EFFECTIVENESS OF IEC MATERIALS ON HEALTH AND NUTRITIONAL PRACTICES OF ADOLESCENT GIRLS

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DECLARATION

I hereby declare that this thesis entitled **"Effectiveness of IEC materials on health and nutritional practices of adolescent girls"** is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title, of any other university or society.

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CERTIFICATE

Certified that this thesis entitled **"Effectiveness of IEC materials on health and nutritional practices of adolescent girls"** is a record of research work done independently by Ms. Sheela. K. V. (2001-16-06) under my guidance and supervision and that it has not previously formed the basis for the award of any degree, fellowship or associateship to her.

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LIST OF ABBREVIATIONS

APL	–	Above poverty line
BPL	–	Below poverty line
cm	–	Centimetre
dl	–	Decilitre
g	–	gram
ICDS	–	Indian Child Development Society
ICMR	–	Indian Council of Medical Research
IEC	–	Information, education and communication
IUHPE	–	International Union for Health Promotion and Education
kg	–	Kilogram
m	–	Metre
NCEHP	–	National Conference on Environmental Hygiene and Promotion
NCHS	–	National Child Health Society
NIN	–	National Institute of Nutrition
NNMB	–	National Nutrition Monitoring Bureau
RCH	–	Reproductive Child Health
RDA	–	Recommended dietary allowance
SH	–	Sarfaraj Hospital

Dedicated
To

My PAPPA

Introduction

1. INTRODUCTION

Today's adolescents are tomorrows citizens. The term adolescence comes from the Latin word "adolescere" meaning 'to grow' or 'to grow to maturity' (Hurlock, 1986). Adolescence is one of the most challenging periods in human development especially girls as future mothers (Esfarjani *et al.*, 2003). Adolescents 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). WHO defines adolescent as a person between 10 to 19 years of age (Riedner, 2001). The period of adolescence are arbitrarily divided into different stages based on growth characteristic. They are pre-adolescence (10 to 11 years), early adolescence (11 to 14 years) and adolescence (14 to 16 years) and late adolescence (17 to 20 years) (Jayanthini, 2000).

Adolescent girl's health 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. Health and nutritional needs of adolescent girls are mostly ignored.

Safe and successful child bearing depends on the health and readiness of the mother to be. So special attention should be paid to the health, feeding and education of adolescent girls (FPAI, 1993). Educational programmes directed towards improving the reproductive health of adolescent populations are being covered by Integrated Child Development Services recently. A special intervention has been devised for adolescent girls using the ICDS infrastructure. This interventions focus on school drop out girls to meet their needs of self-development, nutrition, health, education, literacy, recreation and skill development. This is aimed at breaking the inter-generational life cycle of nutritional

disadvantages and providing a supportive environment for self-development (ICDS, 1995). Even then there is a wide gap between the knowledge imparted and actual assimilation of the new knowledge required by adolescent population. This may be due to the fact that the new ideas covered were not actually catering to their level of visual understanding and perception. In order to better address concerns for women and girl child in a way it will be necessary to design interventions for adolescent girls. Nutrition education is concerned with trying to persuade an individual or a group of people to modify the way of life with a view of improving their heath and nutrition by the better use of available resources, both traditional and modern and both man made and natural. It has been acknowledged as one of the most important methods of combating malnutrition which is common in developing countries (Igbedioh, 1990). Thus health information system is a basic tool for the progress of any society. Many equate it with transmission of information about health and diseases from the expert professional to the lay client (Somers and Anne, 1997). It has been global experience that any move towards community reformation or transformation had to begin from awareness. It is an objective of health education to disseminate scientific knowledge about prevention of disease and promotion of health. Exposure to knowledge will melt away the barriers of ignorance, prejudices and misconceptions, people may have about health and disease.Fraquhar *et al.* (1990) opined that exposure achieved by disseminating messages through multiple channel is expected to result in changes such as increased awareness about campaign related issues, greater levels of knowledge about health, higher levels of self efficacy and ultimately healthier behaviour at both the individual as well as broader community wide level. Through education the public must be motivated to change their habits and ways of living and should be guided into action. Esfarjani *et al.* (2003) showed that nutritional knowledge of adolescent girls was not good enough and can cause nutritional deficiencies, in generation supposed to

be the future mother. Here comes the importance of information, education and communication materials. IEC is an absolute necessity for control and prevention of any deficiency. Money and manpower should not be bottlenecks in their endeavour (ICMR, 1994). For applying an IEC it is essential to know more about the components of IEC *i.e.*, information, education and communication.

Information can be simply described as the passing of facts or it may be a chain of facts. It is information which can help and save the lives of many million in the developing world. Now information and technology has increased people's access to outside information. Commercial messages in television and nutrition campaigns can strongly influence attitudes and behaviours. And the behaviour of people is as important as education and culture can actually compensate for deficits in education (Vishma, 2000). According to Salil (1991) education and training are important elements of programme intervention as they relate to increase in the capabilities of community to analyse the situation and enhance common understanding of the problem and knowledge or how to address the problem. Although efforts to improve the health and well being of people have taken place under a variety of circumstances the most important setting for nutrition improvement programmes are communities. As the greatest force in India probably being inertia, ignorance deals habits and superstition the change we seek calls for awareness, mobilisation, organisation and participation. And communication for behavioural change programmes should be carefully design monitored and evaluated to achieve maximum impacts.

According to Revikumar (2000) Information Education Communication is a concerted and planned endeavour of reaching people as individual, group or masses putting across scientific knowledge and educating them to develop. expected behavioural pattern and creating a condition in which they direct themselves towards the accomplishment of pre-designated

programme. These techniques form a paradigm to achieve public health goals and to communicate and motivate consumers to change their behaviour (Milton, 1999). IEC activities not only need to have an appropriate context in which they are shaped, but it is crucial that health services providers be prepared to respond to any demand that may be created as a result of effective IEC activities. The influence of underlying social, cultural, economic and environmental conditions on health are also taken into consideration in the IEC processes.

Studies conducted elsewhere in the use of IEC materials proved that more the number of senses are stimulated greater will be the success of communication efforts. Communication through the usage of IEC materials enter into social mobilization in several ways. It ensures commitment at the policy level. This will provide a favourable environment for decision making including provision of adequate resources. In this study IEC materials used to disseminate information include charts, leaflets, flashcards and posters.

Hence the present study entitled "Effectiveness of IEC materials on health and nutritional practices of adolescent girls" is proposed with the following objectives :

1. To develop information education and communication materials on health and nutrition practices
2. To assess the effectiveness of formulated information. education and communication materials

Review of Literature

2. REVIEW OF LITERATURE

Adolescence is a crucial phase of growth since it offers the second and last chance for the catch up growth in the life cycle of 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 during which 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.

The term adolescent refers to people between the age of 10 and 19. WHO joint statement defines adolescents comprises 20 per cent of the world's population while the concept of youth varies across cultures, there is increasing global agreement that adolescence is a distinct and important period in a person's life (WHO, 1998).

Earlier studies pertaining to the topic "Effectiveness of information education and communication materials on health and nutritional practices of adolescent girls" are reviewed under the different sub heads.

2.1 Adolescent girl and their characteristics

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

2.3 Studies on adolescent health and nutrition education

2.4 Impact of information, education and communication materials in health promotion among adolescent girls.

2.1 ADOLESCENT GIRLS AND THEIR CHARACTERISTICS

Briggs and Calloway (1985) reported that adolescence is a time of great, physical, biological and emotional adjustment. Wright (1985) stated that adolescence is a period of dynamic changes and these changes occur in all sphere of development of human potential *viz.* physical emotional, intellectual and even spiritual. According to Eggert (1989)

adolescence is reported to be the time between the onset of puberty and adulthood.

Suitor and Hunter (1989) has the opinion that adolescence is a transition stage in the life cycle linking childhood to adulthood. Banik (1990) opined the adolescent is no longer a child, yet, he has not reached adult in social, legal or socio-economic status. He has also reported that adolescents are particularly vulnerable to conflicts to the socio-cultural matrix, which surrounds them in our society. Place (1990) stated that the adolescent stage of life is the period of identifying oneself as a total person. Banik (1992) reported that many behavioural problems of the adolescence are due to maladjustment and these are much greatest among adolescents who do not have close, harmonious relationship with their parents. The development of a personal identity and body image is a major goal for adolescents and educators need to address this issue and provide a support system for students (Mahan and Pees, 1993). Adolescence is a period of increasing fatness in the females and of a transient decrease of fatness in males (Blum, 1994). According to Lansky (1994) adolescence is the period during which a distributed body image was most likely to begin. This negative image is characterized by a feeling that one's body is grotesque and loathsome and that others view it with hostility and contempt. Mc Nutt and Mc Nutt (1998) reported that an adolescent may have the same size of an adult but his/her nutritional requirements are much greater and hence he/she should not be considered as an adult. Rao (1998) remarked that physical and physiological changes occurring in adolescents impose a great demand on nutritional requirements during 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.

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

2.2 FOOD CONSUMPTION PATTERN, DIETARY HABITS AND NUTRITIONAL STATUS OF ADOLESLCENT GIRLS

During adolescence, the influence on eating habits are 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 (Singh and Kaur, 1997). Food habits of an individual are the characteristics and repetitive acts that he performs under the impetus of the need to provide himself with nourishment and simultaneously to meet an assortment of social and emotional goals (Giff *et al.*, 1980). The food habits of adolescents are mainly influenced by urban life style, mass media and peers. Adolescence is a period of high nutritional risk when increased demand for nutrients is often met with poor choice of food, unhealthy eating habits and deficient intake of calories, protein, vitamins and minerals. Soft drinks kill the appetite and promote skipping of meals and finally resulting in nutritional deficiency [illegible]. Kanchwala and Husain (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 over weight adolescents.

Women's nutritional status is an integral part of their household's nutrition profile, it is also a cause of the household nutrition status, since performance of nutrition related roles depends socio-economic and socio-cultural factors (e.g. income, literacy, traditional beliefs). Simultaneously influence with women's nutrition status and their nutrition related roles. Nutritional disorders impede the economic development of the country. According to Delange (1994) poor nutritional status will lead to poor nutritional attainment and decreased economic productivity. Sivapuri (1990) has the opinion that adolescent girl in India are more neglected than adolescent boys. 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. Changes are evident in the physical body, emotional maturity and intellectual achievements (Sharon *et al.*, 1990). Seshadrinath (1993) revealed that the diet of adolescent girls in the age group of 13-15 years found to be more deficient in vitamin, mineral and protein rich foods. Rajashree and Soman (1994) revealed that inspite of better food intake, the rural coastal adolescent girls exhibited poorer nutritional status because of environmental deprivation. Adolescence is a time for socializing and it is not uncommon for teens to spend time together eating fast food restaurants are a common 'hang-out' place for teens (Stunkard, 1997).

Data have shown that snacks are eaten by over 75 per cent of all adolescents. It is not true that all convenience foods are junk food. Nutrition in public health status has led to increased or grouping demand for knowledge of the nutrient content of these convenience foods. As reported by Sadana *et al.* (1997) the consumption of convenience food is more among teenagers. All over the world snack consumption is considerably higher among school children and adolescents. Potato chips, noodles, hot dog and pastry were the most frequently consumed, convenience foods. Glanz *et al.* (1998) reported that adolescent girls are leaving their traditional food habits and are adopting westernized food habits due to the affluence, peer pressure and media misinformations. Products like wafers were preferred to home made snacks while aerated drinks are preferred to milk or fruit juices. 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 atleast once in a day. Ushadevi and Nath (2003) pointed out that in order to met 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. It can weaken physical health and well being and shorten the life expectancy (Taitz, 1998).

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 run 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 the 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). 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 factor (Roos *et al.*, 2001). According to Ahiya *et al.* (2001), a pilot survey was conducted among lower class communities and labourer's families on Pantnagar campus to find out the improvement of adolescent girls in the household activities and their food pattern and habits. None of the girls were found aware of the importance of nutritive diet for their growth. Girls were found engaged in all household activities in addition to childcare and looking after of younger nibbling in the mother's absence. The concern about size and shape of the body sexual development, vitality, skin condition and attractiveness are great and there is a sense of freedom to make their own decisions which is reflected in the choice of

foods (Benefice and Garnier, 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). Takagi *et al.* (2002) revealed that breakfast is frequently neglected and omitted more often by teenagers. For teenage girls, skipping lunch is generally taken to be a way of controlling weight. Diets are likely to be bizarre and unbalanced. In the study by Nutrition Foundation of India at Jabalpur (NFI, 1990) found that malnutrition was higher in rural and urban girls than in boys with deficit in height, weight and mid arm circumference.

Nutritional status of the population is critical to the development and well being of the nation (Rao, 1999). The observations of National Institute of Nutrition (NIN, 1990) on adolescent girls of rural and urban slums had indicated that 10 to 20 per cent of girls had poor haemoglobin level. A study by Awasthi *et al.* (1991) on the block of Amanigany of Faizabad district for the assessment of dietary intake pattern and nutritional status of the children revealed that, the under nutrition was prevailing in more than 70 per cent of children because of various socioeconomic and transfer of technology constraints pertaining to nutritional awareness in the target population. Otta (1992) reported that there was high awareness and adoption of better health measures due to higher maternal education. According to Kanani (1995), 65.00 to 75.00 per cent of the under privileged adolescent girls of 10 to 18 years in India are anaemic. A study conducted by Bhat (1998) among adolescent Kashmir girls found that the mean height was 154, 155 and 156 respectively for 13,14 and 15 year. Devadas (1999) reported that in India two out of every three women suffer from iron deficiency anaemia. Anaemia is one of the glaring deficiency 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 specially

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. A cross sectional study was taken in a public high school in Sao Paulo, Brazil with 92 students' ages 11 to 17 years. 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 colostrum and practice poor weaning and hygiene. Improving the mother's knowledge on these aspects and quantifying 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).

2.3 STUDIES ON ADOLESCENT HEALTH AND NUTRITION EDUCATION

Adolescent girl scheme is a special intervention for girls between 13-15 years of age to meet the special needs in nutrition, skill development and health education. "Adolescent health" is an important thrust of the new RCH programme.

A study by Harshala and Prema (2000) adolescent girl's 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.

Vasudeva and Sunderlal (1989) are of the opinion health and nutrition education activities should be build of meaningfully with explicit message.

Nutrition education is concerned with trying to persuade an individual or a group of people to modify their way of life with a view of improving their health and nutrition by the better use of available resources both traditional and modern and both man made and natural. It has been acknowledged as one of the most important methods of combating malnutrition, which is common in developing countries (Igbedioh, 1990).

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. A person's health is influenced by the availability of health information and health care, both preventive and curative. Finally the individual's behaviour or life style plays a major part in determining the state of her health (Smyke, 1991). 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).

According to Katsha and Watts (1994) a nutrition education programme should not be perceived by local people as a scheme imposed from a far but as something they have helped to create.

USDA (1996) is one of the opinion that nutrition education is needed to literate and improve knowledge in the selection of safe and adequate diet and 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 drops out girls to meet their needs of self-development, nutrition, health, education, illiteracy, recreation and skill formation. This is aimed at breaking the intergenerational lifestyle of nutritional disadvantage and providing a supportive environment for self-development (ICDS, 1995).

Jaya and Shivaraj (1990) in their study pointed out that the educational programmes are most effective method of creating awareness in the aspects of health practices.

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

Women, if educated and aware can improve the health of their children by simple measures like good hygiene, exercise and dietary practices (Buckshee, 1997).

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

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.

UNICEF (1990) proposed a conceptual frame work suggested that not only were food security and health care services necessary for child survival, but care for girls and women and children was equally important.

The nutritional stress of reproduction in 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).

Studies have shown that around the world, across different regions and culture, educated women have a greater say in their reproductive lives than women who have little or no education. These studies also indicate that a minimum of 5 years of education is required to enable women to control her reproductive life (Ghosh, 1993).

According to Kennedy (1993) an educated adolescent is more likely to seek reproductive health information and services than an uneducated one. Moreover, education increases women's self-confidence and self-esteem, employment opportunities and ability to provide for themselves.

The government of Ghana enacted the Adolescent Reproductive health policy aimed at addressing the reproductive health needs of adolescents and providing the policy recognizes the rights of adolescents to information and services relating to sexual and reproductive health (Eggleston *et al.*, 1994).

Anandalakshmi (1994) revealed that adolescent girls need to be considered as a special target group by schemes and development programmes.

A study was conducted in Ahmednagar district of Maharashtra, India to gain insight into whether and how their reproductive health needs are met especially for gynecological problems, family planning and perceived fertility problems (Bentley *et al*, 1995). Goswami (1995)

revealed that there is no adolescence, as they shift so quickly from childhood to motherhood.

Soumya *et al.* (1997) revealed that the RCH (Reproductive Child health), is the newest initiative introduced by the government of India to improve the survival both of mother and their children.

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 omen'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).

2.4 IMPACT OF INFORMATION, EDUCATION AND COMMUNICATION MATERIALS IN HEALTH PROMOTION AMONG ADOLESCENT GIRLS

Information, education, communication component being an integral part of the rural development programme of Government of India IEC combines strategies, approaches and methods that enable individuals, families, groups organizations and communities to play active roles in achieving protecting and sustaining their own health. Embodied in IEC is the process of learning that empowers people to make decisions, modify behaviours and change social conditions. The influence of underlying social cultural, economic and environmental conditions on health are also taken into consideration in the IEC processes. Thus health information system is a basic tool for the progress of any society. Since independence, many nutrition and health programmes were developed to eliminate

malnutrition and associated disease. Their impact evaluation at different points of time showed poor coverage, the main bottlenecks being lack of proper orientation of health function and poor beneficiary complaints due to low awareness which in turn is attributed to weak information, education and communication (IEC) components or its inadequate usage. This remain a gigantic task because IEC strategies and campaign should be faced over a period of time, as people move through different steps of behavioural change – unaware, aware, concern, knowledgeable, skilled motivated to change, trial and sustained behaviour change (Rao, 2004).

According to Revikumar (2000) information education communication is a concerted and planned endeavour of reaching people as individual, group or masses putting across scientific knowledge and educating them to develop expected behavioural pattern and creating a condition in which they direct themselves towards the accomplishment of pre-designated programme.

The recommendations of the proceedings of the NCEHP (1996) revealed that the IEC materials should be designed carefully and very effectively. Apart from accuracy of messages delivered they should be made attractive, colourful and culturally acceptable. The materials should also be made to last for considerable time and should not get spoiled easily. For maximum effectiveness the media have to be used in a co-ordinated and mutually reinforcing manner.

Although efforts to improve the health and well being of people have taken place under a variety of circumstances. The most important settings for nutrition improvement programmes are communities. Milton (1999) developmental programmes which aims to bringing about socio-economic changes in the rural masses will succeed only if the extension workers are able to ensure and deliver direct steady flow of technical information to the right people of the right time in the right way. This calls for proper selection of IEC materials.

IEC is an absolute necessity for control and prevention of any deficiency. Man and money power should not be bottlenecks in their endeavours (ICMR, 1994). For applying an IEC it is essential to know more about the component of IEC *i.e.*, information education and communication.

A study by Saibaba and Raghuram (1999) revealed that to test methodically whether nutrition and health related messages incorporated into the educational (IEC) material were successfully transmitted to the target group of women.

Vishma (2000) revealed that only IEC programme was effective in modifying the community behaviour, if it is united with a programme of community action.

Rao and Rao (1995) pointed out that more the number of senses stimulated in any human being the more the messages that was conveyed to the human being and more thoroughly the message was retained in his memory.

Neena and Singh (2002) observed that effective utilization of IEC strategies are the core of social marketing. It has been well recognized that one of the weakest links in intervention programmes to control malnutrition is absence of proper nutrition education.

According to Santhoshkumar (1990) the visual aids support the spoken word and create visual images which will be remembered long even after the written or spoken word in removed from the audience. Studies conducted elsewhere in the use of visual aids proved that more the number of senses stimulated greater will be success of communication efforts. Communication through the usage of visual aids enter into the social mobilization into several ways.

Shah and Gupta (1990) studied the effectiveness of three visual aids *viz.*, flash card, slides and puppets found that flashcards were significantly superior to the other two in imparting knowledge in non-formal education programme.

It was found that among the three visual aids used in this study, flash cards combined with lecture had the maximum combination in retention of knowledge of neo literate respondents (Santhoshkumar, 1990)

Ramkrishan (1990) reported that the use of slide is convenient and serves as an effective method for improving knowledge of the school students. He emphasized the use of slide in extension as one of the best, cheapest and most effected method of attracting attention, arousing interest and making decisions.

The findings of Singh and Verma (1990) reveals that there was significant gain in knowledge for the simple and complex messages after the exposure through the slide stories.

Kaur and Roy (1990) proved that teaching with the help of non-projected visual aids like, charts, flashcards and flannel graph were effective than the lecture method alone.

Flannel boards can be successfully used because mothers and older children can participate in using them. The aid should form part of the lesson and be induced in the follow up discussion (Igbedioh, 1990).

Vijayalekshmi *et al.* (1992) proved that the level of technicality method of presentation and visual aids should be carefully mixed with the delivery of lessons to make it more effective.

Suryaprakash (1992) reported that media combinations namely exhibition with slide show were found to be superior in increasing the knowledge of respondent school students to the single medium exhibition.

The indirect effects of media portrayal are of crucial importance because they help to determine the health and social concerns of people and society, colouring once perceptions of reality and thus influencing the over all ideology and attitude of life and death. The community has lot to learn from the media (Lisberg, 1993).

Chandrakantan (1994) established radio listening behaviour and significant influence on knowledge gain.

According to Davis (1994) radio, drama, hold promises as a medium through which convey the impact of psychosocial condition on nutrition.

Baskaran *et al.* (1995) reported that radio and newspaper were the most utilized source of information.

Sangha and Katra (1995) revealed that radio and television were used to greater extent than their mass media.

Kelsey and Hearne (1995) studied the effective method of presentation of subject matter. They reported that a very substantial increase in the number of people influenced could be expected through the use of charts to supplement the lectures.

Biradar and Sundaraswamy (1998) reported that video show could be able to provide more intense experience than the only words could in lecture method.

Viswanathan *et al.* (1999) pointed out that with all the advantages video camp served as an effective training tool in extension programmes to impart knowledge to the farmers as well as extension workers.

A study by Annamma *et al.* (2003) revealed that the video film entitled "Drishti" was an effective material for imparting nutrition education pertaining to vitamin A to middle school children.

Another study conducted by Razeena (2000) found that the lecture method in combination with selected visual aids have more influence than when compared with the lecture method alone.

According to Vishma (2000) revealed that the formulated flashcard and slide was found to be very effective than the lecture method alone.

A study by Ghavam *et al.* (2003) showed that the training course has covered the specific objective areas in delivery services to prevent nutritional problems and eventually to promote the community health.

Singh (1995) reported that there was significant difference in gaining knowledge of the tribal women exposed to nutritional education training.

According to Kumar *et al.* (2003) calendars and video films are effective in bringing about positive change in knowledge.

Peterson (1995) reported that more the extension method used, higher will be the person's changing their practices favourably.

According to Rajammal *et al.* (1994) nutrition education imparted through the school curriculum and lunch programme had a significant higher beneficial effect than when imparted through the curriculum alone.

Patnam (2002) revealed that self care intervention programme have brought significant positive changes in the rural girl's knowledge about nutrition, growth, wholesome development and preventive measure in ill health, reproductive system, puberty changes – physical and psychological, management of menstruation.

Another study by Shine *et al.* (2003) revealed that the well designed nutrition education programme for the obese children can be an effective approach to help them to reduce their obesity index and to establish desirable food attitudes.

A study conducted by Siddarmaiah and Rajanna (1992) indicated that the gain in knowledge of the respondent was due to the exposure to various communication methods.

A work conducted by Rajammal *et al.* (1992) revealed that rural women adopted desirable health practices as a result of the exposure to the education programme.

According to Nagarajan (2003) the self-instructional material was very effective in imparting the necessary information as evident by a significantly higher scores on the post study. It was also observed that all the students invariably were gained knowledge and changed favourably in their attitude level towards Adolescents Reproductive Health Education uniformly which indicated that the material was appropriate for the level of the students. He-suggested that self instructional materials can serve as a useful alternative input.

Higher the value orientation, economic motivation and mass media exposure higher would be the knowledge gain, adoption and retention. The mass media commonly used as a radio, television, press films, health magazines, posters, health exhibitions and health museums (Philip *et al.*, 1998).

Venkatesh Murthy (1995) found that high knowledge level of students regarding health and nutrition is associated with the use of leaflet or school visit.

Selvaraj (1999) found that the involvement of poly perceptory organs was more effective in knowledge gain by the listeners compared to involvement of disensory organs and monosensory organs. Thus the IEC programme conducted was helpful to disseminate information among the adolescent girls.

Materials and Methods

3. MATERIALS AND METHODS

The proposed study entitled "Effectiveness of IEC materials on health and nutritional practices of adolescent girls" is a work to assess the effectiveness of formulated information education and communication materials on adolescent health. Methodology followed in the study is presented under the following sub heads.

3.1 Locale of the study

3.2 Selection of the respondents

3.3 Variables selected for the study

3.4 Techniques adopted for measurement of the variables

3.5 Statistical analysis

3.1 LOCALE OF THE STUDY

Two higher secondary government schools in Thiruvananthapuram taluk were purposively selected for the study. The selected schools were located at Venganoor and Thiruvallam of Thiruvananthapuram district.

3.2 SELECTION OF THE RESPONDENTS

3.2.1 Selection of Macro Sample (100 respondents)

One hundred adolescent girls in the age group of 13-15 years from two Government schools at Venganoor and Thiruvallam panchayath of Thiruvananthapuram district formed the macro sample of the study. The selection of the respondents was based on the monthly income of their families. According to Vikasana Guide, Kerala, poverty line is assessed on the basis of income. Below poverty line family has an income below Rs. 22,000 per annum from all sources whereas, above poverty line family has an income above Rs. 22,000 per annum from all sources . Fifty respondents each belonging to Above Poverty and Below Poverty

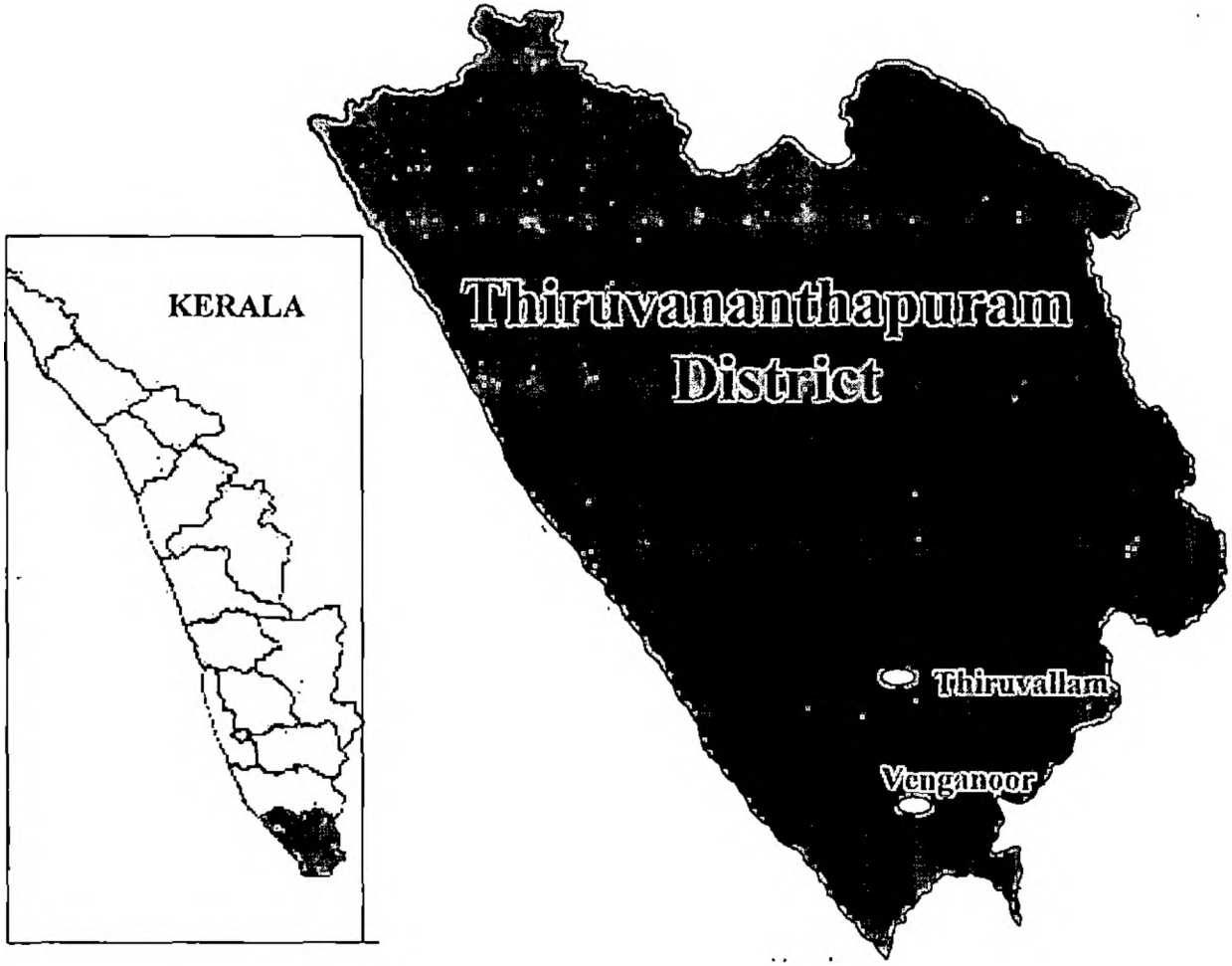


Fig. 1. MAP of the study area

categories were selected on the basis of certain criteria adopted by Srilatha and Gopinathan (1995). The criteria are given below.

(a) The families belonging to SC/ST
(b) With children under five years of age
(c) Having even one illiterate adult
(d) With only one or no adult employed
(e) Living in kutcha house
(f) Without a household latrine
(g) With no access to safe drinking water
(h) Consuming only two or less meals a day
(i) With an alcoholic or drug addict or a major crisis in the family.

Here poverty is defined on the basis of a risk index called the poverty index and a family is considered under high risk if the families have any five or more of the nine risk factors listed on the index.

3.2.2 Selection of Micro Samples (20 respondents)

Ten respondents from each of the two groups (APL and BPL) belonging to the age group of 13-15 years were selected at random for detailed study.

3.3 VARIABLES SELECTED FOR THE STUDY

3.3.1 Socio-economic and Personal Characteristics

3.3.2 Knowledge and practices of health, nutrition and personal hygiene

3.3.2.1 Gain in knowledge

3.3.2.2 Retention of knowledge

3.3.2.3 Adoption of gained knowledge

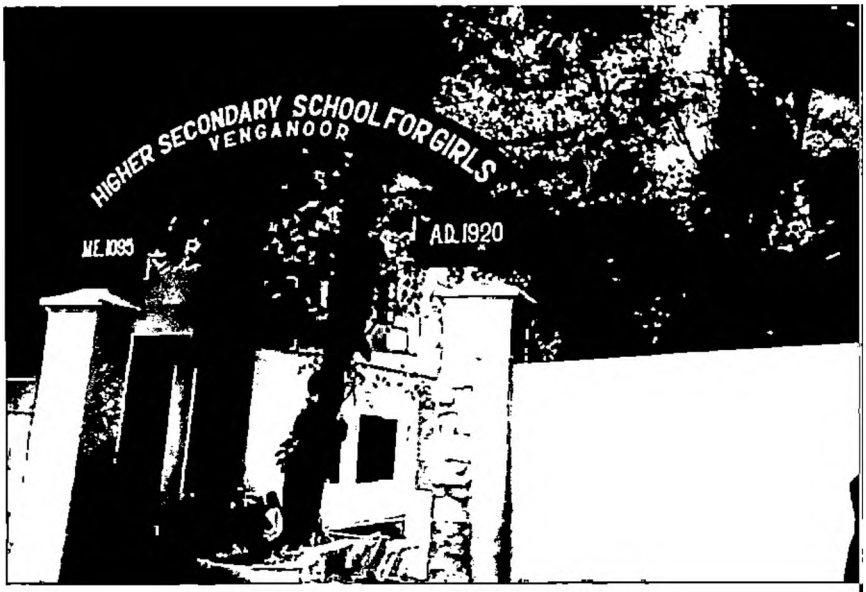
3.3.3 Assessment of Nutritional Status of Selected Respondents based on

3.3.3.1 Anthropometric measurements

3.3.3.2 Biochemical

3.3.3.3 Clinical

3.3.3.4 Dietary habits and food consumption pattern



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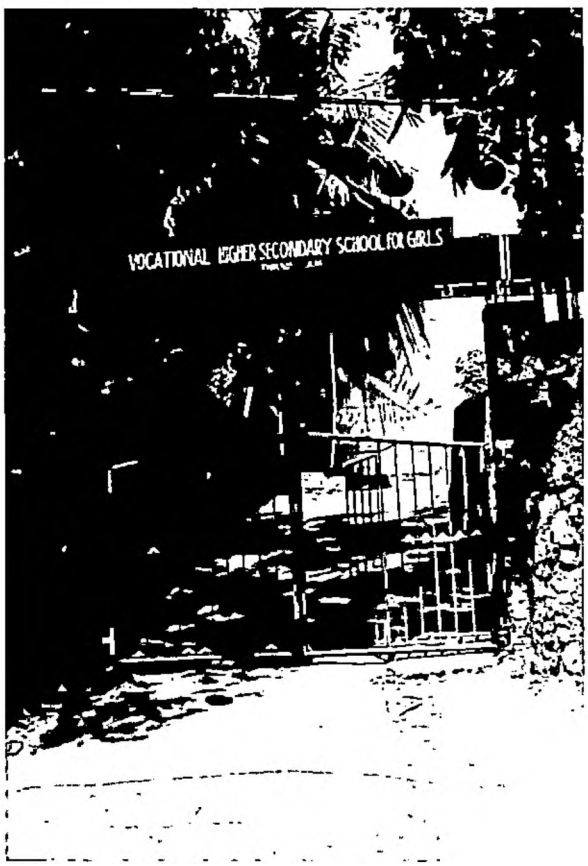


B

Plate 1. Locale of the study

3.4 TECHNIQUES ADOPTED FOR THE MEASUREMENT OF VARIABLES

3.4.1 Socioeconomic and Personal Characteristics of the Respondents

In order to elicit information regarding socioeconomic profile of the respondents, details regarding family income, type and size of the family, religion, family composition, educational status of the respondents and parents, mass media exposure, health profile and availability of basic facilities in the house had to be collected. Hence, incorporating the above details a suitable pre-tested questionnaire was developed using standard procedure and was administered among the respondents. The questionnaire developed is presented in Appendix I. Interview method was used for data collection.

3.4.2 Measurement of Knowledge and Practices of Health, Nutrition and Personal Hygiene

An experimental design to find out the effectiveness and retention of knowledge, developed by Razeena (2000) was adopted with slight modification for the present study.

A baseline survey was conducted to measure the knowledge and practices of health, nutrition and personal hygiene. Based on the knowledge on health, nutrition and personal hygiene obtained from the baseline survey, education modules were prepared. From the survey it was clear that importance of nutritious food, body changes in adolescent period, health care and reproductive heath and hygiene were the major lacuna among the adolescent girls. All these topics were referred in detail by the researcher and the education module was prepared in simple language, easily understandable by the respondents. A total of 125 statements on various aspects of health and nutrition were prepared. These statements were prepared from relevant literature and they were pre-tested. Sixty five statements were selected for constructing the

knowledge test . The number of statements selected in different areas of health and nutrition are as follows and presented in Appendix VI.

Important areas of health and nutrition	Number of statements
1. Importance of nutritious food	18
2. Body changes in adolescent period	16
3. Health Care	16
4. Reproductive health and hygiene	15
Total	65

In order to facilitate easy answering by the respondents the questions were typed in bold letters with sufficient space in between lines. The questions as well as their answer choice were read-out by the researcher to enable easy marking of responses by the respondents.

3.4.3 Development of IEC Materials

All the relevant information regarding health and nutritional practices of adolescent girls were collected from different journals textbooks, news articles, other publications of University and Director of Health Services. The information thus collected was processed and prepared into lecture script for each subtopic in vernacular languages.

The IEC material formulated for the teaching programme includes flashcard, charts, posters, and leaflet (Appendix X).

The IEC materials were tested for their effectiveness by presenting before a selected group of subject experts in the department of Home science, College of Agriculture, Vellayani, Nutrition board and Directorate of Health Services, Thiruvananthapuram.

3.4.4 Implementation of Education Programme

The teaching programme was planned on the basis of nutrition and health practices identified.

The respondents were divided into four groups, each group consisted of 20 adolescent girls and the remaining formed the control group.

The treatments of experiment were

T_1 – Lecture method

T_2 – Lecture + flashcard + leaflet

T_3 – Lecture + posters + chart

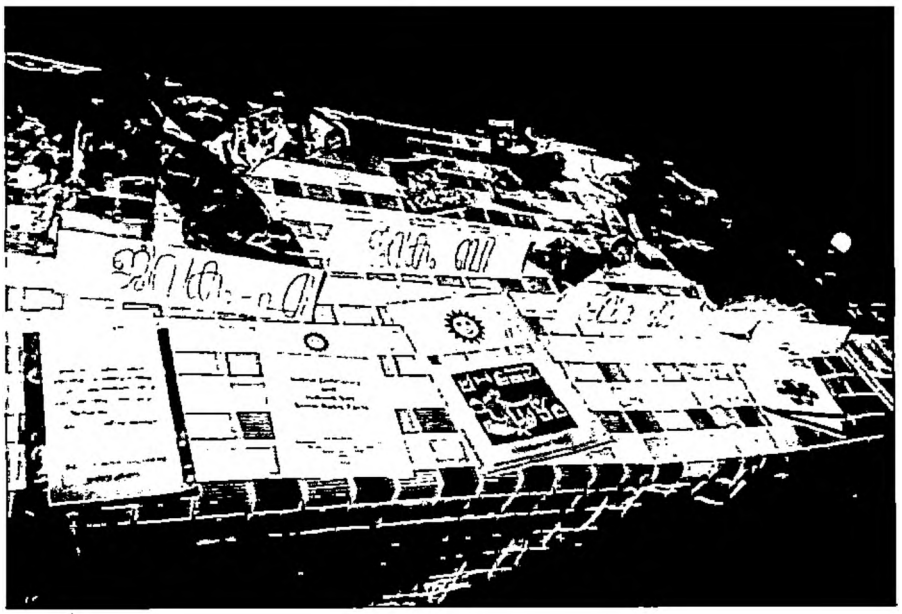
T_4 – Lecture + exhibition + demonstration

In the first group of all the four topics were taught using the treatment one (T_1), in the second group treatment two (T_2), in the third group treatment three (T_3) and in group four treatment (T_4).

Group	Treatments	Topic
1	Lecture alone (T_1)	Importance of nutritious food, body changes in adolescent period, health care, reproductive health and hygiene
2	Lecture + flashcard + leaflet (T_2)	" "
3	Lecture + posters + chart (T_3)	" "
4	Lecture + exhibition + demonstration (T_4)	" "

Plate 2. Students viewing exhibition

A



B

Plate 3. Exhibition conducted with formulated IEC materials

Experimental design

Before	After		
L_1 Pre-test	L_2 Post-test	L_3 Retention	L_4 Adoption

L_1 – Level of knowledge of the experimental group prior to particular education programme

L_2 – Level of knowledge of the experimental group immediately after the education programme

L_3 – Level of knowledge of the experimental group 15 days after the education programme

L_4 – Level of adoption practices one month after the education programme

The education programme was of two hours duration. The first one-hour was spent for lecturing and the remaining period was spent for discussion. The classes were supplemented with suitable IEC materials.

Before the actual conduct of the teaching programme a detailed plan of schedule was prepared by the researcher with the help of the teachers of the schools. The researcher explained the purpose of this study to the students in advance. This helped to build a rapport with the students.

In order to increase the effectiveness of education programme an one-day exhibition cum-demonstration was conducted after the teaching programme.

Plate 4. Demonstration

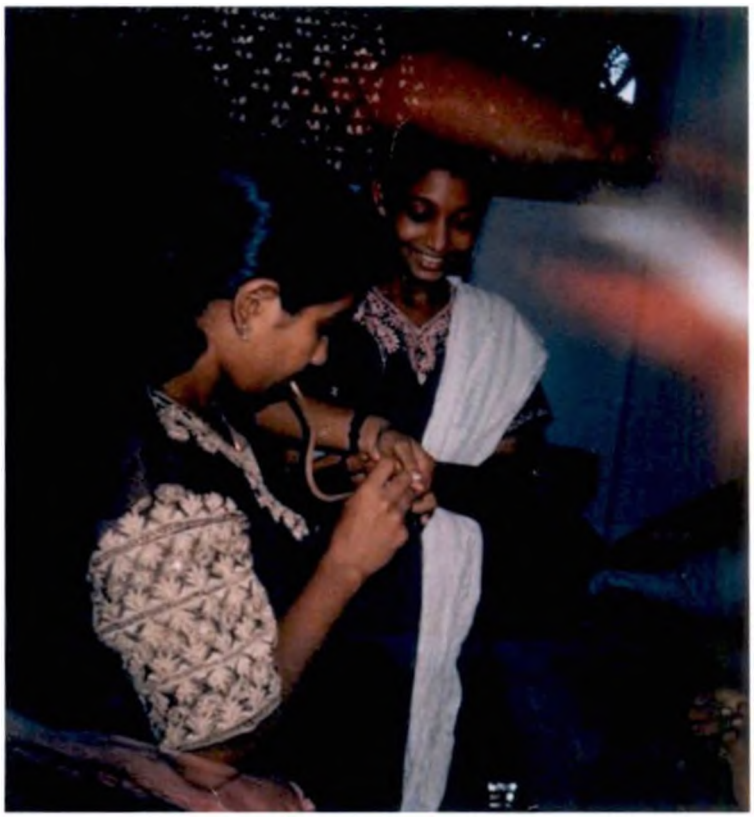


Plate 5. Biochemical assessment

Exhibition on family life education with special reference to nutrition, health and hygiene was organized at Thiruvallam and Venganoor school. The main objective of the exhibition was to focus attention in a concerted manner on the reproductive health and hygiene of adolescent girls.

Preparation of low-cost sanitary napkin was also demonstrated during the exhibition. During the demonstration classes the girls were asked about the hygiene while using this napkin. The preparation steps were repeated several times and they were asked to prepare a sanitary napkin after the demonstration class. Before the conduct of demonstration, students were informed in the education class about the sanitary napkin that can be prepared from locally available materials *i.e.*, cotton and gauze.

3.4.5 Evaluation of Educational Programme

The impact of educational programme was evaluated by selecting the score values obtained in pre-test, post-test, retention of knowledge and also adoption of gained knowledge.

3.4.5.1 Gain in Knowledge

For the measurement of gain in knowledge through various treatments a simple teacher made test was constructed following the procedure adopted by Razeena (2000) with slight modification.

Gain in knowledge was computed as percentage of net gain in knowledge over the total possible knowledge for the respondents on the test using the following formula:

$$\text{Percentage gain in knowledge} = \frac{t_1 - t_0}{t} \times 100$$

Where, t_0 = pre-test knowledge score

t_1 = post-test knowledge score

t = total possible score

The percentage gain in knowledge by each respondent was obtained and the mean score was arrived at for the respondents based on which further analysis was done.

3.4.5.2 Retention of Knowledge

Retention of knowledge is the amount of knowledge 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 knowledge was applied here also but with a gap of 15 days after the exposure to such stimulation. This test is the post delay test.

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

Retention of knowledge=percentage gain in knowledge – percentage loss of knowledge in post delay test.

Percent loss of knowledge due to post delay test was computed as follows.

$$\text{Percent knowledge lost} = \frac{t_1 - t_2}{t} \times 100$$

Where t_1 = post test knowledge score

t_2 = retention score

t= total possible score

3.4.5.3 Adoption of Gained Knowledge

For the measurement of the level of adoption of health and nutritional practices, a checklist was formulated including all the topics to which the respondents were exposed. Based on this checklist a teacher made test was again administered to the respondents which is presented in Appendix VII.

Level of adoption of practices one month after the teaching programme were taken.

The difference in the adoption level of respondents between pre-test and post-test indicated a measure of adoption of the gained knowledge.

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

Where T_1 = pre-test adoption score

T_2 = post adoption score

T = total possible score

The extent of adoption was evaluated one month after the education programme.

3.4.6 Assessment of Nutritional Status of Selected Respondents

Nutritional status is defined as the state of health enjoyed as a result of nutrition. This included anthropometry, biochemical, clinical and dietary assessment and details are presented in Appendix II, III and IV.

3.3.6.1 Anthropometric Measurement

Anthropometry provides the single most universally applicable. inexpensive and non-evasive technique for assessing the size. proportions and composition of the human body. Anthropometry has been accepted as an important tool for the assessment of nutritional status (Vijayaraghavan. 1987).

According to Gorstein *et al.* (1994) anthropometry is widely used as a tool to estimate the nutritional status of populations and to monitor the growth and health of individuals.

Anthropometric measurements *viz.*, weight for age, height for age. body mass index of the respondents were taken in the present study to assess the nutritional status.

Weight is a measurement of body mass. Comparison of weight for age values with regional standards at corresponding age will help to determine the degree of under nutrition in a community. According to Kaul and Nyamongo (1990) a change in body weight may be the result of changes in the health of individual changes in dietary supplies or even change in one's physical activity.

For weighing, platform weighing balance was used as it is portable and is convenient to use in the field. The weighing scale was checked periodically for accuracy. The scale was adjusted to zero before each measurement. The subject was having minimum clothing and was asked to stand on the platform of the scale, without touching anything and looking straight ahead. The weight was recorded to the nearest 0.25 kg. Each reading was taken twice to ensure correctness of the measurement.

The height of an individual is made of the sum of four components legs, pelvis, supine and skull. Height or the total length apart from

nutritional and other environmental factors is influenced by hereditary factors. The extend of height deficit in relation to age was compared to regional standards may be regarded as a measure of the duration of malnutrition (Gopaldas and Seshadri. 1987).

To determine height, a measuring tape was fixed vertically on a smooth wall perpendicular to the ground. taking care to see that the floor area was even and not rough. The subject was asked to remove the slippers. stand with the centre of the back touching the scale with the feet parallel and heels, buttocks, shoulders and back of the head touching the wall. The head was held comfortably erect. the arms hanging loosely by the sides. A smooth thin ruler was held on the top of the head of the centre. crushing the hair at right angle to the scale and the height read from the lower edge of the ruler to the nearest 0.5 cm. Each reading was taken twice to ensure correctness of the measurement.

Body Mass Index (BMI) is expressed as the ratio of weight to height square *i.e.*. weight (kg). height (m^2) was used as good parameter to grade chronic deficiency (NIN. 1990).

$$BMI = \frac{\text{Weight (kg)}}{\text{Height}^2\text{ (m)}} \times 100$$

Chronic energy deficiency has been defined as a steady state in which a person is in energy balance although at a cost in terms of risk to health or an impairment of function and health. Body mass index is regarded as a good indicator of nutritional status.

3.4.6.2 Biochemical Assessment

Biochemical assessment is one of the most important tool, for assessing the nutritional status of the subject. There are several biochemical indicators of malnutrition specified for different nutritional deficiencies.

The haemoglobin content of blood samples collected from the 20 respondents was estimated. Park (1991) stated that haemoglobin level is useful index of the overall state of nutrition irrespective of its significance in anaemia.

Haemoglobin content was estimated by the cyanmethaemoglobin method as described in the Manual of Laboratory Techniques by National Institute of Nutrition ICMR (1994) (Appendix IV).

3.4.6.3 Clinical Assessment

Clinical examination is stated to be one of the most essential and the simplest tools used in the evaluation of nutritional status (Gupta *et al.*, 1989). It is part of nutritional assessment through which direct information of signs and symptoms of dietary deficiency prevalent among the adolescent girls were collected. The presence or absence of clinical deficiency symptoms which is an index of nutritional status was assessed by a qualified physician (Appendix III).

3.4.6.4 Dietary Habits and Food Expenditure and Consumption Pattern

Dietary habits of the respondents were assessed through diet survey. details regarding eating habits, frequency of use of different food items were collected.

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

Gore *et al.* (1997) suggested that only weighment method was the ideal choice for assessment of individual's food intake.

Food consumption pattern is one of the important determinants of nutritional status (Deshpande *et al.*, 2001). A diet survey was done using a

questionnaire to assess the food habits, dietary pattern and food use frequency.

The nutritive value of the food consumed was calculated with the help of food value table and this value was compared with RDA (Recommended Dietary Allowance) of ICMR (1999). A suitable questionnaire was developed incorporating all the variables and was pre tested and administered among the respondents. The schedule structured is presented in Appendix II.

Weighment survey was carried out in a sub sample of 20 respondents to get accurate quantified information on actual food intake. All the raw foods taken for cooking were weighed. The food consumed by the respondents and that remaining after eating were also weighed and recorded to find out the exact amount of foods consumed by them.

A food use frequency score sheet was also included in the diet survey schedule since the frequency of use of different food groups would give an indication of the adequacy of the family diet pattern, as observed by Nelson (1993). In this study food use frequency was measured on a five point rating scale.

3.4.6.5 Nutritional Status Index (NSI) of the Respondents

Suppose x_{ij} be observation corresponding to j^{th} variable for the i^{th} sample. $wj = 1/\sigma j^2$, the weight assigned to the observation corresponding to j^{th} variable, the nutritional status of I^{th} individual is defined as :

$$Ni = \frac{\sum_{j=i}^{k} w_i x_{ij}}{k} \quad i = 1, 2 \ldots N$$

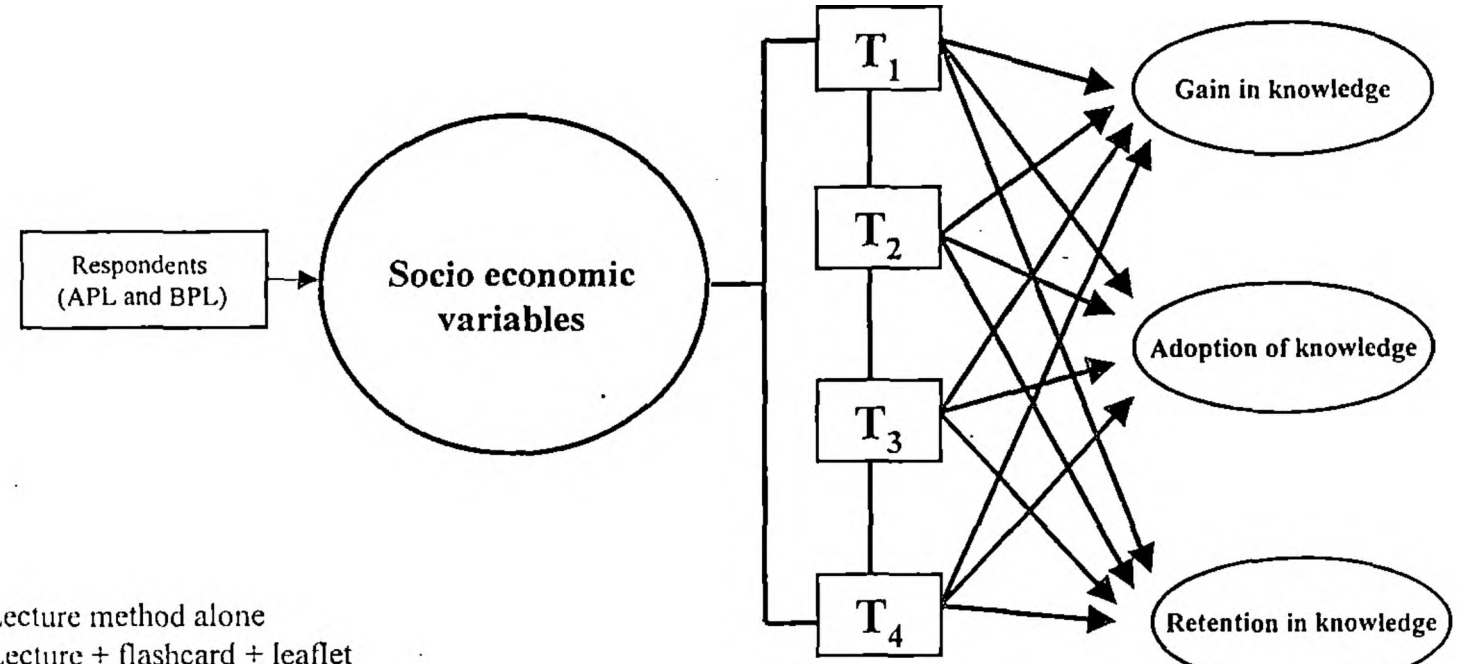
N = Number of respondents

k = Number of variables

The NSI of the selected respondents were defined in terms of characters such as weight, height, body mass index and haemoglobin levels.

3.5 STATISTICAL ANALYSIS

The data collected from the respondents were tabulated and analysed using suitable statistical methods. Mean, percentage, correlation analysis and ANOVA were statistical methods used for the analysis of data.



T_1 – Lecture method alone
T_2 – Lecture + flashcard + leaflet
T_3 – Lecture + posters + charts
T_4 – Lecture + exhibition + demonstration

Fig. 2. Conceptual model of the study

Results

4. RESULTS

The main objective of the study is to develop information education and communication materials on adolescent health and nutrition practices and to assess the effectiveness of the formulated IEC materials. Keeping these objectives in view the data collected from the macro sample (50 respondents each from APL and BPL families) and the micro sample (10 respondents each from APL and BPL families) were analysed and the result of the experimental study are presented under the following heads.

4.1 Socio-economic and personal characteristics of the respondents

4.2 Dietary habit and food consumption pattern of the respondents

4.3 Nutritional status of the respondents

4.4 Association between socio-economic variables

4.5 Correlation between the overall knowledge gain, retention, adoption of health and nutritional practices and selected socio-economic variables

4.6 Inter-correlation between selected socio-economic variables

4.7 Effectiveness of IEC materials on the gain in knowledge and retention

4.8 The comparative effectiveness of formulated IEC materials on gain in knowledge and retention on health and nutritional practices

4.9 Effectiveness of IEC materials on the adoption of health and nutritional practices by the respondents

4.10 Comparative effectiveness of formulated IEC materials on the adoption of health and nutritional practices

4.1 SOCIO-ECONOMIC AND PERSONAL CHARACTERISTICS OF THE RESPONDENTS

The socio economic profile of the selected respondents belonging to APL and BPL families were studied with reference to their family size, type of family, monthly income, educational and employment status of parents, mass media contact, household assets and basic facilities, change in food consumption pattern and health profile. The distribution of respondents based on religion, caste, type and size, age of their families are presented in Table 1.

Table 1. Distribution of respondents based on religion, caste, age, type and size of families

Variables	Category	APL families		BPL families	
		No.	Percentage	No.	Percentage
Religion	Hindu	37	74.00	31	62.00
	Christian	12	24.00	15	30.00
	Muslim	1	2.00	4	8.00
Caste	Backward	11	22.00	5	10.00
	OBC	26	52.00	34	68.00
	Forward	13	26.00	11	22.00
Type of family	Joint	9	18.00	15	30.00
	Nuclear	41	82.00	35	70.00
Family size	Small (1-4)	41	82.00	35	70.00
	Medium (5-7)	3	6.00	7	14.00
	Large (>8)	6	12.00	8	16.00
Age	Pre- adolescence (< 10)	7	2.95	3	1.29
	Adolescence (10-19)	108	45.38	106	45.69
	Young (19-25)	8	3.36	13	5.61
	Middle age (25-55)	101	42.43	98	42.24
	Old (> 55)	14	5.88	12	5.17

4.1.1 Religion

Seventy four per cent of the respondents of APL families and 62 per cent of the respondents of BPL families were belonging to Hindu community. Twenty four per cent of the respondents of APL families and 30 per cent of the respondents of BPL families were belonging to Christian community. Remaining two per cent of the respondents of APL families and eight per cent of BPL families were belonging to Muslim community.

4.1.2 Caste

The caste-wise distribution of the respondents depicted in the Table 1 showed that 52.00 per cent of respondents of APL families and 68.00 per cent of the respondents of BPL families belonged to other backward classes category and 26.00 per cent of respondents of APL families and 22.00 per cent of BPL families were from forward caste *i.e.* Nair community. While the remaining 22.00 per cent of APL families and 10.00 per cent of BPL families belonged to SC/ST category.

4.1.3 Type of Family

Type of family is classified into nuclear and joint based on composition. Results presented in Table 1, revealed that 82.00 per cent of the respondents in APL families and 70.00 per cent of the respondents in BPL families were from nuclear families. The remaining 18.00 per cent (APL families) and 30.00 per cent (BPL families) were from joint families.

4.1.4 Family Size

The total number of family members of 100 respondents were 232 and 238 belonging to APL and BPL families respectively. Eighty two per cent of the respondent of APL families and 70.00 per cent of respondents of BPL families were from small families (1 – 4 members). Twelve per cent of the respondents in APL families and sixteen per cent of the respondents

in BPL families were from large family (> 8 members). The remaining 3.00 per cent of APL families and 7.00 per cent of BPL families were from medium sized families (5 – 7 members).

4.1.5 Age of the Family Members and Respondents

All the respondents were in the adolescent age (13 to 15) group. Age of the family members showed that majority of members in the APL families (45.38 per cent) and BPL families (45.00 to 69.00 per cent) were in the adolescent age category. APL families (42.43 per cent) and BPL families (42.24 per cent) were in the middle age category. While in the old age category there were 5.88 and 5.17 per cent in APL and BPL families respectively. Only 3.36 per cent in APL families and 5.61 per cent in BPL families were of 19 – 25 years age. Remaining 2.95 per cent of APL families and 1.29 per cent of BPL family members were in the pre-adolescent age group.

4.1.6 Educational Status of the Family

A birds eye view of the Table 2 revealed that majority of the adult males in APL families (51.85) and BPL families (38.46) had high school level of education and 24.07 of adult males in APL families had college level of education. With respect to adult females 46.67 per cent from APL families and 32.21 per cent from BPL families had high school level of education and 26.66 of adult females of APL families had college level of education.

With regard to educational status of male children, 50 per cent in APL families and 46.88 per cent in BPL families had high school level of education and 28.12 per cent of male children in BPL families had college level of education. More than 70 per cent of adult female in APL and BPL families had high school level of education and 11.62 per cent in APL and 12.35 per cent in BPL families had college level of education.

Table 2. Educational status of the family member

(n = 100)

Variables	Category	Score range	APL families (%)	BPL families (%)
Adult male	Illiterate	0	3.71	7.69
	LP	1	7.41	32.69
	UP	2	12.96	17.31
	High school	3	51.85	38.46
	College	4	24.07	3.85
Adult female	Illiterate	0	10.00	13.56
	LP	1	5.00	22.03
	UP	2	11.67	30.51
	High school	3	46.67	32.21
	College	4	26.66	1.69
Male children	Illiterate	0	-	-
	LP	1	11.12	-
	UP	2	36.11	25.00
	High school	3	50.00	46.88
	College	4	2.77	28.12
Female children	Illiterate	0	-	-
	LP	1	8.14	2.25
	UP	2	9.31	10.12
	High school	3	70.93	75.28
	College	4	11.62	12.35

4.1.7 Employment Status of the Parents

Table 3 revealed that with respect of father's employment status none of them were unemployed. Forty four per cent of father's in APL families were in government service and 40 per cent in private enterprises and 16 per cent were self-employed.

In BPL families none were employed in government services. 26 per cent in private and 70 per cent of them were working as casual labourers and four per cent had taken up self-employment.

Table 3 Distribution of respondents based on the parent's educational status

Educational level	Father's employment status		Mother's employment status	
	APL	BPL	APL	BPL
1. Government	22 (44.00)	-	6 (12.00)	-
2. Private	20 (40.00)	13 (26.00)	-	-
3. Casual labourer	-	35 (70.00)	4 (8.00)	11 (22.00)
4. Self employment	8 (16.00)	2 (4.00)	3 (6.00)	1 (2.00)
5. Unemployment	-	-	37 (74.00)	38 (76.00)
Total	50 (100)	50 (100)	50 (100)	50 (100)

Numbers in parenthesis indicate percentage

With respect to mother's employment status, 74.00 per cent were unemployed in APL families 12 per cent were employed in government services, eight per cent were casual labourers and six per cent were self-employed.

In BPL families 76 per cent were unemployed. 22 per cent were casual labourers and two per cent had self-employment.

4.1.8 Family Income

The monthly income range of APL families and BPL families are presented in Table 4.

Table 4. Distribution of respondents based on their family income

(n=100)

Monthly income range (Rs.)	Percentage of respondents	
	APL families	BPL families
< 1000	-	18 (36.00)
1001 – 1500	-	18 (36.00)
1501 – 2000	-	14 (28.00)
2001 – 2500	10 (20.00)	-
2501 – 3000	14 (28.00)	-
> 3001	26 (52.00)	-

Numbers in parenthesis indicate percentage

Results presented in Table 4 revealed that in APL families 52 per cent of the respondents belonged to high income group (above Rs. 3001) followed by 28 per cent (Rs. 2501 – 3000) and 20 per cent (Rs. 2001-2500).

In BPL families 36 per cent had their monthly income below Rs. 1000. 36 per cent had their family income ranging between Rs. 1001–1500 remaining 28 per cent had their family income ranging between Rs. 1501-2000.

4.1.9 Household Assets and Basic Facilities

Table 5 shows that majority of respondents in APL families (46.00 per cent) belonged to medium level and 40.00 per cent (APL families) high level with regard to possession of household assets and basic facilities and 84.00 per cent of the respondents in BPL families belonged to low level category and 14.00 per cent of them belonged to medium level while 2.00 per cent belonged to high

Table 5. Distribution of respondents based on presence of household assets and basic facility (n=100)

Score range	Category	Percentage of respondents	
		APL families	BPL families
<10	Low	7 (14.00)	42 (84.00)
10 – 15	Medium	23 (46.00)	7 (14.00)
> 15	High	20 (40.00)	1 (2.00)

Numbers in parenthesis indicate percentage

4.1.10 Mass Media Contact

Table 6. Distribution of respondents based on their mass media contact (n=100)

Variables	Category	Score range	Percentage of respondents	
			APL families	BPL families
Mass media contact	Low	< 7	8 (16.00)	17 (34.00)
	Medium	7-12	20 (40.00)	25 (50.00)
	High	> 12	22 (44.00)	8 (16.00)

Numbers in parenthesis indicate percentage

The distribution of the respondents according to their exposure to information source *viz.*, mass media contact as presented in Table 6 revealed that 40.00 per cent (APL families) and 50.00 per cent (BPL families) were having medium level of mass media contact. Sixteen per cent of APL families and 34.00 per cent of BPL families were having low level contact. The remaining had high level contact.

4.1.11 Monthly Expenditure Pattern

The distribution of respondents (APL and BPL families) based on the monthly expenditure on various household and personal articles given in Table 7 and 8 revealed that majority of the respondents of BPL families spent their income for the purchase of food items. Forty four per cent of respondents of BPL families were spending Rs.1001/- to 15000/- on food materials. The expenditure for water, fuel, recreation, gifts and clothing were found to

Table 7. Percentage distribution of the monthly expenditure pattern (APL families)

Sl. No.	Items	Expenditure (Amount in Rs.)													
		0		1-100		100-500		500-1000		1000-1500		1500-2000		> 2000	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	Food	-	-	-	-	-	-	3	6	21	42	17	34	9	8
2	Clothing	-	-	14	28	31	62	5	10	-	-	-	-	-	-
3	Housing	32	64	12	24	6	12	-	-	--	-	-	-	-	-
4	Education	19	38	6	12	23	46	2	4	-	-	-	-	-	-
5	Health	9	18	21	42	20	40	-	-	-	-	-	-	-	-
6	Travelling	8	16	23	46	19	38	-	-	-	-	-	-	-	-
7	Recreation	42	84	4	8	3	6	1	2	-	-	-	-	-	-
8	Fuel	44	88	4	8	1	2	1	2	-	-	-	-	-	-
9	Water	43	86	3	6	4	8	-	-	-	-	-	-	-	-
10	Electricity	9	18	37	74	4	8	-	-	-	-	-	-	-	-
11	Gifts	13	26	12	24	22	44	3	6	-	-	-	-	-	-
12	Festivals	14	28	21	42	10	20	5	10	-	-	-	-	-	-
13	Savings/ Miscellaneous	4	8	20	40	13	26	12	24	1	2	-	-	-	-

Table 8. Percentage distribution of the monthly expenditure pattern (BPL families)

Sl. No.	Items	Expenditure (Amount in Rs.)													
		0		1-100		100-500		500-1000		1000-1500		1500-2000		> 2000	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	Food	-	-	-	-	-	-	4	8	22	44	16	32	8	16
2	Clothing	27	54	23	46	-	-	-	-	-	-	-	-	-	-
3	Housing	34	68	16	32	-	-	-	-	-	-	-	-	-	-
4	Education	16	32	21	42	10	20	3	6	-	-	-	-	-	-
5	Health	8	16	26	52	15	30	1	2	-	-	-	-	-	-
6	Travelling	10	20	36	72	4	8	-	-	-	-	-	-	-	-
7	Recreation	49	98	1	2	-	-	-	-	-	-	-	-	-	-
8	Fuel	49	98	1	2	-	-	-	-	-	-	-	-	-	-
9	Water	41	82	8	16	1	2	-	-	-	-	-	-	-	-
10	Electricity	49	98	1	2	-	-	-	-	-	-	-	-	-	-
11	Gifts	50	100	-	-	-	-	-	-	-	-	-	-	-	-
12	Festivals	42	84	8	16	-	-	-	-	-	-	-	-	-	-
13	Savings/ Miscellaneous	50	100	-	-	-	-	-	-	-	-	-	-	-	-

be very low. Forty two per cent of the respondents of APL families were spending Rs.1000/- to 1500/- on food materials. APL families were spending their income for purchase of clothing (62.00 per cent for Rs.100-500), education (46.00 per cent for Rs.100/- to 500/-), health (40.00 per cent for Rs.100/-500/-) and gifts (44.00 per cent for Rs.100/- to 500/-).

APL families were given equal importance to food as well as other items like education, health, electricity and gifts.

4.1.12 Health Profile of the Respondents

More than 75.00 per cent from both the groups belonged to 'high' category with regard to personal health care. Table 9 showed that 6.00 per cent of the respondents of APL families and 10.00 per cent of the respondents of BPL families had 'medium' level of health. Remaining 8.00 per cent of the respondents of APL families and 12.00 per cent of the respondents of BPL families were in the 'low' level category.

Table 9. Distribution of the respondents based on selected personal health care practices (n=100)

Variables	Category	Score range	Percentage of respondents	
			APL families	BPL families
Personal health profile	Low	< 4	4 (8.00)	6 (12.00)
	Medium	4 – 8	3 (6.00)	5 (10.00)
	High	> 8	43 (86.00)	39 (78.00)

Numbers in parenthesis indicate percentage

4.2 DIETARY HABITS AND FOOD CONSUMPTION PATTERN OF THE RESPONDENTS

The food consumption pattern of the respondents were assessed with regard to the dietary practices of the families, food expenditure pattern and frequency of use of various food stuffs.

4.2.1 Food Habits of the Family

Food habits of the families are presented in Table 10.

Table 10. Distribution of respondents based on the food habits of the families (n=100)

Variables	Category	Score range	Percentage of respondents	
			APL families	BPL families
Food habit of the family	Vegetarian	1	2 (4.00)	4 (8.00)
	Non-vegetarian	2	48 (96.00)	46 (92.00)

Numbers in parenthesis indicate percentage

Ninety six per cent in APL families and 92.00 per cent in BPL families were non-vegetarians. Though both the families were branded as non-vegetarians. Four per cent in APL families and 8.00 per cent in BPL families were vegetarians.

4.2.2 Monthly Expenditure on Food

The total food expenditure pattern of the families (APL and BPL) as in Table 11 and 12 showed that six per cent of APL families and ten per cent of BPL families were spending less than 25.00 per cent of their income on food. Fifty nine per cent of APL families and 32.00 per cent of BPL families were spending 25.50 per cent of their income on food and 35.00 per cent of APL families and 58.00 per cent of BPL families were spending more than 50.00 per cent of their total income on food.

Forty eight per cent of APL families and 34.00 per cent of BPL families spent 10.00 to 20.00 per cent of their income for cereals. Sixty three per cent of APL families and 74.00 per cent of BPL families spend less than four per cent of income for purchase of pulses. Forty two per cent of APL families and 45.00 per cent of BPL families spent less than one per cent of their income for the purchase of green leafy vegetables. Seventy two per cent of BPL families and 79.00 per cent of APL families spent less than five per cent of their income for the purchase of other vegetables while 79.00

Table 11. Monthly food expenditure pattern of the families (APL)

Monthly income↓	Cereals			Pulses			Green leafy veg.			Other veg.			Roots and tubers			Fruits			Nut and oil seeds			Milk and milk products		
Percentage→	< 10	10-20	> 20	≤ 4	4 - 8	>8	≤ 1	1-2	> 2	≤ 5	5-10	≥10	≤2	2-4	≥4	≤2	2-5	≥5	≤2	2-4	≥4	≤4	4-8	>8
≤ 1000	-	22	4	-	18	2	-	-	-	-	-	1	-	-	-	-	15	1	-	-	1	-	-	2
1001-1500	-	-	-	-	-	-	8	24	20	18	5	-	15	-	5	19	-	-	-	15	-	7	25	-
1501-2000	4	4	-	28	8	-	-	-	-	-	-	-	-	8	-	-	8	-	34	-	-	-	-	-
2001-2500	8	18	1	17	-	-	8	1	13	54	15	-	56	-	6	-	-	-	-	21	1	43	16	-
2501-3000	29	-	-	6	9	-	12	-	-	-	-	-	-	-	-	54	3	-	27	-	-	-	-	-
≥ 3001	6	4	-	12	-	-	14	-	-	7	-	-	8	2	-	-	-	-	-	1	-	6	1	-
Total	47	48	5	63	35	2	42	25	33	79	20	1	79	10	1 1	73	26	1	61	37	2	56	42	2

Monthly income↓	Fats and oils			Sugar and jaggery			Animal food			Beverages			Spices and condiments			Processed food			Total food expenditure			Total family expenditure			
Percentage→	≤2	2-4	>4	≤3	3-6	> 6	≤5	5-10	>10	≤1	1-2	>2	≤5	5-10	> 10	≤2	2-4	>4	<25	25-50	>50	<1000	1000-2000	2000-3000	3000>
≤ 1000	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	0	-	-	0	-	-	0
1001-1500	-	-	5	-	-	3	-	16	-	12	15	7	-	-	1	-	5	-	-	7	27	1	17	17	5
1501-2000	6	16	-	54	13	-	13	-	-	-	-	-	21	15	-	25	-	4	2	-	-	-	-	-	2
2001-2500	-	-	-	-	-	5	-	22	1	32	24	3	-	5	-	-	6	-	-	49	8	-	19	34	-
2501-3000	42	23	1	18	5	-	36	-	-	-	-	-	49	-	-	53	-	-	4	-	-	-	3	2	-
≥ 3001	7	-	-	7	-	0	6	1	-	6	1	-	4	-	-	6	1	-	-	3	-	0	-	-	-
Total	55	39	6	79	18	8	55	39	6	50	40	10	74	25	1	84	12	4	6	59	35	1	39	53	7

Table 12. Monthly food expenditure pattern of the families (BPL)

Monthly income↓	Cereals			Pulses			Green leafy veg.			Other veg.			Roots and tubers			Fruits			Nut and oil seeds			Milk and milk products		
Percentage →	< 10	10-20	> 20	≤ 4	4 - 8	>8	≤ 1	1-2	> 2	≤ 5	5-10	≥10	≤2	2-4	≥4	≤2	2-5	≥5	≤1	2-4	≥4	≤4	4-8	>8
≤ 1000	29	-	4	32	2	-	18	20	-	52	16	1	54	14	4	58	12	5	14	18	3	52	9	4
1001-1500	-	25	-	-	-	1	-	-	10	-	-	-	-	-	-	-	7	-	-	-	-	2	-	-
1501-2000	28	-	1	42	20	-	19	12	5	22	5	-	12	7	2	17	-	-	48	9	2	-	8	3
2001-2500	4	9	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	-	-
2501-3000	-	-	-	0	1	-	8	2	5	-	6	-	-	5	2	7	-	-	1	5	-	-	8	-
≥ 3001	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	61	34	5	74	23	3	45	35	20	72	27	1	66	26	8	82	19	5	63	32	5	68	25	7

Monthly income↓	Fats and oils			Sugar and jaggery			Animal food			Beverages			Spices and condiments			Processed food			Total food expenditure			Total family expenditure			
Percentage →	≤2	2-4	>4	≤3	3-6	> 6	≤5	5-10	>10	≤1	1-2	≥2	≤5	5-10	>10	≤2	2-4	>4	<25	25-50	>50	<1000	1000-2000	2000-3000	3000>
≤ 1000	19	28	2	32	12	1	14	25	1	-	19	4	-	12	1	20	16	6	2	12	19	2	18	0	0
1001-1500	-	-	-	-	-	-	16	12	-	34	-	-	-	-	-	-	-	-	-	-	24	0	0	19	-
1501-2000	23	7	-	41	7	-	-	-	-	-	12	3	20	14	-	44	4	2	0	6	-	1	22	8	8
2001-2500	-	-	-	-	-	-	23	8	-	12	-	-	-	-	-	-	-	-	-	-	15	-	-	-	3
2501-3000	18	-	-	4	3	-	-	-	-	-	8	-	50	-	-	3	5	-	8	14	-	3	8	4	2
≥ 3001	-	3	-	-	-	-	1	-	-	8	-	-	3	-	-	-	-	-	-	-	-	0	2	0	-
Total	60	38	2	77	22	1	54	45	1	54	39	7	73	26	1	67	25	8	10	32	58	6	50	31	13

per cent of APL families and 66.00 per cent of BPL families spent less than 2.00 per cent of their income for the purchase of roots and tubers. The percentage of income of BPL families spent for the purchase of fruits were found to be very low when compared with APL families. The income spent by the majority of the BPL and APL families for the purchase of nuts and oil seeds and fats and oil were found to be meagre *i.e.*, below two per cent by 63 and 60 per cent by BPL families and 61.00 and 55.00 per cent by APL families respectively. The percentage of expenditure incurred for the purchase of milk and milk products were below four per cent by 56.00 per cent of APL families and 68.00 per cent of BPL families and for animal foods 55.00 per cent of APL families and 54.00 per cent of BPL families spent about 5.00 per cent of their income. The income spent for the purchase of sugar and jaggery was found to be less than three per cent by 79.00 per cent of APL families and 77.00 per cent of BPL families and for beverages 50.00 per cent of APL families and 54.00 per cent of BPL families spent about one per cent of their income. Seventy four per cent of APL families and 73.00 per cent of BPL spent less than 5.00 per cent of their income for the purchase of spices and condiments. Eighty four per cent of APL families and 67.00 per cent of BPL families spent less than 2.00 per cent of their income only for the purchase of processed items.

4.2.3 Frequency of Use of Various Food Items

Frequency of use of various food items in the daily diet of the respondents is presented in Table 13 and 14.

All the respondents belonging to APL and BPL families included cereal, sugar and jaggery, fats and oils, spices and condiments in their daily diet.

Ninety eight per cent of the respondents of APL families and 90.00 per cent of the respondents of BPL families consumed beverages like coffee or tea daily. Eight per cent of the respondents of APL families and none of the respondents of BPL families included pulses in their daily diet.

Table 13. Frequency of use of various food items (APL families)

(n= 50)

Food item	Daily		Thrice in week		Twice in week		Once in week		Occasionally		Never	
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
Cereals	50	100.00	-	-	-	-	-	-	-	-	-	-
Pulses	4	8.00	28	56.00	12	30.00	3	6.00	3	6.00	-	-
Green leafy vegetables	20	40.00	17	34.00	11	22.00	1	2.00	1	2.00	-	-
Other vegetables	17	34.00	17	34.00	10	20.00	6	12.00	-	-	-	-
Roots and tubers	28	56.00	14	28.00	8	16.00	-	-	-	-	-	-
Fruits	6	12.00	8	16.00	6	12.00	8	16.00	15	30.00	7	14.00
Nuts and oils	46	96.00	-	-	2	4.00	-	-	1	2.00	1	2.00
Milk and milk products	37	74.00	3	6.00	3	6.00	3	6.00	-	-	4	8.00
Fats and oils	50	100.00	-	-	-	-	-	-	-	-	-	-
Sugar and jaggery	50	100.00	-	-	-	-	-	-	-	-	-	-
Animal food	31	62.00	11	22.00	3	6.00	2	4.00	-	-	3	6.00
Beverages	49	98.00	-	-	-	-	1	2.00	-	-	-	-
Spices and condiments	50	100.00	-	-	-	-	-	-	-	-	-	-
Processed food	3	6.00	4	8.00	4	8.00	21	42.00	12	24.00	6	12.00

Table 14. Frequency of use of various food items (BPL families)

(n=50)

Food item	Daily		Thrice in week		Twice in week		Once in week		Occasionally		Never	
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
Cereals	50	100.00	-	-	-	-	-	-	-	-	-	-
Pulses	-	-	12	24.00	18	36.00	18	36.00	2	4.00	-	-
Green leafy vegetables	12	24.00	14	28.00	13	26.00	4	8.00	1	2.00	6.00	12.00
Other vegetables	6	12.00	10	20.00	23	46:00	10	20.00	1	2.00	-	-
Roots and tubers	38	76.00	8	16.00	1	2.00	3	6.00	-	-	-	-
Fruits	4	8.00	4	8.00	3	6.00	1	2.00	22	44.00	16.00	32.00
Nuts and oils	25	50.00	10	20.00	2	4.00	6	12.00	-	-	7.00	14.00
Milk and milk products	25	50.00	10	20.00	2	4.00	6	12.00	-	-	7.00	14.00
Fats and oils	49	98.00	-	-	-	-	-	-	-	-	1.00	2.00
Nuts and oil seeds	32	64.00	2	4.00	-	-	-	-	6	12.00	10.00	20.00
Sugar and jaggery	50	100.00	-	-	-	-	-	-	-	-	-	-
Animal food	32	64.00	13	26.00	2	4.00	-	-	3	6.00	-	-
Beverages	45	90.00	-	-	2	4.00	-	-	3	6.00	-	-
Spices and condiments	50	100.00	-	-	-	-	-	-	-	-	-	-
Processed food	2	4.00	4	8.00	-	-	13	26.00	10	20.00	21.00	42.00

Vegetables also had a place in the daily dietaries of 34.00 per cent of the respondents of APL families whereas roots and tubers were used daily by 56.00 per cent of APL families and 76.00 per cent of BPL families.

4.2.4 Actual Food Intake of Adolescent Girls

Measurement of actual food intake is a direct method of nutrition monitoring. Ten respondents each from APL and BPL families were selected and their dietary intake were computed from individual food consumption by actual weighment. This was helpful to determine the quality and quantity of food consumed by the respondents and to locate inadequacies in the dietaries if any. Details pertaining to the actual food intake of the respondents are presented in Table 15 in comparison with RDA stipulated by ICMR (1999).

Table 15. Actual food intake of selected respondents

(n=20)

Food	RDA, g/day	APL families		BPL families	
		Mean intake (g)	Percentage RDA met	Mean intake (g)	Percentage RDA met
Cereals	350	449.2	128.3	426.1	121.7
Pulses	50	40.5	81.0	29.6	59.2
Green leafy vegetables	150	80.5	53.6	92.5	61.6
Other vegetables	75	62.8	83.7	12.33	16.44
Roots and tubers	50	23.3	46.60	31.50	63.00
Fruits	30	19.9	66.3	2.2	7.3
Oils and fats	40	16.5	41.3	12.1	30.2
Fleshy foods	30	18.6	62.0	20.2	67.3
Milk and milk products	150	17.2	11.46	9.8	6.5
Sugar and jaggery	30	2.7	7.8	1.9	6.3

(Source: ICMR, 1999)

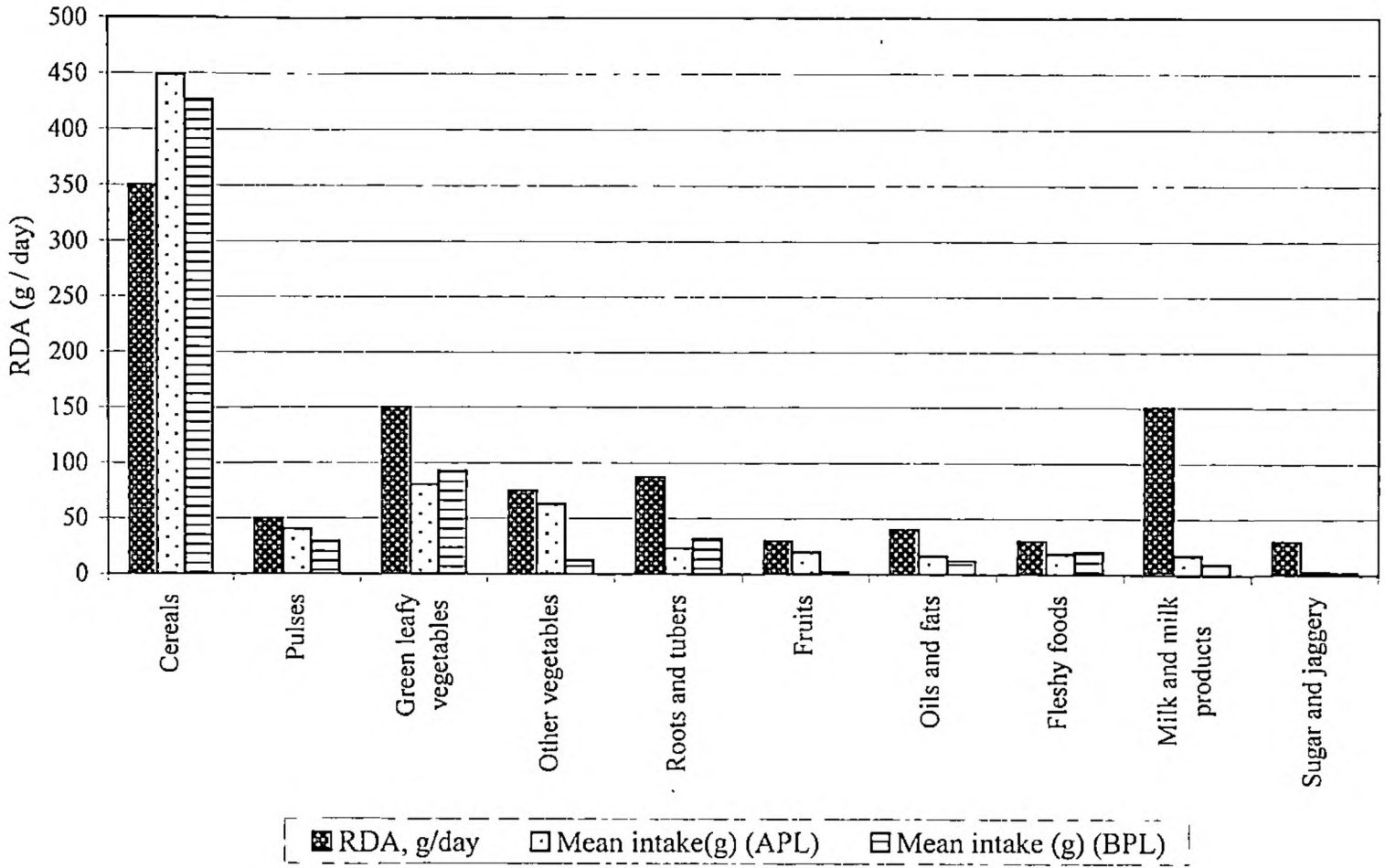


Fig. 3 Actual food intake of selected respondents

The results presented in Table 15 reveals that the intake of roots and tubers was more in the adolescent girls of BPL families when compared to the respondents belonged to APL families. The intake of other food groups such as fruits, oils and fats, fleshy foods, milk and milk products and sugar and jaggery by the respondents of APL families was lower than the respective RDA. In case of BPL families the intake of other vegetables, pulses and oil and fats were lower than the corresponding RDA whereas the intake of milk, sugar and jaggery were very negligible. In terms of percentage of RDA met, pulse intake was 81.00 per cent followed by oils and fats 41.30 per cent, fleshy foods 62.00 per cent, milk 11.46 per cent and sugar and jaggery nine per cent incase of respondents belonging to APL families. In case of BPL families the percentage adequacy was comparatively lower for fleshy foods (67.30), pulses (59.20 per cent), other vegetables (16.44 per cent) and oils and fats (30.20 per cent).

4.2.5 Nutrient Intake of Adolescent Girls

The nutrient intake of the respondents are presented in Table 16. The result shows that intake of protein, calcium, fat and iron were lesser by BPL families than respective RDA. Whereas the energy intake by the respondents (belonging to APL and BPL families) were closer to RDA. In APL families the percentage of RDA for different nutrients were energy 99.5, protein 87.8, calcium 64.4 and iron 45.30 per cent while that of BPL families were 98.50 per cent for energy, 73.20 per cent for protein, 32.10 per cent for calcium, 38.40 per cent for iron and 20.00 per cent for fat.

Table 16. Nutrient intake of selected respondents

(n=20)

Nutrients	RDA	APL families		BPL families	
		Mean intake	Percent RDA met	Mean intake	Per cent RDA met
Energy, kcal	2060	2049.9	99.5	2020.2	98.30
Protein, g	64	56.2	87.8	46.9	73.20
Fat, g	15	6.0	40.0	3.0	20.00
Calcium, mg	550	354.3	64.4	177.7	32.10
Iron, mg	45	20.4	45.3	17.3	38.40
Carotene, µg	2400	2200	91.6	2252	93.80
Riboflavin, mg	1.4	0.9	64.2	0.1	7.14
Niacin, mg	15	9.0	60.0	5.5	36.60
Thiamin, mg	1.2	0.5	41.6	0.2	16.6

(Source: ICMR, 1999)

4.3 NUTRITIONAL STATUS OF THE RESPONDENTS

Assessment of nutritional status of the respondents in this study was done by anthropometric, clinical and biochemical parameters.

Based on the above information a nutritional status index of the selected respondents was also worked out.

4.3.1 Anthropometric Measurements

4.3.1.1 Weight for Age Profile of the Respondents

Table 17. Weight for age profile

(n=20)

Sl. No.	Age	Mean weight (kg)		NCHS standard (kg)
		APL families	BPL families	
1	13	25	36.0	44.4
2	14	42.2	42.2	46.7

(Source: NCHS, 1999)

The weight for age profile of selected respondents are depicted in Appendix VIII. The average weight for age of the selected respondents were compared with NCHS standard and are presented in Table 17. The results showed that the respondents of APL families belonging to 13 years of age were lower than the NCHS standard. While the respondents of BPL families were comparatively closer to the NCHS standard. At the age of 14 years, respondents of both APL and BPL families were relatively closer to the NCHS standards.

4.3.1.2 Height for Age Profile of the Respondents

The height for age profile of selected respondents are given in Appendix VIII. The height for age of respondents were compared with NCHS standard. Height deficit gives a picture of the past nutritional status. The observed average height of adolescent girls of APL and BPL families belonging to 13 and 14 years were found to be 140, 145, 155.2, 153.1 respectively and is depicted in Table 18.

Table 18. Height for age profile

(n=20)

Sl. No.	Age	Mean height (cm)		NCHS standard (cm)
		APL families	BPL families	
1	13	140	145	153.0
2	14	155.2	153.1	155.1

(Source: NCHS, 1999)

4.3.1.3 Body Mass Index of Selected Respondents

Body mass index is used as a good parameter to grade chronic energy deficiency and to ascertain the nutritional status in adolescents.

Table 19. Distribution of respondents based on their BMI

(n=20)

BMI class	Presumptive diagnosis	APL families		BPL families	
		No.	Per cent	No.	Per cent
< 16.0	CED grade III (Severe)	3	30.00	-	-
16.0-17.0	CED grade II (Moderate)	4	40.00	2	20.00
17.0-18.5	CED grade I (Mild)	2	20.00	6	60.00
18.5-20.0	Low weight normal	-	-	1	10.00
20.0-25.0	Normal	1	10.00	1	10.00
	Total	10	100.00	10	100.00

As per body mass index given in Table 19, 40.00 per cent of the respondents of APL families and 20.00 per cent of the respondents of BPL families were suffering from moderate chronic energy deficiency. Ten per cent of the respondents of BPL families were identified as low weight where as none of the respondents belonging to APL families were found in the low weight category. Twenty per cent of the respondents of APL families and 60.00 per cent of the respondents of BPL families were found to have mild chronic energy deficiency. Ten per cent of respondents of APL and BPL families were reported to be normal as per the BMI classification.

4.3.2 Biochemical Assessment

Biochemical indicators represent the most objective assessment of the nutritional status of an individual frequently providing pre or sub clinical information.

In the present study, haemoglobin level of the selected sub samples were assessed by the cyanmethhaemoglobin method and the procedure used is given in Appendix IV.

For estimating iron insufficiency measurement of haemoglobin is the most commonly employed biochemical indicator. Haemoglobin levels of the respondents surveyed are depicted in Table 20.

Table 20. Haemoglobin level of the selected respondents

(n=20)

Haemoglobin level (g/dl)	Percentage of respondents	
	APL families	BPL families
8 to 10	-	10
10.1 to 11.0	20	40
> 11.1	80	50

Eighty per cent of the respondents of APL families and 50.00 per cent of the respondents of BPL families had normal haemoglobin values while 20.00 per cent of the respondents of APL families and 40.00 per cent respondents of BPL families had haemoglobin level between 10.1 to 11.0 gm/dl. While haemoglobin level between 8 to 10 gm/dl was seen in 10.00 per cent respondents of BPL families, while none of the respondents of APL families belonged to this group.

4.3.3 Clinical Examination

Results of clinical examination carried out among the respondents are presented in Table 21.

Table 21. Nutritional deficiency symptoms observed among the respondents

(n=20)

Deficiencies	APL families		BPL families	
	No.	Per cent	No.	Per cent
Anaemia	2	20.00	3	30.00
Pigmentation of skin	2	20.00	2	20.00
Angular stomatitis	-	-	1	10.00
Spongy bleeding gum	-	-	1	10.00
Teeth (dental caries)	3	30.00	3	30.00
No deficiency symptoms	3	30.00	-	-
Total	10	100.00	10	100.00

The presence of clinical signs and symptoms of different deficiency disorders were assessed among the sub sample. It was observed that 30.00 per cent of the respondents belonging to APL families were free of deficiency sign and symptoms.

Anaemia was found among 20.00 per cent of the respondents of APL families and 30.00 per cent of the respondents form BPL families. Thirty per cent of the respondents of APL families and BPL families were having dental problems. Ten per cent of the respondents belonging to BPL families had angular stomatitis and bleeding gums. Twenty per cent of the respondents belonging to APL and BPL families had pigmentation of skin.

4.3.4 Nutritional Status Index (NSI)

Nutritional status index of ten respondents each from APL families and BPL families were worked out with the parameters such as weight, height, BMI and haemoglobin level.

The index worked out for the selected subsamples are presented in Appendix IX. The mean values are depicted in Table 22.

Table 22. Nutritional status of selected respondents

(n=20)

Sl. No.	Respondents	Age in years	Nutritional status index
1	APL families	13	18.6
		14	20.9
2	BPL families	13	20.3
		14	20.1

The results revealed that the 14 years of the respondents of APL families showed better nutritional status index than the same age group of BPL families, the 13 years old showed a lower nutritional status than the same age group from BPL families.

4.4 ASSOCIATION BETWEEN SOCIO-ECONOMIC VARIABLES

4.4.1 Association between Family Income and Socio-economic Variables

Table 23 Association between family income and socio-economic variables

Characteristics	Chi square value	
	APL	BPL
Religion	2.60	1.08
Monthly income of the family	3.24	2.08
Expenditure on food	1.84	0.51
Expenditure on clothing	0.23	0.10
Expenditure on education	6.79*	5.29*
Expenditure on health	1.79	1.29
Savings	1.80	0.29
Food consumption pattern	4.25	6.24*
Mass media	0.79	0.10
Basic facilities available	0.29	0.18
Personal hygiene	1.67	1.04

*Significant at 5 per cent level

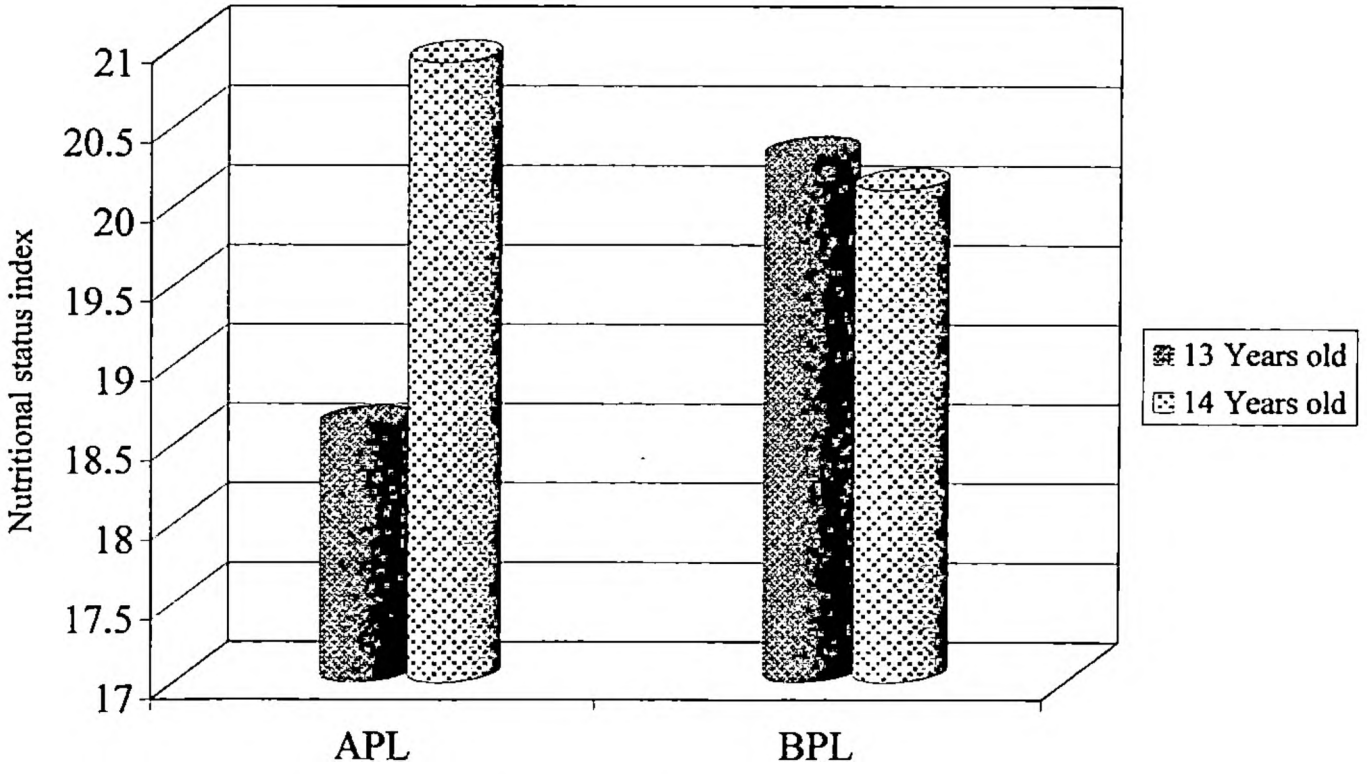


Fig. 4 Nutritional status of selected respondents

The results presented in Table 23 showed that the total family income of the respondents of APL families and BPL families had significant positive association with expenditure on education. Similarly, food consumption pattern of the respondents of BPL were found to have significant association with income. Other selected characteristics of the respondents had no significant association with their average family income.

4.4.2 Association between with Personal Hygiene and other Socio-economic Variables

The results given in Table 24, revealed that the personal hygiene of the respondents of APL families were significantly associated with their caste, type of family, family size, mass media contact, basic facilities and food habits of the family. The other three variables showed no significant association with personal hygiene. Whereas in the case of BPL families, caste and mass media contact alone were significantly associated with personal hygiene.

Table 24. Association with personal hygiene and other socio-economic variables

(n=100)

Characteristics	Chi square value	
	APL families	BPL families
Religion	0.16	0.11
Caste	1.89	5.04*
Type of family	6.91*	3.17
Family size	5.93*	2.75
Monthly income of the family	8.98	1.09
Basic facility available	5.91*	0.12
Educational status of the family	0.19	0.13
Mass media contact	8.25*	7.10*
Food habit of the family	8.91*	3.57

*Significant at 5 per cent level

4.4.3 Association between Total Family Income and Expenditure on Various Food Items

The results presented in Table 25 revealed that the total family income of the respondents of BPL families had significant effect on the expenditure for green leafy vegetables and roots and tubers. Whereas in the case of APL families significant effect was seen in the expenditure on fats and oil, processed foods and roots and tubers. The other characteristics had no significant effect on the total family income.

Table 25. Association between family income and expenditure on various food items

Sl. No.	Characteristics	Chi square value	
		APL families	BPL families
1	Total food expenditure	1.20	1.89
2	Expenditure on cereals	1.94	1.25
3	Expenditure on pulses	0.20	0.10
4	Expenditure on green leafy vegetables	4.38	5.67*
5	Expenditure on other vegetables	0.79	0.56
6	Expenditure on roots and tubers	5.02*	8.76*
7	Expenditure on fruits	2.69	0.91
8	Expenditure on nuts and oil seeds	0.82	0.59
9	Expenditure on milk and milk products	1.26	1.10
10	Expenditure on fats and oils	7.26*	2.76
11	Expenditure on sugar and jaggery	1.26	1.90
12	Expenditure on animal foods	2.68	1.76
13	Expenditure on beverages	3.37	2.95
14	Expenditure on spices and condiments	1.18	1.01
15	Expenditure on processed foods	5.78*	2.18

*Significant at 5 per cent level

4.5 CORRELATION BETWEEN THE OVERALL KNOWLEDGE GAIN, RETENTION, ADOPTION OF HEALTH AND NUTRITIONAL PRACTICES AND SELECTED SOCIO-ECONOMIC VARIABLES

To study the relationship between gain in knowledge retention and adoption of health and nutritional practices and selected socio-economic variables *viz.*, age, family size, income of the family, educational status of the respondents, mass media contact, basic facilities available in the family, correlation coefficient (r) was computed and the results are presented in Table 26.

Table 26 Correlation between overall knowledge gain, retention and adoption of selected socio-economic variables

Socio-economic variables	Overall knowledge gain post test		Retention		Adoption	
	APL families	BPL families	APL families	BPL families	APL families	BPL families
1. Age of the respondents	0.0717	-0.0121	-0.0312	0.0211	0.1239	0.0122
2. Family size	0.0734	-0.0221	-0.0324	0.0274	-0.0163	0.0113
3. Income of the family	-0.1832	0.1246	-0.2037**	0.1834*	-0.1049	0.0142
4. Educational status	0.1792	0.0123	0.3867**	0.1967*	0.0720	0.0290
5. Food consumption pattern	0.0170	0.0010	0.2730**	0.0170	0.0210	0.0712
6. Mass media contact	0.0931	0.0394	0.0529	0.0467	0.1260	0.0190
7. Basic facilities	0.0313	0.0291	0.0371	0.0262	0.1383	0.0230
8. Personal hygiene	0.0410	-0.0180	0.0721	0.1010	0.3619**	0.2746**

*Significant at 5 per cent level

**Significant at 1 per cent level

The overall gain in knowledge (post-test) and the selected variables exhibited no significant relationship. With respect to the retention of knowledge and selected variables *viz.*, income of the respondents of APL families were found to have significant relationship, but in the negative direction. Whereas the educational status and food consumption pattern were found to have significant relationship in positive direction with retention of knowledge by the respondents of APL families (significant at five per cent level). Among the respondents of BPL families, the income of the family and educational status were found to have significant relationship in positive direction with retention of knowledge at one per cent level.

4.6 INTER-CORRELATION BETWEEN SELECTED SOCIO-ECONOMIC VARIABLES

The results presented in the inter-correlation matrix revealed that age of the respondents of APL and BPL families have significant relation with food consumption pattern. The family income of the APL families showed significant positive correlation with the expenditure on cereals, pulses, milk and milk products, beverages, spices and condiments and processed food and it was negatively correlated with expenditure on green leafy vegetables, whereas in the BPL families significant positive correlation were seen with expenditure on cereals, pulses, green leafy vegetables, roots and tubers and it was negatively correlated with expenditure on processed food and basic facilities available in the family. The exposure to information sources of APL families were found to be positively correlated with the expenditure on fruits, milk and milk products, basic facility available in the family and personal hygiene, whereas in BPL families significant correlation was seen with personal hygiene (Table 27 and 28).

Table 27 Inter-correlation matrix of the socio-economic and personal characteristics of the respondent (APL families)

X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}	X_{16}	X_{17}	X_{18}	X_{19}
1.0000																		
0.0800	1.0000																	
0.0959	-0.0087	1.0000																
0.1307	0.3019**	0.0574	1.0000															
0.0858	0.3054**	0.1200	0.4289**	1.0000														
0.0165	-0.2600	0.0936	0.0634	0.1056	1.0000													
0.0185	-0.0336*	-0.0123	0.1773	0.0426	0.2662*	1.0000												
0.1653	0.0298	0.2830*	0.1268	0.1585	0.1965	0.1004	1.0000											
0.0017	0.0589	0.0710	0.3833**	0.3826	0.0009	0.0735	0.2013*	1.0000										
0.0159	0.4238*	0.2168*	0.0710	0.2040	-0.0.359	0.1374	0.3175**	0.2777*	1.0000									
0.1421	0.0851	0.0347	0.4755**	0.2672	0.1718	0.0203	0.1675	0.4200**	0.1340	1.0000								
0.0112	0.1597	0.0882	0.2374	-0.0472	0.3299**	0.2127*	0.0356	0.1987	-0.1140	0.3555**	1.0000							
0.1125	0.0662	0.1130	0.1747	0.3199**	0.1234	-0.1975	0.0780	0.2719	0.2694*	0.1453	0.0128	1.0000						
0.0341	0.2147	-0.0149	0.3099	0.0114	0.2128*	0.1506	0.0986	0.2515	0.0347	0.4576**	0.5253**	0.0238	1.0000					
0.0021	0.2246*	0.0103	0.3110	0.1503	-0.0182	0.0645	-0.1224	0.2587*	0.0123	0.2121*	0.0745	0.2107*	0.0376	1.0000				
0.0123	0.2030	0.1618	0.1326	0.1391	0.1371	0.2455*	0.1540	0.1419	0.2820*	0.0528	0.1285	0.1984*	0.1533	0.2267*	1.0000			
0.0132	-0.0160	0.3734**	0.0925	-0.0680	-0.0091	0.1611	0.0443	0.0366	0.0105	0.1070	0.1446	0.2836*	-0.0351	0.1982*	0.0210	1.0000		
0.2133*	0.0400	0.0656	0.0868	0.0468	0.0256	0.0598	0.0183	0.0982	0.1882	-0.0929	-0.1714	0.0697	0.0763	-0.0579	0.0991	0.0516	1.0000	
0.0122	0.1323	0.2438*	0.0961	-0.0449	0.2684	0.1639	-0.0786	-0.1152	0.0673	0.0325	0.2325*	0.0508	0.0679	0.1169	0.1183	0.2132*	-0.0270	1.0000

*Significant at 5 per cent level, **Significant at 1 per cent level

X_1 : Age
X_2 : Family income
X_3 : Mass media contact
X_4 : Expenditure on cereals
X_5 : Expenditure on pulses
X_6 : Expenditure on green leafy vegetables
X_7 : Expenditure on roots and tubers
X_8 : Expenditure on fruits
X_9 : Expenditure on nuts and oil seeds
X_{10} : Expenditure on milk and milk products
X_{11} : Expenditure on fats and oils
X_{12} : Expenditure on sugar and jaggery
X_{13} : Expenditure on animal food
X_{14} : Expenditure on beverages
X_{15} : Expenditure on spices and condiments
X_{16} : Expenditure on processed food
X_{17} : Basic facility
X_{18} : Food consumption pattern
X_{19} : Personal hygiene

Table 28 Inter-correlation matrix of the socio-economic and personal characteristics of the respondents (BPL families)

X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}	X_{16}	X_{17}	X_{18}	X_{19}
1.0000																		
0.0112	1.0000																	
0.0203	0.0168	1.0000																
0.0325	0.2039*	0.0190	1.0000															
0.0165	0.2638*	0.0069	0.2343*	1.0000														
0.1234	0.3019**	0.0179	0.0210	0.0396	1.0000													
0.0296	0.2956*	0.0099	-0.1090	0.1079	-0.1998*	1.0000												
0.1679	0.0110	0.0176	0.0020	0.0278	0.0196	0.1017	1.0000											
0.0310	0.0090	0.0209	0.0126	0.2078*	0.0009	0.0179	0.0102	1.0000										
0.0090	0.0196	0.0123	0.0019	-0.1790	0.0264	0.0017	0.0903	0.1619	1.0000									
0.0103	0.0019	0.0010	0.0169	0.0290	0.0179	0.1232	0.0009	0.0161	0.0079	1.0000								
0.0010	0.1023	0.0164	0.0279	0.0219	0.1036	-0.1634	0.0218	0.0002	-0.1279	0.0161	1.0000							
0.0296	0.0049	0.0973	0.0163	0.0026	0.0101	0.0639	0.0019	0.0132	0.0033	0.0179	0.0101	1.0000						
0.0401	0.0169	0.0010	0.0101	0.1081	0.0273	0.1078	0.0002	0.0169	0.2310*	0.0013	0.2043*	0.0218	1.0000					
0.0018	0.0029	0.0789	0.0703	0.0192	0.1263	0.0171	0.0006	0.0017	0.0010	0.0016	0.0210	0.0017	0.0101	1.0000				
0.1201	-0.1269	0.0169	0.0070	0.1011	-0.1764	0.2341*	0.0017	0.0019	0.0049	0.0007	0.0003	-0.1969*	0.1129	0.1926*	1.0000			
0.323	-0.0101	-0.1223	0.0101	0.0179	0.0783	0.0192	0.1079	0.0803	0.0016	0.0008	0.0614	0.0198	0.0901	0.0179	0.1021	1.0000		
2.043*	0.1010	0.1926	0.0298	0.0158	0.2078*	0.2961	0.0279	0.0143	0.1029	0.1098	0.0179	0.1064	0.0146	0.0008	0.0017	0.0167	1.0000	
0.0149	0.0070	0.2329*	0.0298	0.0496	0.1089	0.0210	0.0139	0.0023	0.0013	0.0109	0.0014	0.0396	0.0276	0.0012	0.0129	0.1968*	0.0018	1.0000

*Significant at 5 per cent level, **Significant at 1 per cent level

X_1 : Age
X_2 : Family income
X_3 : Mass media contact
X_4 : Expenditure on cereals
X_5 : Expenditure on pulses
X_6 : Expenditure on green leafy vegetables
X_7 : Expenditure on roots and tubers
X_8 : Expenditure on fruits
X_9 : Expenditure on nuts and oil seeds
X_{10} : Expenditure on milk and milk products
X_{11} : Expenditure on fats and oils
X_{12} : Expenditure on sugar and jaggery
X_{13} : Expenditure on animal food
X_{14} : Expenditure on beverages
X_{15} : Expenditure on spices and condiments
X_{16} : Expenditure on processed food
X_{17} : Basic facility
X_{18} : Food consumption pattern
X_{19} : Personal hygiene

Table 29 Comparison of knowledge level scores of four experimental groups and the control group before and after the treatment

Sl. No.	Lecture method alone			Lecture + flash card + leaflet			Lecture + Posters + Charts			Lecture + Exhibition + demonstration			Control group
	Group I			Group II			Group III			Group IV			
	Pre-test	Post-test	Retention	Pre-test	Post-test	Retention	Pre-test	Post-test	Retention	Pre-test	Post-test	Retention	
1	25	62	52	26	62	48	20	62	52	22	62	51	28
2	21	62	49	20	61	40	20	62	50	21	62	54	30
3	22	58	39	17	62	41	22	62	53	22	62	63	28
4	21	61	45	23	62	47	19	62	54	22	62	53	30
5	22	63	41	18	60	44	17	62	53	20	62	53	21
6	20	59	40	16	62	46	22	62	52	22	62	55	26
7	19	57	41	19	61	42	20	62	52	22	62	53	22
8	21	61	42	21	62	47	26	62	53	23	62	56	23
9	21	61	42	17	62	45	19	61	50	23	62	54	21
10	23	59	41	19	61	43	20	62	54	24	62	56	24
11	22	62	43	18	62	48	20	62	54	20	62	57	24
12	20	61	42	22	61	48	20	62	54	22	62	55	30
13	20	60	43	18	61	46	18	62	54	22	62	55	25
14	22	62	45	17	16	45	18	82	54	22	62	55	31
15	19	59	49	22	64	47	19	63	53	21	61	54	30
16	18	60	40	21	63	40	18	62	54	22	62	55	21
17	17	62	43	20	62	42	28	61	50	25	61	56	26
18	19	64	33	20	62	42	25	62	54	22	62	55	25
19	20	61	48	23	61	44	18	62	53	22	62	56	23
20	21	60	49	19	60	42	20	61	52	24	63	57	24

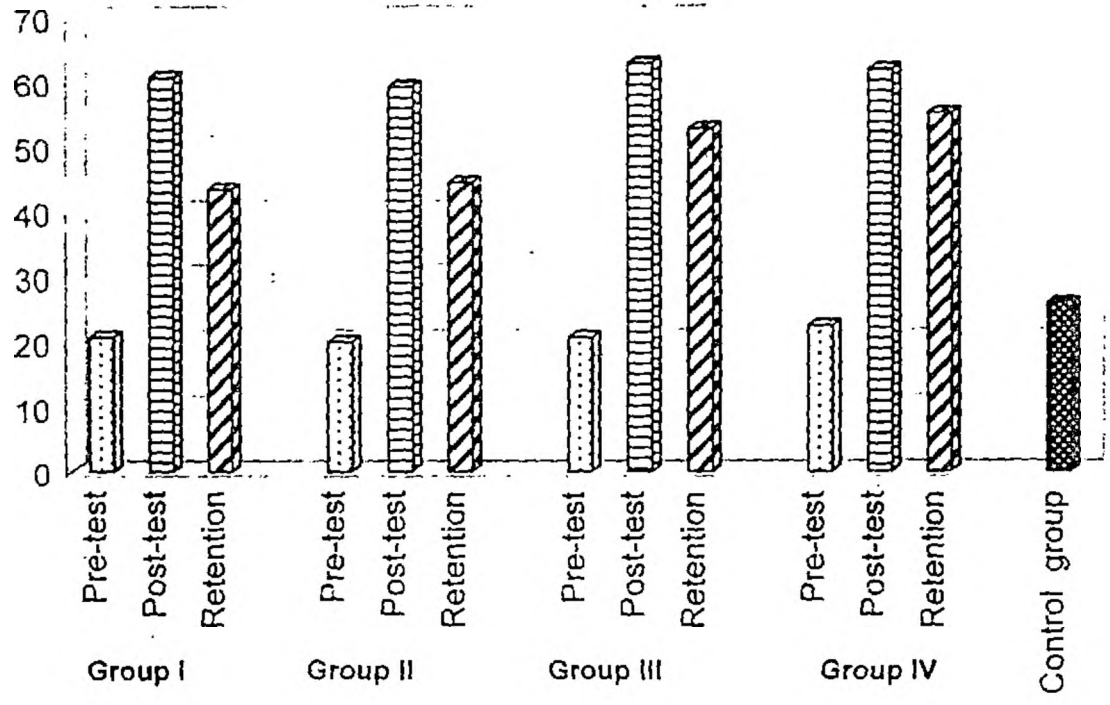


Fig. 5 Comparison of knowledge level scores four experimental groups and the control groups before and after the treatment

4.7 EFFECTIVENESS OF EDUCATIONAL PROGRAMMES ON THE GAIN IN KNOWLEDGE AND RETENTION

To study the effectiveness of IEC materials on the gain in knowledge of health and nutrition practices, the total scores for pre-test, post-test and retention were computed by adding the individual scores of the selected topics *viz.*, importance of nutritious food, body changes in adolescent period, health care, reproductive health and hygiene and is presented in Table 29.

4.7.1 Comparison of the Knowledge Level Scores of Four Experimental Groups and the Control Group Before and After the Treatments

The pre, post and retention knowledge test scores of four groups presented in Table 29 revealed that the pre-test scores of all the four treatments were having lowest scoring when compared with the control group. In all the four groups post-test value differed significantly with the pre-test value and control group. With regard to retention, the retention test score differed significantly with pre-test and less than post-test and significantly higher than the control group score.

Table 30. Mean scores to show the overall knowledge gain and retention by the respondents

	Mean scores
Pre-test score	10.67
Post-test score	61.51
Retention score	48.88
Control group	10.35
CD	1.174

The results presented in Table 30, revealed that there exists significant difference between mean values of the treatment group and the control group *i.e.*, the control group was inferior to all the other four treatment means. Mean post-test scores (61.51) was significantly superior to all the other treatments. The retention score (48.88) was significantly superior to pre-test score and the control group and inferior to post-test score. And the pre-test

score was significantly superior to control group and inferior to all other treatments.

4.8 THE COMPARATIVE EFFECTIVENESS OF THE FORMULATED IEC MATERIALS ON GAIN IN KNOWLEDGE AND RETENTION OF KNOWLEDGE ON HEALTH AND NUTRITIONAL PRACTICES BY THE RESPONDENTS

4.8.1 Effectiveness of Formulated IEC Materials on Gain in Knowledge

The teaching methods used were lecture method, lecture + flash card + leaflet, lecture + posters + charts, and Lecture + exhibition + demonstration. The topic selected were importance of nutritious food, body changes in adolescent age, health care, reproductive health and hygiene. The scores obtained for each treatment were statistically analysed and the mean values obtained for the treatments are presented in Table 31.

Table 31. Comparative analysis of the effectiveness of formulated IEC materials on gain in knowledge on health and nutritional practices immediately after the treatment (post-test)

Subjects / Treatments	S_1	S_2	S_3	S_4	Mean (treatments)
T_1	645.42	289.98	244.15	1373.32	638.202
T_2	542.37	519.75	574.35	1234.04	717.62
T_3	582.85	519.75	392.36	1141.18	661.04
T_4	724.51	317.96	184.30	1416.18	659.95
Mean (Subjects)	623.77	411.86	346.87	1291.18	

CD T – 79.05, CD S – 76.33, CD T x S – 157.92

With regard to subject one, the gain in knowledge was more when the respondents were exposed to T_4 followed by T_1 and T_4 differ significantly with other treatment and T_1 differ significantly with T_2 and on par with T_3 and T_2 and T_3 were on par.

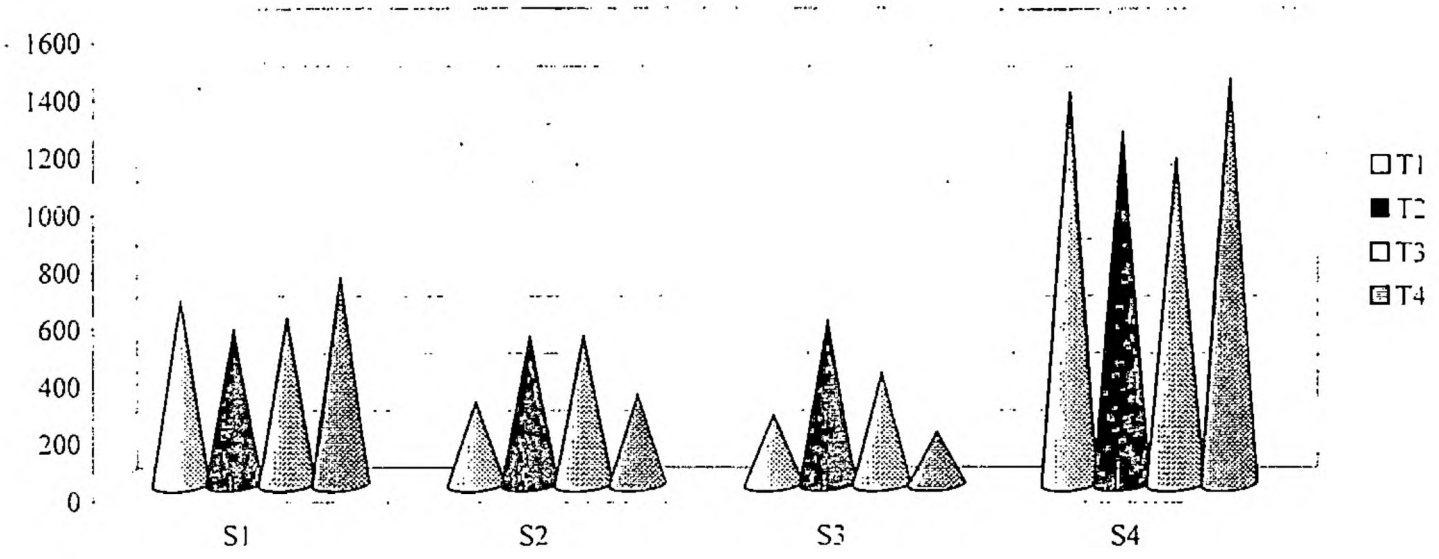


Fig. 6 Comparative analysis of the effectiveness of formulated IEC materials on gain in knowledge on health and nutritional practices
immediately after the treatment (post-test)

T_1 - Lecture method alone
T_2 - Lecture + flashcard + leaflet
T_3 - Lecture + Posters + charts
T_4 - Lecture + demonstration + exhibition

In subject two, gain in knowledge was more when the topic body changes in adolescent period was handled with T_2 and T_3 and differ significantly with T_1 and T_4 and these exist no significant difference with respect to knowledge gain in the case of T_2 and T_3, similarly significant difference between T_4 and T_1.

Same trend was also noticed in subject three. T_2 differ significantly with other two treatments. T_3 also differ significantly with T_1 and T_4 and no significant difference between T_1 and T_4.

The mean scores of the four treatments were compared with critical value and it was found that T_2 and T_3 differs significantly from all other treatments while T_1 and T_4 have no significant difference in knowledge gain.

When the topic four was taught to the respondents, the highest mean value was obtained for T_4 and the mean values of T_1, T_2, T_3 and T_4 when compared with the critical difference indicated that T_4 is superior to T_3 and T_2 but par with T_1 and T_1 differ significant with T_2 and T_3 and T_2 superior to T_3.

The respondents were exposed to four topics and the highest mean value obtained was topic fourth *i.e.*, reproductive health and hygiene followed by S_1, S_2 and S_3 when T_4 was used as the treatment.

When these mean values of the topics were compared with the critical difference, the gain in knowledge on S_3 and S_4 significantly differ from all the other subject while S_2 and S_3 have no significant difference in the knowledge gain.

Gain in knowledge among different topics, gain in knowledge was more with respect to topic four in all the treatments.

The subject when handled with T_1 the gain in knowledge was more with respect to subject four and differ significantly with S_1, S_2 and S_3. S_1 differed significantly with S_2 and S_3 and S_2 and S_3 were on par.

The subject when treated with T_2, S_4 was superior to all the three S_1, S_2 and S_3 and no significant difference exist among S_1, S_2 and S_3. The same trend was observed when the subjects were handled with T_3.

With respect to T_4, subject four was superior to S_1, S_2 and S_3, gain in knowledge of S_1 was significantly superior to S_2 and S_3 and S_2 with S_3. The mean score values of four subjects were significantly different from each other.

4.8.2 Comparative Effectiveness of the Formulated IEC Materials in Retention of Knowledge

Fifteen days after the implementation of teaching programmes, the retention of the gained knowledge were assessed and the details are presented in Table 32.

Table 32. Comparative analysis of the effectiveness of formulated IEC materials on gain in knowledge on health and nutritional practices 15 days after treatment (retention)

Subjects / Treatments	S_1	S_2	S_3	S_4	Mean (Treatments)
T_1	429.86	188.80	139.28	916.18	418.53
T_2	384.43	356.66	406.51	848.32	499.03
T_3	494.75	423.33	317.96	934.04	542.52
T_4	630.46	261.54	159.34	1166.17	554.36
Mean (Subjects)	484.90	307.58	255.75	966.18	

CD treatments – 64.91

CD subject – 66.01

CD treatment x subject – 138.26

From the Table 32, it was found that the highest mean value for the first topic was obtained by the exposure to T_4 followed by T_3, T_1 and T_2. When the mean values of these treatments were compared with critical difference it was clear that T_4 differs significantly from all the other treatments in knowledge retention. While T_1 have no significant difference between T_2 and T_3 in retaining knowledge. But T_3 was

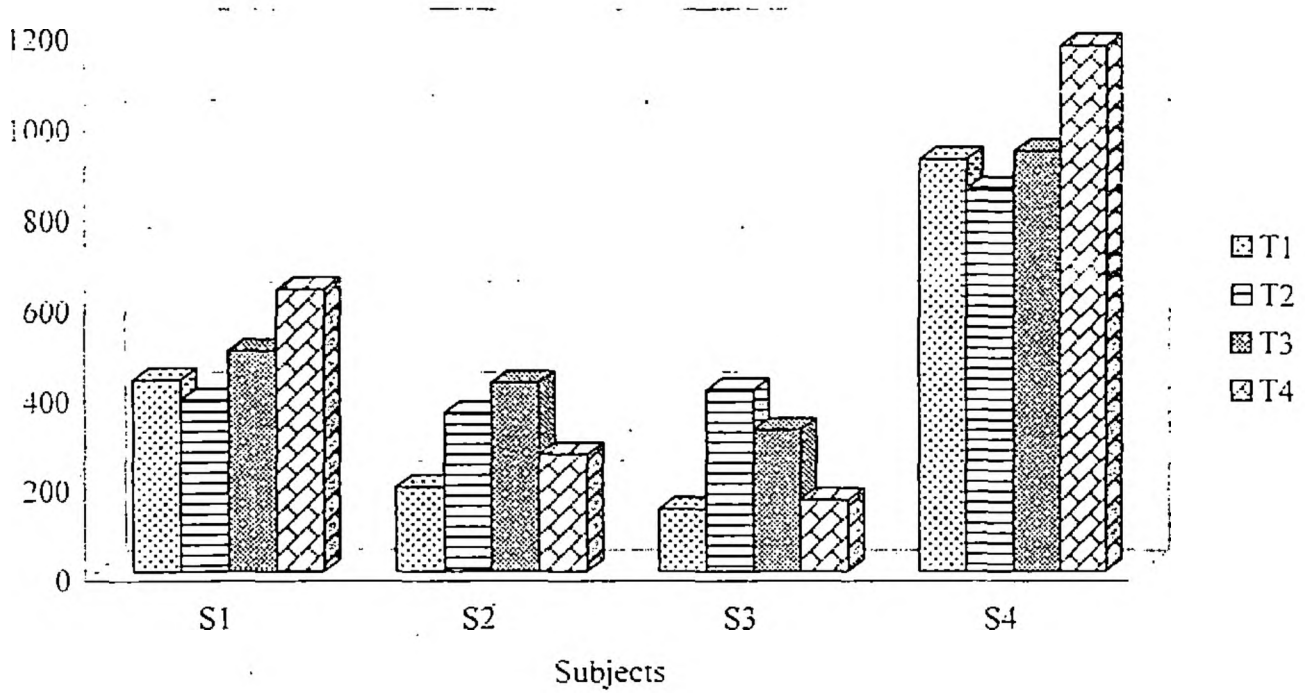


Fig. 7 Comparative analysis of the effectiveness of formulated IEC materials on gain in knowledge on health and nutritional practices 15 days after treatment (retention)

significantly superior to T_2 and on par with T_1 in retaining knowledge related to importance of nutritious food.

The mean scores of the second topic indicated that the highest value was obtained when T_3 was used as the treatment and T_3 differs significantly with other three followed by T_2 superior to T_4 and T_2 and T_4 was significantly superior to T_1. When the mean values were compared with the critical difference, indicate that T_3 and T_2 have no significant difference in retaining knowledge while all the other treatments have significant difference between each other.

With respect to health care (S_3), T_2 have got the highest mean value and when the mean values of these were compared with it's critical difference, it was found that T_2 differs significantly with all the other treatments. T_3 differs significantly with T_1 and T_4 in retaining the gained knowledge.

The fourth topic, reproductive health and hygiene, when taught T_4 was found to be more effective followed by T_3. T_1 and T_2 differs significantly in retention of knowledge compared to other treatments. T_3 and T_1 were on par and T_3 differs significantly with T_2 and T_1 and T_2 have not significant difference between the knowledge related to reproductive health.

With respect to first group exposed to T_1, the mean value of subject four was 916.18 which is significantly superior to the mean values of S_1, S_2 and S_3 followed by S_4. S_1 differs significantly with S_2 and S_3 and no difference between S_2 and S_3. It was observed that S_4 and S_1 differs significantly from all the other subjects.

The second group treated with T_2 (lecture + flashcard + leaflet) as treatment, the mean value of different subjects were compared with critical value, it was found that S_4 differs significantly from all the mean values of all the other subjects and no difference existed with other three subjects in retention of knowledge.

When the treatment three (T_3) was used to teach the respondents, the retention was more on the topic four (S_4) followed by S_1, S_2 and S_3 and when their mean values were compared with critical difference. Almost the same trend was seen that S_4 differs significantly with S_1, S_2 and S_3 and S_1 differs significantly with S_2 and S_3 and S_2 with S_3 in retaining the knowledge.

With respect to fourth group treated with T_4 (lecture + exhibition + demonstration) the trend observed with group three was noticed here. These mean values were compared with critical difference and found that each of the subject was significantly different in the knowledge retention.

4.8.3 Effectiveness of IEC Materials in Retention of Knowledge by the Respondents

The mean scores obtained for the different level of treatments in Table 30 revealed that the mean retention score was 48.88. The pre test score was 10.67. From these two values it is clear that there was significant difference between the pre test score and retention score (48.88), which means that the gained knowledge was retained for a period of 15 days after the treatment.

4.9 EFFECTIVENESS OF IEC MATERIALS ON THE ADOPTION OF HEALTH AND NUTRITIONAL PRACTICES BY THE RESPONDENTS

A check list was used after the education programme in order to assess adoption of practices.

4.9.1 Comparison of the Adoption of Health and Nutritional Practices of Four Experimental Groups and Control Group before and after the Treatment

The adoption practices of the gained knowledge by the respondents were compared in Table 33. The pre adoption scores of all the four treatment groups were lower than the post score and value of pre-test was on par with that of control group.

Table 33 Comparison of the adoption of health and nutritional practices of four experimental groups and control group one month after the treatment

Sl. No	Lecture method alone		Lecture + flash card + leaflet		Lecture + Posters + Charts		Lecture + Exhibition + demonstration		Control group
	Group I		Group II		Group III		Group IV		
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	
1	9	20	10	22	10	23	13	23	10
2	6	21	6	22	12	23	10	23	11
3	7	21	8	22	12	23	8	21	8
4	8	21	10	23	10	24	11	23	12
5	11	21	9	22	9	23	12	21	11
6	7	20	12	22	12	22	11	23	9
7	10	24	6	23	11	22	10	23	11
8	11	22	14	22	9	23	9	23	8
9	11	22	12	24	11	23	11	24	12
10	6	23	11	24	10	24	8	23	13
11	12	23	11	22	12	24	9	23	9
12	12	23	11	24	13	23	10	23	11
13	11	23	10	23	12	25	10	25	8
14	13	23	12	22	8	24	12	24	10
15	11	21	6	22	12	23	13	23	12
16	6	22	12	24	10	24	9	24	11
17	12	23	11	23	12	24	8	24	13
18	11	22	11	24	10	23	10	23	11
19	12	23	11	24	13	23	10	23	12
20	11	23	10	23	12	25	10	24	6

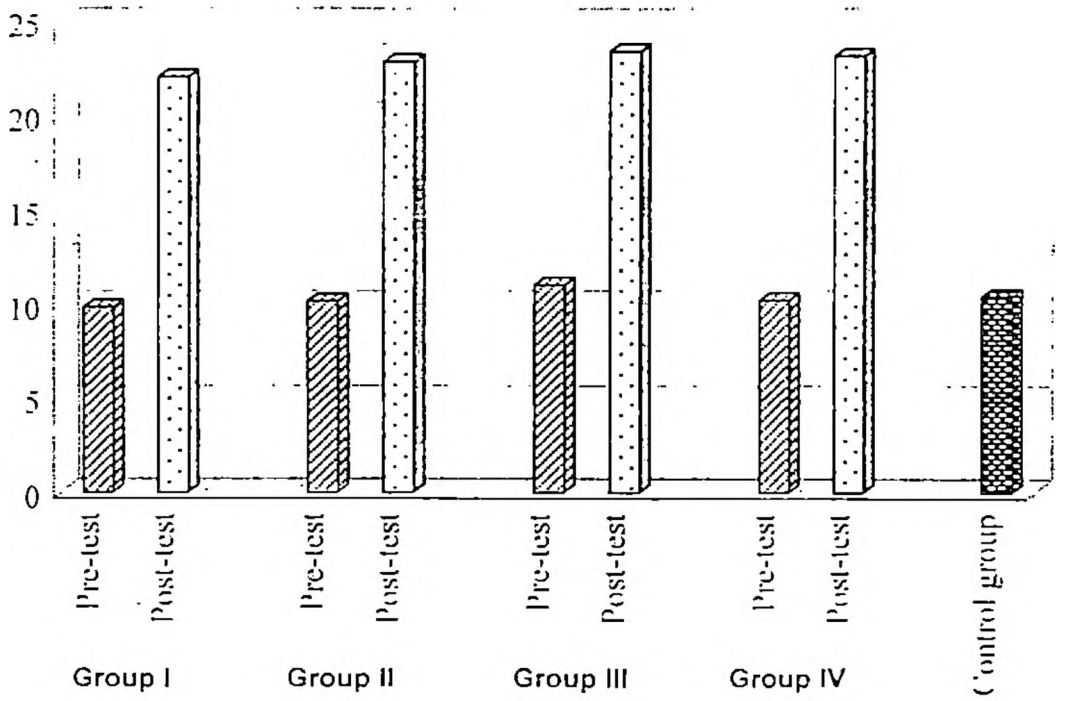


Fig. 8 Comparison of the adoption of health and nutritional practices of four experimental groups and control group one month after the treatment

Analysis of variance was applied to study the effectiveness of IEC materials on the adoption of gained knowledge and the results were presented in Table 34.

Table 34. The mean values of adoption over pre-test scores

	I	II	III	IV
Treatment mean	184.75	200.02	176.33	203.95
Subject mean	51.85	177.54	181.66	345.05

CD: Treatment x subject – 91.99

The results presented in Table 34, revealed that the mean value of four treatments have no significant difference between each other when it was compared with the critical value. But the mean values for the adoption of knowledge on four subjects revealed that S4 (reproductive health and its hygiene) differs significantly from S_1, S_2 and S_3. There exists no significant difference between S_2 and S_3. At the same time S_3 differs significantly from S_2 and S_3 and S_2 with S_1.

4.10 COMPARATIVE EFFECTIVENESS OF THE FORMULATED IEC MATERIALS ON THE ADOPTION OF KNOWLEDGE ON HEALTH AND NUTRITIONAL PRACTICES

The analysis on the effectiveness of IEC materials showed that it had significant influence on the gain in knowledge while trying to analyse the effectiveness of IEC materials on the adoption of gained knowledge, the data obtained are presented in Table 35.

Table 35. The effectiveness of IEC materials in knowledge gain one month after the treatment (adoption)

Subjects / Treatments	S_1	S_2	S_3	S_4	Mean (Treatments)
T1	103.56	128.56	197.13	269.75	174.75
T2	42.72	160.95	231.66	380.46	203.95
T3	36.54	231.66	137.60	299.52	176.33
T4	24.40	184.98	160.22	430.46	200.02
Mean (Subjects)	51.85	176.54	181.66	345.05	

CD treatment – 46.59, CD subject – 43.36, CD treatment x subject– 91.99

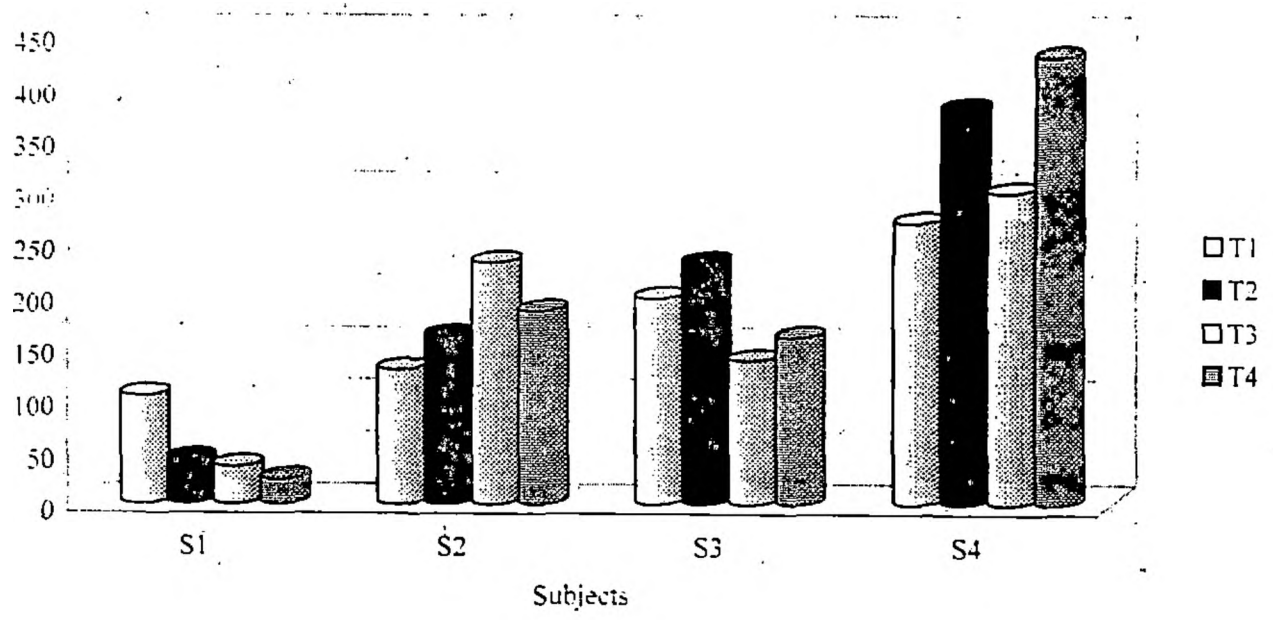


Fig. 9 The effectiveness of IEC materials in knowledge gain one month after the treatment (adoption)

The mean values of different treatments showed that the highest mean value was for T_1 (103.56) when S_1 was taken as subject. The scores of different treatments were compared with the critical value and it was found that T_1 differs significantly from all the other treatments, while T_2, T_3 and T_4 were having no significant difference when the knowledge adoption practices of the respondents on S_1 was analysed.

When the adoption practices on S_2 was analysed it was found that the adoption was more when the respondents were exposed to T_3 followed by T_4, T_2 and T_1. Comparison between mean values and critical difference indicates that T_3 differs significantly from T_2 and T_1 and T_4 differs significant from T_1 in the adoption of gained knowledge.

The mean values for the adoption of S_3 showed that the highest score was for T_2, followed by T_1, T_3 and T_4. The comparison between mean values and the critical difference indicated that T_2 was significantly superior to T_3 and T_4 and on par with T_1. T_1 differs significantly from T_3 on the adoption of knowledge practices.

When the adoption practices of S_4 was taken into consideration, it can be said that T_4 have got highest mean value and that was most effective treatment for adoption. When the critical value and mean value was compared that T_4 differs significantly from T_1, T_2 and T_3 and T_2 differs significantly with T_1 and T_3 and on par with T_4. No significant difference between T_1 and T_3 in the adoption of gained knowledge on the topic reproductive health and hygiene.

With respect to group I treated with T_1, knowledge was more on S_4 followed by S_3, S_2 and S_1 and when the mean values of the subjects were compared with critical difference it was found that S_4 and S_3 differs significantly from all the other subjects. While S_2 and S_1 have no significant difference between each other when their adoption levels were compared.

Mean values of T_2 for different subjects showed that S4 has the highest mean value (380.46) followed by S_3, S_2 and S_1. When the mean

scores were compared with the critical difference showed that all the subjects differ significantly from each other on adoption practices by the respondents.

When the respondents were exposed to treatment three (T_3) the adoption practices done by the respondents on all the four subjects differ significantly from each other when their mean values were compared with the critical difference. The highest mean value was obtained for S_4 followed by S_2, S_3 and S_1. S_2 differs significantly with S_1 and S_3 and S_3 with S_1.

The mean values of the treatment four, for four subjects showed that the highest mean score was obtained for S_4 followed by S_2, S_3 and S_1. When these mean values were compared with the critical difference it can be said that S_4 differs significantly from all the other subjects while S_2 and S_3 have no significant difference and S_2 and S_1 and S_3 and S_1 were also significantly differ from each other in the adoption of practices.

Discussion

5. DISCUSSION

The study entitled "Effectiveness of information education and communication materials on health and nutritional practices of adolescent girls" was conducted with the purpose of eliciting the effectiveness of IEC materials on the gain, retention and adoption of the knowledge on health and nutritional practices by adolescent school going girls and also to find out the comparative effectiveness of the formulated IEC materials. The salient findings, of the study are discussed under:

5.1 Socio-economic and personal characteristics of the respondents

5.2 Dietary habit and food consumption pattern of the respondents

5.3 Nutritional status of the respondents

5.4 Association between socio-economic variables

5.5 Correlation between the overall knowledge gain, retention, adoption of health and nutritional practices and selected socio-economic variables

5.6 Inter-correlation between selected socio-economic variables and other variables

5.7 Effectiveness of IEC materials on the gain in knowledge and retention

5.8 The comparative effectiveness of formulated IEC materials on gain in knowledge and retention on health and nutritional practices

5.9 Effectiveness of IEC materials on the adoption of health and nutritional practices by the respondents

5.10 Comparative effectiveness of formulated IEC materials on the adoption of health and nutritional practices

5.1 SOCIO-ECONOMIC AND PERSONAL CHARACTERISTICS OF THE RESPONDENTS

Socio-economic status is known to be key determinants of health status of any individuals as it affects educational background, food consumption pattern and other life style 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 reveals 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.

5.1.1 & 2 Religion and Caste

According to Ghosh (1990) social factors like religion, occupation, economic status, education, beliefs and culture had important bearing on health. Ramankutty (2000) reported that better socio-economic status of woman is reflected in better literacy, better work participation and greater independence within and out side the family. Arora (1991) observed that religion plays a dominant role in the process of socialization and it maintains the stability of the social system and social relationships and hence the religion and caste of the families surveyed were ascertained. The Kerala Statistical Institute (1992) also reported that caste is an unique system in India. With respect to religion, majority of the respondents of APL (74.00 per cent) and BPL families (62.00 per cent) were Hindus. Among their caste 52 per cent of the respondents of APL families and 68 per cent of the BPL families were other backward class (Table.1). This agrees with the earlier studies that Hindus constitute 57.00 per cent of the total population in rural Kerala (Kannan *et al.*, 1997).

The results of the study are in the line with the findings of Kavitha (1999), Razeena (2000), Vishma (2000), Rekha (2001) and Thara (2002).

5.1.3 Type of Family

The family background of the respondents are also studied in detail to understand the socio-economic conditions. Saxena (2000) reported that, the nuclear type families are considered to be generally better than joint type families for the healthy development of the children. The type of family of the respondents revealed that an over whelming majority of the respondents were having nuclear families (Table 1).

In the study it was found that 82 per cent of the respondents of the APL families and 70.00 per cent of BPL families were from nuclear type families (2 to 4 members). In Kerala joint family system is not very common now-a-days, even though 30.00 per cent of the respondents of BPL families and 18.00 per cent of APL families were found to be from joint family. It is observed that the concept of nuclear family is becoming more and more common in our society and joint family system is fast disappearing.

The findings of this study is in concurrence with the finding reported by Shailaja (1990), Shah and Rathore (1993), Karuna (1993), Jyothi (1993), Lovely (1996), Razeena (2000), Sajitha (2000) and Vishma (2000).

5.1.4 Family Size

Regarding the family size it could be seen that 82 per cent of the respondents of APL and 70 per cent of the respondents of the BPL have small families *i.e.*, one to four members. While 14 per cent of the respondents of BPL families and six per cent of the respondents of APL families have medium sized family (5 – 7 members) and 16 per cent of the respondents of BPL families and 12 per cent of the respondents of APL families have large sized family (above 8 members). 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. Regarding the family size, Park (1997) had reported that average family size in India is four.

The findings of this study is in conformity with the studies reported by Karuna (1993), Park (1991), Kavitha (1999), Razeena (2000), Jaimy (2001) and Bulliyya *et al.* (2002).

5.1.5 Age of Family Members

The study revealed that the majority of the respondents were in the adolescent age group (Table 1). Younger group constituted 3.36 per cent in APL families and 5.61 per cent in BPL families. Only 2.95 per cent APL families and 1.29 per cent BPL families came under pre-adolescent age group. The respondents of APL families (43.43 per cent) and 42.24 per cent of BPL families were in the middle aged category, whereas only 5.88 per cent (APL families) and 5.17 per cent (BPL families) were in the old age category (Table 1).

The results of this study are in tune with the findings of Mony (1993), Sajitha (2000), Anjana and Vimala (2003).

5.1.6 Educational Status of the Family

Education is lifeblood 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 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 are not furnished through any education programme.

With regard to the family educational status, 7.69 per cent of adult male belonging to BPL families and 3.71 per cent belonging to APL families were illiterate, whereas 13.56 per cent (BPL families) and 10.00

per cent (APL families) of the female adults were illiterate (Table 2). And the results indicated that there was wide variation in the educational status of the family members.

The findings of the present study are in line with the findings of Sujatha (1990). Husain (1994), Resia and Sarangadharan (1994), Kavitha (1999) and Razeena (2000).

5.1.7 Parent's Employment Status

The employment status of the population is an important determining factors with respect to health and nutritional status as reported by Reddy *et al.* (1993). Under the occupational status the employment of the head of the family was given importance. With regard to their parent's employment status 44 per cent of the fathers of APL families were government servants whereas more of fathers of BPL families are casual labourers *i.e.*, 70 per cent. The usual practice seen was that minority of population possessed land and majority was working in the field as causal labourers.

About their mother's employment status majority were housewives *i.e.*, 74 per cent in APL and 76 per cent in BPL families. The present study also agrees with the earlier observation and census data available, which include that the work participation of females has not increased as much as males in last decades in Kerala particularly in Thiruvananthapuram district (Eapen, 2000).

5.1.8 Family Income

Family income is considered as an important determinant, since it determines the family status and the socio-economic position in the society to which they belong. In the case of total family income of the respondents it could be seen from Table 4 that 36.00 per cent of the respondents of BPL families had a monthly income below Rs.1000/- while 52.00 per cent of APL families had a monthly income above Rs.3000/-.

Majority of families belonging to BPL had only very small land holdings so they earned only a negligible amount from subsidiary jobs. The study is in concurrence with the result of Razeena (2000).

5.1.9 Presence of Household Assets and Basic Facilities

Sanitation and drinking water facilities are important variables in determining the health status of a population. As UNICEF (1990) has reported that lack of ready access to water and poor environmental sanitation are important underlying causes of various types of infection resulting in malnutrition. As per the data furnished in Table 5, the basic facility available in the family was categorized into low, medium and high based on the type of housing facilities for defecation/urination and waste water disposal facilities and it was found that in 46 per cent of APL families and 14.00 per cent of BPL families, basic facilities available were medium. Most of the respondents of APL families use pipe water for drinking and washing while majority of BPL families use well water for drinking and all other household activities. Due to the lack of sanitary latrines, the respondents of BPL families were using open grounds available around the house and this situation could be due to lack of knowledge regarding health, hygiene and environmental sanitation. Majority of the respondents of BPL families (84.00 per cent) environmental sanitation conditions were very poor. Environmental pollution by human excreta, disposal of waste, stagnation of water due to improper drainage also promotes breeding of mosquitoes and flies. This leads to poor environmental sanitation.

This findings of the present study is in conformity with the findings of UNICEF (1990), Dilton and Philip (1996), Razeena (2000), Brozekowski (2001) and Nirmala (2002).

5.1.10 Mass Media Contact

Mass media play a significant role in the spread of new ideas among women and in Kerala majority of the families subscribe to

newspapers and possess radio and television in their homes. Naik (1991) reported that mass media exposure had significant association with awareness about TV system. The mass media contact of the respondents revealed that 40.00 per cent of APL families and 50.00 per cent of BPL families were having medium level of exposure. Sixteen per cent of APL families and 34.00 per cent of BPL families were having low level of exposure (Table 6). This indicated that majority had sufficient exposure to media slightly to higher mass media contact. Every family subscribe at least one newspaper and they possess radio and TV. Possession of all these media might have increased their mass media contact. All these point out that the standard of living of Keralites have improved a lot. Park (1997) had observed that though many a numbers belonged to low income in Kerala, a high standard of living is enjoyed by Keralites.

These findings are in concurrence with the findings of Prema and Jayaseelan (1992), Mony (1993), Anusuya (1997), Lakshmi (2000), Razeena (2000) and Thara (2002).

5.1.11 Monthly Expenditure Pattern

Monthly expenditure pattern of the respondents of APL families were found to be high compared to the respondents of BPL families (Table 7 and 8). The respondents of BPL families spent more money for food whereas the respondents of APL families spent foods followed by clothing, education and on purchase of gifts. After purchase of food materials the respondents of BPL families have not enough money to save and improve their stable income when compared to the respondents of APL families. APL families give equal weightage to food as well as other expenditure. According to Sarvekshana (1992) an average Indian spent more portion of his income for food.

The results of the present study are in concurrence with the findings of Giriappa (1990), Nirmal (1990), Pawar *et al* (1991) and Ranjini *et al.* (2000).

5.1.12 Health Profile of the Respondents

Smyke (1991) opined that a person's health is influenced by the availability of health information and health care both preventive and curative. The health profile of the respondents of APL (6.00 per cent) and BPL families (10.00 per cent) revealed that they were having medium level of personal health care practices. Eight percent of the respondents of APL families and 12.00 per cent of respondents of BPL families had lower level of health care practices (Table 9). Results indicated that the personal health care of the respondents belonging to BPL families were almost similar to that of APL families. A study by Chopra *et al.* (1999) clearly indicated that the personal hygiene of the rural school children were almost same as the urban. Ayoama (1999) is also similar view that people's access to health care, education, clean water and sanitation, affects their nutritional status.

The results of the present study are in line with the findings of Chhabra *et al.* (1997), WHO (1998) and Government of Kerala (2000).

5.2 DIETARY HABITS AND FOOD CONSUMPTION PATTERN OF THE RESPONDENTS

5.2.1 Food Habits of the Family

Food habits constitute one of the most obvious distinguishing features between population and are influenced by the cultural categories expressed by a society. With regard to the food habit of the respondents majority of them were non-vegetarians (Table 10). Similar result was obtained by Beatrice (1999) in her study undertaken in Thiruvananthapuram district and majority of adolescent sample were noted as non-vegetarians. Only 4.00 per cent of APL families and 8.00 per cent of BPL families were vegetarians. The respondents of APL families include meat occasionally and egg weekly in their diet where as fish is a common

constitute in BPL families and that was the usual meal pattern found in low income groups in Kerala.

The findings of the present study is in line with the findings of Karuna (1993), Lovely (1996), Kavitha (1999), Sajitha (2000) and KSI (2000). Majority (58.00 per cent) of the adolescent girls have the habit of nibbling some food in between meals. Though a three meal a day is followed in both APL and BPL families, most of the respondents *i.e.*, 65.00 per cent of APL families stated that they regularly skip one or two meals daily particularly breakfast. The food habits of adolescents in the study are mainly characterised by irregular meal pattern as revealed earlier by Samuelson (2000). Lack of time is the main reason reported by them. This study is in line with that of Khalil (2003) on the breakfast practices of adolescent girls. Twenty two per cent of the adolescent girls of APL family were reluctant to carry their lunch and they skip their meal and substitute this with bakery items like biscuits, chips, candies and fast foods which gave some calories and fat with little protein. The study is in line with the findings of Sadana *et al.* (1997). Rekha (2001) had reported that new products are purchased in order to save time. It is evident that though these items satisfy their hunger for the time being they are not sufficient to meet the adolescents nutritional need. It is recommended that the lunch should meet one third of the one's is daily nutrient needs (Srilakshmi, 2002).

5.2.2 Monthly Expenditure on Food

On further enquiry about the distribution of money for the purchase of various food items, it is revealed that majority of the families allocated more money for the purchase of cereals. The amount spent for the purchase of green leafy vegetables are found to be very low in the APL families, whereas it was high in the case of BPL families (Table 11 & 12). This indicated that the respondents of APL families reluctant to eat green leafy vegetables even though the cost of it is low.

The results of this study is in agreement with the studies reported by Mony (1993), National Nutrition Monitoring Bureau (1996), Wadekar *et al.* (1998) and Chopra *et al.* (1999).

5.2.3 Frequency of Use of Various Food Items

On assessing frequency of use of various food items it was found that cereals are consumed daily by the adolescent as cereal is the staple food of Indian and among this rice is consumed daily by adolescents 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, fruits, roots and tubers, nuts and oil seeds, milk and milk products, spices and condiments, fats and oils, sugar and jaggery. were the most perpetually used foods in the dietaries of all respondents. Similar results were obtained by Mony (1993) and Gayathri (2002), as these items are needed in small quantities daily for various culinary preparations (Table 13 and 14). Next to cereals, milk, roots and tubers were found to be consumed almost daily by the adolescents. This is mainly seen among adolescent girls of both APL and BPL families. Milk is taken with tea or coffee daily which as usually substituted for the breakfast. This study agrees with the earlier study reported by Kavitha (1999) that the milk and 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. Respondents of APL families consume more fruits than the respondents of BPL family. It was due to their low income status. A study reported by Hamulka *et al.* (2003) reveals that frequency of breakfast intake decreased at older school children. Intake of snacks, sweets, beverages, like Pepsi, Coco cola was too high among adolescent girls of APL families.

5.2.4 Actual Food Intake

The dietary intake of the respondents were computed from individual food consumption by actual weighment. Nutritional status

pertains to the conditions of health of the individual, affected by the intake of foods and the utilization of nutrition.

Data presented in Table 15 depicts that the intake of pulses, fleshy foods, fruits, milk and milk products; vegetables were very poor among the respondents of BPL families. 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 leafy vegetables, poor consumption was found among APL families when compared to BPL families. A study done by Kumari and Singh (2003) on secondary school children also reported that green leafy vegetables and other vegetables are inadequate in adolescent's diet. Increased consumption of green leafy vegetables in BPL families may be due to the fact that they are cheap, easily and locally available. Similar observation was noted in a study conducted by Natarajan (1999).

Regarding the consumption of fleshy foods it was found that the respondents of APL families consumed egg once in a week while the respondents of BPL families took egg only occasionally due to financial constraints. Intake of fish was very high among the respondents of BPL families, when compared to the respondents of APL families. Preference for fish rather than meat could be attributed to easy availability and cheapness when compared to meat. 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 is most frequently used food items (Kumari and Singh, 2003). Similar results were obtained from Mony (1993), Jayantha (1993) and Lovely (1996).

Fats and oils were found to be mainly used only for seasoning. In terms of percentage of RDA, oils and fats intake was 41.30 per cent by APL families and 30.20 per cent by BPL families.

Sugar was used on daily basis as an ingredient of tea or coffee with milk.

The above data revealed the disparity in terms of quantity of food consumed by adolescent girls belonging to APL and BPL families in comparison with the requirements of a balanced diet.

5.2.5 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).

Details related to the nutrient intake of 20 respondents were presented in Table 16.

Intake of all nutrients except energy was comparatively closer to RDA for the respondent belong to APL and BPL families. The percentage RDA met for energy was comparatively higher than the other nutrients and this might have been because of high consumption of cereals as they considered cereals as the staple food. Saurupriya and Mathew (2000) and Sunitha and Sushila (2003) were also found the similar results for tribal adolescents.

Calcium deficit was also found to be more among the dietaries of respondents belong BPL families compared to respondents belong to APL families and could be attributed to the low intake of milk. However, it is interesting to note that the intake of protein was lesser than respective RDA for the respondents of BPL families. This could be related to the fact that the consumption of pulses was very low among the respondents of BPL families. But the intake of protein was comparatively closer to RDA for the respondents of APL families. Similar observations were found by Rajni and Priti (2003).

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. Accordingly in the present study methods such as anthropometry, biochemical and clinical examination were used as method to assess nutritional status.

5.3.1 Anthropometric Measurement

Anthropometry is a method which involves measurement of human body was taken as a primary method to assess the nutritional status of the subjects. 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 variation in the nutritional status of adolescent girls (APL and BPL families) belonging to 13 and 14 years of age groups.

Bhasin *et al.* (1990), Gupta *et al.* (1990) and Venkati and Peramma (2000) observed that anthropometric measurements of adolescent girls (body weight and height) increased with an increase in the age from 13 to 15 years.

Anthropometric measurements taken for assessing the nutritional status of the adolescent girls revealed that the average weight for age of the respondents of APL families belonging to 13 years of age was lower than the NCHS standard (1991) (Table 17) whereas the respondents of BPL families were comparatively closer to NCHS standard. Jaishree *et al.* (2001) also got the same results among adolescent girls. At the age of 14 years of the respondents of both APL and BPL families were relatively closer to the NCHS standards. Bhatia *et al.* (1998) in their study among adolescent girls of Kashmir found that the mean weight of girls belonging to 13, 14 and 15 years were 43.7, 45.9 and 47 kg respectively. Deficit in body weight has been reported among the rural and urban adolescents of

low socioeconomic status by NIN (1990). A study done by Kumari and Singh (2003) give similar results where female adolescents were comparatively more malnourished than boys. Girls in the 13-16 years of age group consume less food than boys (Anant, 2001).

The average height for age profile of the adolescent girls (APL and BPL families) belonging to 13 and 14 years were found to be closer to the NCHS standard (Table 18). Vijayaraghavan *et al.* (1971) reported that well-to-do Indian children were found to be taller and heavier than the children belonging to lower income group of corresponding ages.

A study conducted by Bhatia *et al.* (1998) among adolescent Kashmir girls found that the mean height was 154, 155 and 156 respectively for 13,14 and 15 years. Average height of the adolescent girls of APL and BPL families in this study for 13 and 14 years was found to be 140, 145, 155.2, 153.1 respectively, which is in tune with body height reported among pre-adolescent athletes SH (1990).

Body mass index (BMI) 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 (1991). 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 ($Wt./Ht^2$) was used as a parameter for detecting chronic energy deficiency (CED) and for purposes of classifying the respondent's deficient energy intake. Findings indicate that 40.00 per cent of the respondents of APL families and 20.00 per cent of the respondents of BPL families suffered from moderate chronic energy deficiency (Table 19). Experts from NIN (1990) are of the opinion that BMI values between 18.6 and 25.0 can be considered as compatible with health for both men and women. Thus 10.00 per cent of the respondents (APL families) and 10.00 per cent of the respondents (BPL families) were found to fall in the

normal range of BMI implicating the respondents of APL and BPL families current nutritional status is satisfactory. It is really surprising to note that even though these adolescents of BPL families have irregular meal pattern none were severely malnourished when compared to normal standard. Whereas 30.00 per cent of respondents of APL families had severe chronic energy deficiency and their birth weight was too low. However, when assessed by the Eliz Health Path for Adolescents (EHPA) designed by Child Development Centre, a different picture is obtained. It was found that 90.50 per cent of the adolescents under study are normal whose BMI level is between 15-22 kg/m^2 whereas only five per cent are under weight, three per cent are over weight and 1.50 per cent obese.

5.3.2 Biochemical Assessment

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).

In the present study the results indicated that haemoglobin levels between 8 to 10 gm/dl in ten per cent respondents of BPL families and none of the respondents of APL families (Table 20).

The study is in line with the findings of Kavitha (1999), Sajitha (2000) and Nirmala (2002).

5.3.3 Clinical Examination

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 in 20.00 per cent of the respondents of APL families and 30 per cent of adolescent girls of BPL families. Anaemia and dental caries were the most common nutritional deficiency symptoms

noted. According to Kellog'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 and Vimala (2003) among adolescent girls. Thirty per cent of the respondents of APL families and BPL families were having dental problems (Table 21). The present study again confirmed that the inadequate and unbalanced diet with no intake of fruits and vegetables could lead to micro nutrient deficiency that result in deficiency symptoms. Mild symptoms of other nutritional deficiency symptoms like angular stomtitis, bleeding gum, pigmentation of skin could be noted in most of the adolescent girls among BPL families.

5.3.4 Nutritional Status Index

Adolescents form a significant part of our population and the assessment of nutritional status is relevant and healthy adolescent a pre-requisite to a healthy adult life and 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, 1999). Here as for the major sample parameters like height, weight, BMI were measured to understand the nutritional status of the adolescents. In addition to this biochemical 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 deficits in anthropometrical measurements with poor

haemoglobin level and possessing many of the nutritional deficiency symptoms and consume a diet inadequate in quantity and quality.

When the NSI of the respondents were computed, the NSI of 13 year old of APL families were found to be lesser than the respondents of the same age group from BPL families, but in the case 14 year old respondents, the NSI was found to be satisfactory (Table 22). It was observed that adolescent girls of BPL families consume more food than APL families. The respondents of APL families consume convenience food like chips, noodles and aerated drinks. They want to slim by skipping meal.

The study is in line with Sadana *et al.* (1997), Glanz *et al.* (1998), Nickles *et al.* (2002) and Brien *et al.* (2003).

5.4 ASSOCIATION BETWEEN SOCIO-ECONOMIC VARIABLES

5.4.1 Association between Family Income and Selected Socio-economic Variables

Association of total family income with other selected variables was found by using chi-square test. It was found that the expenditure on education was significantly associated with the total family income of APL and BPL families. The significant association of expenditure on education with total family income was seen in the BPL families this may be because they were getting only fixed amount of income and most of them have no subsidiary jobs or income from other sources. Due to the lack of money most of them spent less amount for education which is very much dependent on their family income. The children of APL families have better education and it was significantly associated with the family income. High aspiration among the parents about their children is another reason for the high association of income and education. The food consumption pattern of the respondents of BPL families were also significantly associated with family income (Table 23).

The results of the present study is in the line with the findings of Parvathi and Babitha (1998), Saha and Kanchan (2000) and Vaquerio and Nanarro (2002).

5.4.2 Association between Personal Hygiene and other Socio-economic Variables

Association of personal hygiene with other socio-economic variables was found out using chi-square test (Table 24). It was found that the personal hygiene of the respondents of APL families were having significant association with their family type, family size, monthly income of the family, mass media contact, food habit of the family and basic facility. While among the respondents of BPL families only caste and mass media participation had significant association with their personal hygiene. Mass media exposure was found to have significant relationship with the personal hygiene of the respondents of both APL and BPL families. Exposure of different mass media would have helped the respondents to get new information about personal hygiene. This might have resulted an increase in their knowledge about personal hygiene. Type of family and family size showed significant association with personal hygiene of the respondents of APL families. Family size do have an effect on the personal hygiene of individuals as reported by Kumar *et al.* (1999) and according to Devadas *et al.* (2000), that family size has an influence upon the development of children in all aspects.

The findings is in alignment with that of Jayakrishnan (1994), Manjunath *et al.* (1996) and Jeya (1999).

5.4.3 Association between Family Income and Expenditure on Various Food Items

The total family income of the respondents of APL families was considered. It was significantly associated with the expenditure pattern of food items like roots and tubers, fats and oils and processed foods (Table 25).

Whereas the total income of the respondents of BPL families had significant association with the expenditure for green leafy vegetable and roots and tubers. In roots and tubers, tapioca was the commonly used food items for the low income group. The reason may be easy availability and affordable price of the food. The food like pulses, vegetables, fruits, nuts and oil seeds, animal food especially meat and egg were consumed only in small quantities by the respondents of BPL families. But they consumed green leafy vegetables more than the respondents of APL families. Stephanie (1994) revealed that the expenditure on food is high, constituting 60.00 to 70.00 per cent of the total monthly expenditure of an average Indian. Only diets of high and middle income groups in urban areas were satisfactory (Juna, 1999).

5.5 CORRELATION BETWEEN THE OVERALL KNOWLEDGE GAIN, RETENTION, ADOPTION OF HEALTH AND NUTRITIONAL PRACTICES AND SELECTED SOCIO-ECONOMIC VARIABLES

The overall knowledge gain of health and nutritional practices were analysed and their relationship with selected socio-economic variables were discussed next.

In the present study, age of the respondent have no significant relationship with gain in knowledge on post-test, retention and adoption (Table 26).

In this study the gain in knowledge have no significant relationship with the selected socio-economic variables with respect to post-test. None of the variable selected for the study were found to have relationship with gain taken in APL and BPL groups, whereas education, income and food consumption with respect to APL families were found to have relationship with gain in knowledge. The relationship with income was in the negative direction. This indicates that whatever be the family income it has no effect upon acquisition of knowledge. Higher education, more will be their enthusiasm to acquire and retain that knowledge. Healthy body will have

on healthy mind. Same trend was noticed in the BPL family, whereas the retention have significant relationship with income, education and food consumption pattern. Because of higher educational status of the respondents, they retained the topic taught to them. This could be the main reason for the relationship between retention and socio-economic variables.

The adoption of the respondents of APL and BPL families have significant relationship with the personal hygiene.

The results of the present study is in tune with the findings of Bhatia *et al.* (1998). Chhabra *et al.* (1997) and WHO Technical Report Series (1997).

5.6 INTER-CORRELATION BETWEEN SELECTED SOCIO-ECONOMIC VARIABLES AND OTHER VARIABLES

The present study revealed that age of the respondents had significant relationship with the food consumption pattern (Table 27 and 28). As the age increases, their consumption pattern were also changing. They were very much careful about changing food consumption patterns on their future life. Because they are the future mothers. This was also supported by the studies conducted by Seetharamu (1999) and Kaleel (2000).

A study conducted by Ahiya *et al.* (2000) revealed that age and education of the respondents have significant correlation with the knowledge regarding health.

The correlation between mass media participation and other variables of APL families revealed that it had significant relationship with the total basic facility and the personal hygiene. Whereas in BPL families, it had only significant relationship with personal hygiene. Mass media help to generate new ideas and informations to improve health and healthful living. Mass media participation helps the people to change their faulty habits. Otta (1992) proved that mother with low educational level were found to have less knowledge about various health care practices and did not take proper health measures.

With regard to adoption on the personal hygiene were found to have positive significant relationship with adoption in both APL and BPL families. Knowledge on personal hygiene plays a very important role in health status of the respondents.

The significant relationship of mass media exposure with adoption was also reported by Chandran (1993) and Kamaraj (2000).

The result is in tune with the findings of Gowda (1999), Lakshmi (2000) and Razeena (2000).

5.7 EFFECTIVENESS OF IEC MATERIALS ON THE GAIN IN KNOWLEDGE

From the findings of the present study, it was clear that the formulated IEC materials had significant influence on the gain in knowledge. A combination of media *viz.*, posters, charts, flashcards and leaflets were administered. Philip *et al.* (1998) observed that usage of visuals through different modes of presentation play a very important and crucial domain in affecting effective cognitive and psychomotor domains. Nishi (1997) opined that the purpose of the process of communication is to enable the evidence in bringing out increase 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 are more bothered about improved health practices.

The relative effectiveness of the formulated IEC materials namely flashcards, posters, charts and leaflets were used. Thus using a variety of teaching methods will be most effective approach to bring about behavioural changes.

From the score obtained for post-test it is clear that IEC materials had significant influence on the gain in knowledge. IEC materials used along with lecture helped the students to get a better understanding of health and nutritional problem.

The results emphasized the need for making use of different IEC materials for imparting knowledge to the school going adolescent girls. When the combination of different IEC materials were used along with lecture we can not only catch hold the attention of the learner but also at the same time, retention can be more. A picture is equivalent to 'thousand words' and when the same information is given to the learner through different sources learning will be more effective and reinforcement will be there. As a part of reinforcement adoption will be more. The study conducted by Vishma (2000) also proved the impact of different IEC materials in the gain in knowledge. According to Das and Sharma (1998) better the education greater would be the knowledge of adoption.

The studies of Premalatha and Verma (1990) and Singh *et al.* (2003) and Talikoti and Goel (2003) support the present findings that IEC materials are better in increasing the knowledge of respondents.

5.8 THE COMPARATIVE EFFECTIVENESS OF FORMULATED IEC MATERIALS ON GAIN IN KNOWLEDGE AND RETENTION ON HEALTH AND NUTRITIONAL PRACTICES

5.8.1 The Effectiveness of IEC Materials in Gain in Knowledge (post-test)

The effectiveness of different IEC materials *viz.*, lecture alone, lecture + flash card + leaflet, lecture + posters + charts, lecture + demonstration + exhibition were analysed and discussed. From the analysed data it could be seen that there was significant difference in the mean scores obtained by the adolescent girls for the different treatments. At the same time the knowledge gain on the four topics or subjects selected, was also varied (Table 29).

When the gain in knowledge of the respondents were considered lecture + flash card + leaflet had got the highest mean value (722.88) and that method was more effective to teaching the respondent. The studies conducted by Vishma (2000) proved that lecture combined with IEC

materials secured the maximum means score. In the present study the lecture + flashcard + leaflet was better for gain in knowledge and the knowledge gain was more on the topic reproductive health and its hygiene. Here they try to understand more on the topic reproductive health and its hygiene. Adolescent reproductive health care needs vary with culture, age and martial status. But all adolescents need accurate and adequate information about sexual and reproductive health. Without easy access to accurate information, adolescents are at risk of being misinformed about sexual and reproductive matters, which may lead them to make decisions that could have negative effects on their lives.

In India most adolescent girls of 15-19 years old are married. A study was conducted in 1995-97 in Ahmednagar district of Maharashtra, India to gain insight into whether and how their reproductive health needs are met, especially for gynecological problems, family planning and perceived fertility problems (Alka and Katheen, 2001). Perhaps it may be difficult to the respondents to grasp the details of messages presented through lecture alone or lecturing combination with poster and charts. Flash cards on the other hand presented very brief message with illustrations to emphasis the key points of lecture. The number of flash cards used were also less when compared to posters and charts. Moreover there was more involvement on the part of the respondents during the exposure of the message by using flash cards. These are the main reasons that the flash cards in combination with lecture had got the highest score for knowledge gain.

In the above findings through lecture + poster + charts contribute next to lecture + flash cards + leaf lets all other treatments were superior to lecture method alone. The results emphasized the need for making use of IEC materials for imparting knowledge to the adolescents. Awareness of the respondents were positively correlated with education. Education

exposes the individual to a multitude of facts and information (Vishma, 2000).

The results of the present study is supported by the findings of Kim *et al.* (2003), Rokiah and Noor (2003), Kumar *et al.* (2003) and Annamma *et al.* (2003). They support the finding that the visual aids such as slides, flashcards, and poster, charts and flannel graphs are better in increasing the knowledge of the respondents.

5.8.2 Effectiveness of the Selected IEC Materials in Retention of Knowledge (15 days after the treatment)

In the present study the retention of knowledge was more when the respondents received information through the lecture method combined with exhibition and demonstration. Since the exhibition + demonstration experimented in this study, along with lecture were significantly different from lecture alone method and from each other.

The superiority of lecture + exhibition + demonstration reinforcement is more and that could be attributed to the inherent qualities of IEC materials in terms of attracting and holding attention, stimulating interest and making subject matter more understandable. These IEC materials presented the informations in a systematic manner so as to make the audience gain as much information as possible. This could help to acquire and retain more knowledge.

An exhibition was organized with different IEC materials presented very brief message with illustrations to emphasize the key points of lecture. In this posters, charts, slides, flash card and leaflets were included. During exhibition a balanced diet for an adolescent girl was also demonstrated. A demonstration of low cost sanitary napkin was also conducted during the exhibition. This demonstration was very useful to the adolescent girls. Moreover there was more involvement on the part of the respondents during the exhibition and demonstration using different

combination of IEC materials. These are the main reasons that demonstration and exhibition in combination with lecture had got the highest score for retaining knowledge.

The studies conducted by Santhoshkumar (1990), Razeena (2000) and Vishma (2000) revealed that lecture combined with flash cards was found to be superior to other treatments in retaining knowledge. But in the present study the lecture + exhibition + demonstration have got more score for retaining the gained knowledge.

Similar observations are found by Gincy (1987), Wardlaw and Insel (2000), Neena and Singh (2002), Zao *et al.* (2003) and Stalin and Abel (2003).

5.9 EFFECTIVENESS OF IEC MATERIALS ON THE RETENTION OF KNOWLEDGE BY THE RESPONDENTS

In the present study the mean retention score (48.88) was higher than the pre-test score (10.67) and control group (10.35) this indicated that the gained knowledge was retained after 15 days of treatment. This is because of the effect of IEC materials used. So whenever we have to teach people it is necessary to prepare IEC materials which were familiar to the audience and was prepared after pre-test. This may be a reason for retention.

Santhoshkumar (1990) and Razeena (2000) reported that there was significant difference between and among the different visual aids combined with lecture method in retaining knowledge of neoliterates. The result is in line with the studies reported by Saibaba and Raghuram (1999), Neena and Singh (2002) and Singh *et al.* (2003). All the above studies reported about the effectiveness of IEC materials in combination with lecture method in retaining more knowledge over the lecture method alone. Mukkahoel and Annamma (1998) also reported that the

combination of media helped the rural mothers to grasp information and change the attitude towards favourable side.

The null hypothesis set for the study was that their would not be any significant difference between the treatments involving lecture + IEC materials and lecture alone method in their effect on relating the knowledge by adolescent girls was rejected. Similarly the null hypothesis that there would not be any significant difference between the IEC materials on their effect in increasing the retention of knowledge by the adolescent girl was also rejected.

The respondents were subjected to the post delay test after a time lag of 15 days of the message presentation and exposure to IEC materials. Santhoshkumar (1990) and Razeena (2000) reported that there was more involvement on the part of the respondents during the exposure of the message by using flashcards since the audience could have closer look at the illustrations on the cards.

5.10 COMPARATIVE EFFECTIVENESS OF FORMULATED IEC MATERIALS ON THE ADOPTION OF HEALTH AND NUTRITIONAL PRACTICES

Tharaneatharan *et al.* (1998) observed that only after gaining sufficient knowledge people would develop favourable attitude towards adoption. The present study proved that the actual effectiveness of IEC materials was the adoption of the gained knowledge. When the pre and post-test scores of adoption practices were compared it was found that the teaching with IEC materials have significant effect on the adoption practices.

The results of the study is in the line with the findings of Ukkuru (1993), Sushma *et al.* (1999), Lakshmi (2000), Razeena (2000), Vishma (2000), Mathur (2001) and Mobsen (2003).

Studies conducted else where in the use of IEC materials proved that more the number of senses stimulated greater will be the success of communication efforts.

In the present study the adoption practices done by the respondents were high when they were exposed to treatment 2 (lecture + flashcard + leaflet). When the flashcard was used to supplement the topics presented through lecture, the respondents could grasp more knowledge in simple way and that help them to adopt the gained knowledge in a better way and the reinforcement retention, interest, motivation etc. was high.

When lecture alone method was used to teach the respondents their knowledge gain retention and adoption practices were low and this may be due to the monotony of lecture alone method.

The adoption practices had shown that most of the respondents adopted the practices for the hygiene during menstruation period. When the pictures of menstruation cycle and its hygiene was shown through flash cards, charts and posters during exhibition, they become very much aware of the importance of hygiene on those conditions. For this a demonstration class was conducted and showed a low cost sanitary napkin by using cotton and gauze. The results showed that the adoption practices were more in S_4 (reproductive health and its hygiene). It clearly indicated the adolescent girls have adopted the simple technique of preparing low cost sanitary napkin. T_4 was found to very effective in communicating the adolescent girls about the preparation of low cost sanitary napkins and easiness in preparation and hygiene. Therefore, here got a profound influence in the adoption of treatment when the same technology is disseminating through different methods. Reinforcement taken place which results in adoption. According to Nagarajan (2003) clearly depicted that adolescent girls have adopted the message easily in reproductive health because they want to ensure cleanliness and inculcate hygienic practice of the use of sanitary napkins during menstruation.

Otta (1992) reported that there was high awareness and adoption of better health measures due to higher maternal education. Studies conducted by Bosley (1996), Razeena (2000), Goel and Kumar (2003) were found that IEC materials had significant effect on the adoption of practices.

Summary

6. SUMMARY

Communication to be effective and meaningful not only the meaning be imparted, but also be understood properly. In other words communication is the transference and understanding of meaning. This principle is of greater significance when the message is communicated to the adolescent girls. The spoken word, supplemented by formulated IEC materials suitable to the situation and type of audience make communication still more effective.

In Kerala, no systematic efforts have been made so far to study the health status and nutritional practices of the adolescent girls and the effectiveness of IEC materials on it. Hence it was felt worthwhile to undertake an experimental study to evaluate the effectiveness of information education and communication materials on the health and nutritional practices of adolescent girls in Thiruvananthapuram district and also to analyse the effectiveness of IEC materials *viz.* lecture alone, lecture + flash card + leaflet, lecture + posters + charts, Lecture + demonstration + exhibition in gain, retention and adoption of knowledge. The study was designed with the following specific objectives.

1. To assess the effectiveness of educational programme using IEC materials on the gain in knowledge
2. To assess the effectiveness of educational programme using IEC materials on the retention of knowledge.
3. To evaluate the effectiveness of educational programme using IEC materials on the adoption of gained knowledge
4. To study the food consumption pattern and nutritional status of the respondents
5. To study the relationship of certain selected socio-personal characteristics of the respondents with their gain in knowledge, retention and adoption of gained knowledge

The experiment was conducted in two higher secondary girls schools located at Venganoor and Thiruvallam in Thiruvananthapuram district. Adolescent girls in the age group of 13-15 years, from the schools were purposively selected for the study.

Hundred adolescent girls belonging to above poverty line and below poverty line formed the study sample. Ten respondents from each of the two groups were selected at random for assessing the nutritional status.

The dependent variables selected for the study were gain in knowledge, retention of knowledge and adoption of gained knowledge by the adolescent girls. The independent variables for the study include age, family size, type of family, monthly income, educational status of the family, mass media contact, health profile, household assets and basic facilities, dietary habit and food consumption pattern.

In the experimental study, the topics selected were importance of nutritious food (S_1), body changes in adolescent period (S_2), Health care (S_3), reproductive health and hygiene (S_4).

The knowledge level of each of the respondents was measured.

1. Before exposure (pre-test)
2. Immediately after the exposure (Post-test)
3. 15 days after the exposure (retention and
4. After one month to test the level of adoption

For pre, post and retention tests, structured interview schedule was used and to test the level of adoption, a checklist was used. The data pertaining to the independent variables were collected with the help of a structured pre-tested interview schedule. The collected data were tabulated, analysed statistically and the results were interpreted.

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

1. Majority of the selected respondents of APL and BPL families in the study belonged to adolescent aged category and they belonged to Hindu religion and were from other backward community. Eighty two per cent of the respondents of APL families and 70 per cent of BPL families had small family size. The educational status of the family belonged to low income group was not much satisfactory. Mass media contact of the respondents (APL and BPL families) was found to be at medium level. Nutritional practices showed that the adolescent girls of BPL families consume more food than APL families. The respondents of APL families consume convenience foods like, chips, noodles and aerated drinks. They want to slim by skipping meals.
2. The teaching programme using IEC materials had significant effect on the gain in knowledge of the respondents.
3. There was significant difference between the different teaching methods used in imparting knowledge to the respondent. Similarly the IEC materials experimented were also different from each other.
4. Among the four topics selected for teaching the respondents maximum gain in knowledge was on the topic reproductive health and hygiene and the most effective method using IEC materials for knowledge gain was lecture + flashcard + leaflet when exposed to T_2.
5. There was significant difference in the retention of knowledge of the adolescent girls due to the different IEC materials.
6. The two IEC materials in combination with lecture were significant different from lecture alone method in retaining the knowledge of the respondent. Similarly the IEC materials themselves were significantly different from each other

7. Among the four topics selected, the knowledge on the fourth topic *i.e.*, reproductive health and hygiene was retained more by the respondents and those who were taught by using the method with IEC materials *i.e.*, lecture + demonstration + exhibition (T_4).

8. Correlation between overall knowledge gain, retention adoption and selected socio-economic variables revealed that,

   (a) The educational status and food consumption pattern have significant relationship with retention of knowledge of the respondents of APL families, but the income have significant relationship in negative direction, whereas in BPL families, the income and educational status were found to have significant relationship in positive direction.

   (b) The adoption of the respondents of APL and BPL families have significant relationship with the personal hygiene

9. The educational programme using IEC materials had significant influence on the adoption of gained knowledge by the respondents.

10. Among the significantly superior methods using IEC materials lecture + flash card + leaflets (T_2) was superior to the other methods using IEC materials in adoption practices.

11. The four topics selected, to which the respondents were exposed, the adoption practices were more because adolescent girls adopted the messages easily in reproductive health as they want to ensure cleanliness.

12. The comparative effectiveness of the formulated IEC materials showed that there was significant difference between the lecture alone and other treatments. Lecture when supplemented with IEC materials, highly superior to lecture method alone in gain, retention and adoption of knowledge by the adolescent girls.

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*Original not seen

EFFECTIVENESS OF IEC MATERIALS ON HEALTH AND NUTRITIONAL PRACTICES OF ADOLESCENT GIRLS

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Abstract of the
thesis submitted in partial fulfillment of the requirement
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ABSTRACT

A study entitled the "Effectiveness of IEC materials on health and nutritional practices of adolescent girls" was conducted to evaluate the effectiveness of information education and communication materials on the knowledge and adoption of health and nutritional practices by the adolescent girls and also to find out the comparative effectiveness of the formulated IEC materials.

The study was carried out in Venganoor and Thiruvallam Higher Secondary Schools in Thiruvananthapuram district. The formulated IEC materials *viz.*, flash cards, charts, posters and leaflets were tested for their effectiveness. The topic selected to teach the respondents were importance of nutritious food, body changes in adolescent period, health care and reproductive health and hygiene. Hundred adolescent girls of APL and BPL families belonging to the age group of 13 to 15 years form the study sample. All respondents were exposed to the selected topics at one-week interval using the formulated IEC materials.

Gain in knowledge, retention in knowledge and the adoption of gained knowledge on health, and nutritional practices are the dependent variables. Age, family size, type of family, monthly income, educational status of the respondent and family, mass media contact, basic facilities available in the family, health profile and nutritional status were selected as independent variables.

The results revealed that the educational programme using IEC materials had significant effect on the knowledge and adoption of health and nutritional practices by the adolescent girls. The gain in knowledge and retention was more on the topic reproductive health and its hygiene. The IEC materials *i.e.*, lecture + flashcard + leaflet was the most effective in terms of gain knowledge and adoption of knowledge. The knowledge

adoption was also more on the topic reproductive health and hygiene and the retention was more in the respondent, who were exposed to treatment 4 *i.e.*, lecture + demonstration + exhibition.

The correlation between the overall knowledge gain, retention, adoption and socio-economic variables revealed that the retention have significant relationship with income, education and food consumption pattern. The adoption of the respondents of APL and BPL families have significant relationship with the personal hygiene.

The relative effectiveness of the formulated IEC materials revealed that there was significant difference between the selected IEC materials of teaching. The lecture methods in combination with formulated IEC materials have more influence on the gain retention and adoption of knowledge when compared with the lecture method alone.

Appendices

APPENDIX – I
KERALA AGRICULTURAL UNIVERSITY
College of Agriculture, Vellayani

Department of Home Science

Name of Investigator :

Name of Subject :

"Effectiveness of information education and communication materials on health and nutritional practices of adolescent girls"..

A. Interview schedule of elicit information on socio-economic pattern

1. Name and address of the respondent :
2. Age of the respondent :
3. Class :
4. Religion-Hindu/Muslim/Christian :
5. Caste-specify :
6. Family size – Small/Medium/Large :
7. Type of family – Joint/Nuclear :

8. Family composition :

Sl. No.	Name of family members	Relationship with the head of the family	Age	Sex	Educational status	Occupation status			
						Main	Subsi	Main	Subsi

9.(i). Educational status of the father :

(ii). Educational status of the mother :

10. Per capita income of the family :

11. Monthly expenditure pattern

Sl. No.	Items	Average expenditure / month (Rs)						
		0	1-100	100-500	500-1000	1000-1500	1500-2000	> 2000
1	Food							
2	Clothing							
3	Housing							
4	Education							
5	Health							
6	Travelling							
7	Recreating							
8	Fuel							
9	Water							
10	Electricity							
11	Gifts							
12	Festivals / special occasion							
13	Savings							

B. Schedule to collect information on the exposure to information sources of respondents

I.

1. Do you own a radio ? Yes / No
2. Do you hear radio ? Yes / No
3. Do you listen programmes related to health and hygiene

Always / occasional / never

II.

1. Do your family posses T.V ? Yes / No
2. Do you see TV programmes ? Yes / No
3. Do you see the programmes related to health and hygiene ?

Always / occasional / never

III.

1. Do your family subscribe Newspaper ? Yes / No
2. Do you read newspaper ? Yes / No
3. Do you read article related to health and hygiene ?

Always/Occassional/ Never

IV.

1. Do your family subscribe health magazines ? Yes / No
2. Do you read health magazine ? Always/Occasional/Never

V. Contact with extension agency

A. Formal sources

1. Extension officers in women welfare ☐
2. Health workers ☐
3. Anganwadi workers ☐
4. ICDS supervisors ☐
5. Others ☐

B. Informal sources

1. Neighbours ☐
2. Friends ☐
3. Relatives ☐
4. Ayal Koottam ☐
5. Youth club ☐
6. Mahila Mandals ☐
7. Others ☐

C. Schedule to collect the details about the availability of basic facilities and amenities at home

1. Types of house Kutcha / Pucca ☐
2. Do you have proper ventilation facility in your house ☐
3. Do you have facilities for defecation/urination, If yes, specify ☐
4. How do you dispose your household waste ? ☐
5. Source of drinking water in your home ? ☐
6. Source of water for washing/bathing ? ☐
7. Do you have drainage facility in your house. If yes, how do you dispose waste from the house ? ☐
8. Is there the presence of stagnant pool of water around your house ? ☐
9. Is there the presence of more number of mosquitoes in your home ? If yes, what type of measure do you adopt to control it ? ☐
10. Do you have electrical facility in your houses ☐

D. Schedule to collect the informations regarding health profile and personal hygiene of the respondents

I.

1. Do you take bath every day ? ☐
2. If no, how often do you take bath, why ? ☐
3. Specify ? ☐
4. Do you use soap to clear your body ? ☐

II.

1. Do you wash your teeth daily ? ☐
2. If no, when do you clean your teeth ? ☐
3. How much time you wash your teeth ? ☐

III.

1. Do you clean your hair daily ? ☐
2. Using soap or other specify ? ☐

IV.

1. Do you take any care of feet ? ☐
2. Do you use any foot wears ? ☐

V.

1. Do you clean your nose, ears and eye ? ☐
2. If no, ☐
3. Why ? ☐

VI.

1. Do you wash your cloth regularly ? ☐
2. Do you change your undergarmets regularly ? ☐
3. Do you wash your hands before taking foods ? ☐

VII.

1. Do you take exercise regularly ? ☐
2. If no, specify ? ☐

VIII.

1. Do you drink enough water daily ? ☐
2. If yes, how much ? ☐
3. How many times ? ☐
4. (1-3 glass / 3-5 glass/5-7 glass/ more than 7 glass) ☐

IX.

1. Do you cut your nails ? ☐
2. If no, specify ? ☐

X.

1. Do you take enough rest and sleep ? ☐
2. If no. ☐
3. Why ? ☐

XI.

1. Do you wash your hands with soap after defecation ? ☐
2. Do you wash your vajina with soap during menstruation ? ☐
3. Do you wash your hand after changing the napkins ? ☐

APPENDIX – II

KERALA AGRICULTURAL UNIVERSITY

College of Agriculture, Vellayani

Department of Home Science

Name of Investigator :

Name of Subject :

"Effectiveness of information education and communication materials on health and nutritional practices of adolescent girls".

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

I. Food habit of the family : Vegetarian / Non-vegetarian

II. Monthly Expenditure on food

Sl. No.	Foot items		Expenditure / month		
1	Cereals	1.2			
2	Pulses	2.1			
3	Green leafy vegetables	3.1			
4	Other vegetables	4.1			
5	Roots and tubers	5.1			
6	Fruits	6.1			
7	Nuts and oil seeds	7.1			
8	Milk and milk products	8.1			
9	Fats and oil	9.1			
10	Sugar and jaggery	10.1			
11	Animal foods	11.1			
12	Beverages	12.1			
13	Spices and condiments	13.1			
14	Processed foods	14.1			

I. Daily meal pattern of the family

a. Break fast
b. Lunch
c. Evening tea
d. Dinner

IV. Frequency of using different food items

Sl. No	Food item	Daily	More than twice in a week	Twice in a week	Once in a week	Fort-nightly	Once in a month	Occasi-onally
1	Cereal							
2	Blackgram							
3	Bengal gram							
4	Green gram							
5	Dhal							
6	Horse gram							
7	Green leafy veg.							
8	Other vegetables							
9	Potato							
10	Onion							
11	Carrot							
12	Chilly							
13	Ginger							
14	Turmeric							
15	Mustard							
16	Fruits							
17	Milk, egg							
18	Mean							
19	Fish							
20	Dry fish							

APPENDIX II Continued

ONE-DAY WEIGHMENT METHOD

(Individual food consumption pattern)

Name of Investigator.:

Name of the meal	Menu	Weight of a total raw ingredient used by the family	Weight of total cooked food consumed by the family	Amount of cooked food consumed by the family	Raw equivalents used by the individual
1	2	3	4	5	6
Breakfast					
Lunch					
Tea time					
Dinner					
Others					

Nibbling habit

Skipping meals

APPENDIX – III

KERALA AGRICULTURAL UNIVERSITY
College of Agriculture, Vellayani
Department of Home Science

Name of the student :
Age :
Standard :

"Effectiveness of information education and communication materials on health and nutritional practices of adolescent girls".

Schedule to collect the information regarding the nutritional assessment of the respondents

a. Anthropometry

1. Weight
2. Height
3. BMI

b. Clinical examination

Sl. No.		Respondents				
1	Parotid enlargement	I	II	III	IV	V
2	Oedema					
3	Emaciation					
4	Marasmus					
5	Conjunctival xerosis					
6	Bitot's spots					
7	Corneal xerosis / Keratomalacia					
8	Night blindness					
9	Photophohia					
10	Anaemia					
11	Tongue-red and raw					
12	Atropic lingcial 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 dyssebacea					

APPENDIX IV

HAEMOGLOBIN – CYANMETHAEMOGLOBIN METHOD

Principle

Haemoglobin is converted into cyanmethaemoglobin by the addition f KCN and ferricyanide. The colour of cyanmethaemoglobin is read in a photoelectric calorimeter at 540 nm against a standard solution. Since cyanide has the maximum affinity for haemoglobin, this method estimates the total haemoglobin.

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

20 ml of blood is transferred with the help of a haemoglobin pipette on to a Whatman No.1 filter paper disc. The filter paper is air dried, labelled and can be stored upto one week. The portion of filter paper containing the blood is cut and dipped of filter paper containing the blood is cut and dipped in 5 ml of drabkin solution and taken in a test tube. Wait for 30 minutes and mix the content in the tubes, take the readings in a photoelectric colorimeter. The reagent blank (Drabkin's solution) is adjusted to zero.

APPENDIX V

KERALA AGRICULTURAL UNIVERSITY
College of Agriculture, Vellayani

Department of Home Science

Formulae for making food use frequency Table

Score = $R_1S_1 + R_2S_2$.....+ RnSn

Where,

Sn = scale of rating

Rn = percentage of respondents selecting a rating

N = Maximum scale rating

APPENDIX VI

KERALA AGRICULTURAL UNIVERSITY
College of Agriculture, Vellayani

Department of Home Science

"Effectiveness of information education and communication materials on health and nutritional practices of adolescent girls".

Statements to test the knowledge on health and nutritional practices

	SUBJECT 1 **Importance of nutritious food**	Pre-test	Post-test	Retention
1	Health in adolescence is the basement of future health			
2	Any food that can be included in adolescent diet			
3	Adolescent need more nutritious foods then adult			
4	All type of food can be consumed instead of one type			
5	Anaemia is the non deficiency disease seen in the adolescent girls			
6	Iron is the most essential nutrient for adolescent girl			
7	Adolescent girls need not take on iron folate tablets supplied from PHC			
8	Parents should take more care of adolescent health			
9	Adolescent should take fast-food regularly			

10	Adolescent is more like to eat chocolates, ice creams and bakery items.			
11	Adolescents should take 5-8 glasses of water daily			
12	Adolescents need not take leafy vegetables			
13	Dieting is not good for the adolescents			
14	When menstruation period started, adolescent girls should take iron rich foods			
15	Heavy food is needed for the adolescents			
16	Carrot, papaya and pumpkin are better for good vision			
17	Fishes are rich sources of vitamin and minerals			
18	Sugar and jaggary are rich in calorie			
	SUBJECTS 2 **Body changes in adolescent period**			
1	Adolescence is the period of life between childhood and the full development of the frame			
2	In boys, puberty start with the production of male hormone in testes			
3	In girls, puberty start with the production of female hormone in ovary			
4	Adolescent growth is a usual process			
5	Puberty start in each individual in different period			
6	Three hormones are produced during adolescent period			

7	During adolescents, changes occur due to androgen			
8	Height which is the first sign seen in adolescent			
9	Breast development and hair growth are not the only signs of adolescent growth			
10	Vaginal discharge is another sign of adolescent growth			
11	Female hormone is not the cause of body growth which accelerates and prepares for mother hood			
12	Menstruation is the most important natural changes in girls			
13	Menstruation is not a disease			
14	Use clean sanitary napkins during menstruation			
15	Menstruation occurs one in every 28 days			
16	Mental and emotional development seen in adolescent are not the part of growth			
	SUBJECT 3 **Health care**			
1	During adolescent growth occur both in boys and girls			
2	Heathcare is very essential during adolescents			
3	Vitamin A is essential for the proper functioning of eyes			
4	Vitamin A in food has no role in the care of skin			
5	Vegetables and fruits are rich in vitamins			
6	Improper cleanliness of teeth and gum is			

	the important signs of pyorrhea.			
7	The food we eat cause bacterial growth in teeth			
8	In adolescents health care and cleaniness are very essential during reproductive health			
9	Excess intake of water leads to excess bleeding during menstruation			
10	Excess bleeding in menstruation leads to anaemia in girls			
11	After defecation and urination wash from front to back			
12	Blood loss is excess during menstruation			
13	During menstruation bath atleast two times a day			
14	We should purchase neat and clean napkin from market			
15	Adolescence use tight undergarments			
16	Reproductive organ is washed only when bathing			
	SUBJECT : 4 **Reproductive health and hygiene**			
1	Reproductive health is the health care of reproductive organ			
2	Once a girl attain her first menstrual cycle she is matured and grown up			
3	Sex education should not be introduced in schools			
4	Influence of media develops sexual urge in adolescents			

5	RCH is the knowledge of reproductive organ			
6	Reproductive health is more in slim girls			
7	Nocturnal emission and masturbation causes fatigue			
8	Leucorrhoea is not a disease seen in girls			
9	Pregnancy occurs only after menstruation			
10	Girls who has got menstruation are impure			
11	Girls conceive only after the beginning of menstrual cycle			
12	Sodomy is a homosexuality			
13	Healthy reproductive habit is good for a better future			
14	AIDS is a curable disease			
15	Giving shake hand spreads HIV positive			

APPENDIX VII

KERALA AGRICULTURAL UNIVERSITY
College of Agriculture, Vellayani

Department of Home Science

"Effectiveness of information education and communication materials on health and nutritional practices of adolescent girls".

Checklist to test the knowledge adoption level

Sl. No.	Statements	Pre test	Post test
1	Any food that can be included in the adolescent girl		
2	All type of food can be consumed instead of one type		
3	Dieting is not good for the adolescents		
4	When menstruation period started, adolescent girls need to take iron rich foods		
5	Include calcium rich food in daily life		
6	Sea foods are good for the health because it contains iodine		
7	Adolescents should take 5-8 glasses of water daily		
8	Adolescents take leafy vegetables		
9	Adolescent should not take fast food regularly		
10	Adolescent growth is a usual process		
11	Puberty start in each individual in different period		
12	During adolescents, changes occur due to androgen		
13	Menstruation is the most important neutral change in girls		
14	Girls use clean sanitary napkins during menstruation		

15	Mental and emotional development seen in adolescents are not the part of growth		
16	Healthcare is very essential during adolescents.		
17	Vitamin K rich foods is essential for the proper functioning of eyes		
18	Include green leafy vegetable and yellow fruits and vegetables		
19	Wash face with hot water and cold water alternately for removing pimples		
20	After defecation and urination wash from front to back		
21	We can make low cost napkin with cotton and gauze		
22	Reproductive health is the health care of reproductive organ		
23	Sex education should not be introduced in schools		
24	Influence of media develops sexual urge in adolescents		
25	Smoking is not good for maintaining health during adolescence		

APPENDIX VIII

Microsample (20)

Weight for age profile

Sl. No.	Age	Standard weight	APL families	BPL families
			Observed weight	
1	14	46.7	41	46
2	14	46.7	43	40
3	14	46.7	59	38
4	14	46.7	34	42
5	14	46.7	37	45
6	13	44.4	25	36
7	14	46.7	40	40
8	14	46.7	42	46
9	14	46.7	43	43
10	14	46.7	41	40

Height for age profile

Sl. No.	Age	Standard height	APL families	BPL families
			Observed height	
1	14	155.1	160	160
2	14	155.1	152	158
3	14	155.1	153	148
4	14	155.1	150	154
5	14	155.1	150	142
6	13	153.0	140	145
7	14	155.1	163	152
8	14	155.1	161	154
9	14	155.1	152	156
10	14	155.1	156	154

APPENDIX IX
Nutritional status index of adolescent girls

Sl. No.	Age	Above poverty line					Below poverty line				
		Wt (kg)	Ht (cm)	BMI	Hb level	Nutritional status	Wt (kg)	Ht (cm)	BMI	Hb level	Nutritional status
1	14	41	160	16.1	13.00	21.6	46	160	17.9	11.61	20.6
2	14	43	152	18.2	12.10	20.8	40	158	16.1	11.82	20.3
3	14	59	153	25.2	12.60	22.9	38	148	17.3	9.80	18.0
4	14	34	150	15.1	13.00	21.0	42	154	17.7	10.10	18.7
5	14	37	150	16.4	11.80	20.0	45	142	22.3	13.00	22.2
6	13	25	140	12.7	11.60	18.6	36	145	17.1	12.10	20.3
7	14	40	163	15.1	12.91	21.4	40	152	17.3	12.59	21.1
8	14	42	161	16.2	10.89	19.5	46	154	19.3	10.92	19.9
9	14	43	152	18.2	12.80	21.6	43	156	17.6	11.62	20.4
10	14	41	156	16.8	10.76	19.3	40	154	16.8	10.59	19.0

APPENDIX X

FORMULATED IEC MATERIALS

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 No.2

NUTRIENTS AND ITS IMPORTANCE

Nutrients	*Important functions*	*Source*	*Deficiency*
Vitamins			
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*	*Bitot's spot, 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 polishing*	*Weakness pernicious anaemia, burning at the angles of mouth, burning tongue, irritability, growth retarded*
C	*Formation of collagen, essential for rapid healing of wounds, formation of connective tissues*	*Citrus fruits, orange, pineapple, ripe mango, papaya, cashew fruits, tomato, amla or Indian gooseberry*	*Scurvy, fatigue, weakness, irritability, frequent infection*

Calcium	*Ossification of bones, formation of bone and teeth, nerve impulse transmission*	*Milk and milk products, ragi, egg, small fish all vegetables*	*Tetany, irritation, confusion, pain, involuntary muscles spasm, bronchial spasm, loss of hair and nails, roughness of the skin*
Phosphorus	*Calcification of bones*	*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, cretism, impaired mental function, retarded physical development*

Poster II

IMMUNIZATION

Vaccine	Age
Typhoid vaccine	TA, Vi or oral Typhoid vaccine every 3 to 5 years
Hepatitis B Vaccine	3 doses (0, 1 and 6 m) if not given earlier
Hepatitis A Vaccine	2 doses (0 and 6 m) if not given earlier
Tatanus Toxoid	Booster at 10 and 16 years
MMR Vaccine	1 dose if not given earlier
Rubella Vaccine	As part of MMR Vaccine or 1 dose of girls at 12 to 13 years of age
Vericella Vaccine	1 dose below 13 years of age 2 doses 13 years of age and avoe

LEAFLETS DISTRIBUTED DURING EXHIBITION

Leaflet 1.

കുടംബ ജീവിത വിദ്യാഭ്യാസം

കൗമാര പ്രായത്തിൽ

- കൗമാരപ്രായത്തിന്റെ പ്രാധാന്യം
- പോഷകാഹാരത്തിന്റെ പ്രാധാന്യം
- വ്യക്തിശുചിത്വം, ആർത്തവശുചിത്വം
- വ്യക്തിത്വ വികസനം, കൗൺസിലിംഗ്
- പറ്റില്ല എന്ന് പറയാനുള്ള ശീലം

ഹോം സയൻസ് ഡിപ്പാർട്ട്മെന്റ്

വെള്ളയാണി

Leaflet 2.

കൗമാരപ്രായക്കാരും പോഷകാഹാരവും

- കൗമാരപ്രായത്തിൽ ഡയറ്റിംഗ്
- അഭികാമ്യമായ തൂക്കവും പൊക്കവും
- പ്രഭാത ഭക്ഷണത്തിന്റെ പ്രാധാന്യം
- കൗമാര പ്രായവും ഫാസ്റ്റ് ഫുഡും
- വിളർച്ച രോഗം
- കൗമാര പ്രായത്തിലെ തൊണ്ടമുഴ

KERALA AGRICULTURAL UNIVERSITY

ഹോം സയൻസ് ഡിപ്പാർട്ട്മെന്റ്

വെള്ളയാണി