood cells	All vegetables,leafy vegetables,milk,liver, fish,animal foods, whole legumes,wheat germs,rice polishings	Weakness, perinious anaemia,burning at the angles of the mouth,burning tongue,irritability, growth retarded
C	Formation of collagen,essential for rapid healing of wounds,formation of connective tissues	Citus fruits,orange,pineapple, ripe mango, papaya, cashew fruits, tomato ,amla	Scurvy,fatigue, weakness, irritability, frequent infections
Calcium	Ossification of bones,formation of bone and teeth,	Milk and milk products, ragi,egg,small fish and	Irritation , confusion,pain, involuntary,

	nerve impulse transmission	all vegetables	muscles spam,loss of hair,and nails, roughness of the skin
Phosphorous	Calcification of bones and teeth	Meat ,fish, poultry, egg, milk and milk products	,,
Iron	To form a constituent of haemoglobin	Liver,kidney, heart,lean meat,egg yolk,shell fish, green leafy vegetables, molasses	Anaemia, weakness, heart burn
Iodine	Thyroxin production,normal growth,functioning of the both brain and body	Sea foods,iodised salts	Goitre,cretinism, impaired mental function,retarded physical development

LEAFLET DISTRIBUTED DURING COUNSELING

വിളർച്ചയും
വിളർച്ച തടയലും
പരിപാടിയും

നാം
അറിഞ്ഞിരിക്കേണ്ട
വസ്തുതകൾ