DETERMINANTS OF DIETARY PROFILE OF HIGHER SECONDARY SCHOOL CHILDREN

KRISHNA ROOPA

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Department of Home Science
COLLEGE OF AGRICULTURE
VELLAYANI, THIRUVANANTHAPURAM-695522

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KRISHNA ROOPA

**Thesis submitted in partial fulfilment of the requirement
for the degree of**

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**Department of Home Science
COLLEGE OF AGRICULTURE
VELLAYANI, THIRUVANANTHAPURAM-695522**

DECLARATION

I hereby declare that this thesis entitled "**Determinants of dietary profile of higher secondary school children**" 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 of any degree, diploma, associateship, fellowship or other similar title, of any other university or society.

Vellayani,
08-10-2003.

KRISHNA ROOPA
(2001-16-05)

CERTIFICATE

Certified that this thesis entitled "**Determinants of dietary profile of higher secondary school children**" is a record of research work done independently by Ms. Krishna Roopa (2001-16-05) 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.

Vellayani,
09-10-2003.

Dr. S. Syamakumari
(Chairman, Advisory Committee)
Associate Professor
Department of Home Science
College of Agriculture, Vellayani
Thiruvananthapuram

Approved by

Chairperson :

Dr. S. SYAMAKUMARI
Associate Professor,
Department of Home Science,
College of Agriculture, Vellayani,
Thiruvananthapuram-695522.

Members:

Mrs. N.K. VIMALAKUMARI
Associate Professor and Head,
Department of Home Science,
College of Agriculture, Vellayani,
Thiruvananthapuram-695522.

Smt. S. SUBAIDABEEVI
Assistant Professor (Sel. Gr.),
Department of Home Science,
College of Agriculture, Vellayani,
Thiruvananthapuram-695522.

Dr. N.P. KUMARI SUSHAMA
Associate Professor,
Department of Agricultural Extension,
College of Agriculture, Vellayani,
Thiruvananthapuram-695522.

External Examiner :

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Krishna Roopa
(2001-16-05)

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Introduction

1. INTRODUCTION

An adolescent is defined by World Health Organisation (WHO) as a person between 10-19 years of age (Riedner, 2001). The term adolescence comes from the Latin word 'adolescere' meaning 'to grow' or 'to grow to maturity'. The term includes mental, emotional, social maturity as well as physical maturity and it is customary to regard adolescence as beginning when children become sexually mature and ending when they reach the age of legal maturity (Hurlock, 1986). Psychologically adolescence is the age when the individual becomes integrated into the society of adults, the age when child no longer feels that he is below the level of his elder but equal in rights (Piaget, 1969).

Adolescence is one of the fascinating periods in the human life that marks transition from being a dependent child to an independent adult. It is a period during which manifold changes takes place in their physical structure, physiological and endocrine functioning, pattern of thinking, attitude towards concepts and in their moral standards and values.

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

Future of every society depends upon the physical and mental health of its growing children and adolescents who become adults of tomorrow. According to Population Projection for India and States, 1996-2016, the

age group10 − 19 years constitute 21.16 per cent of the total population in Kerala (Gopakumar, 2002). Adolescents of 15 − 19 years constitute about 115 crores 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). But adolescence is also a stage characterised by lots of turmoil, a vulnerable period with physical, psychological and emotional instability, a period of more food inadequacy and health and nutritional disorders than any other periods in life (Soman, 2001).

Besides, this is a period of nutritional stress and consequently energy balance during this period is very important. It has been proved long back itself that all the physical and psychological changes impose a great demand on nutritional requirement during adolescence and so their nutritional requirements are much greater than any other groups (Mc Nutt and Mc Nutt, 1978).

Moreover, adolescence being the final phase of growth in life provides a unique opportunity to compensate nutritional deficiencies or growth retardation that may have occurred during the early years of development. However, studies point out that the life risks during adolescence is almost twice as great as during pre-adolescence and mortality rate is rather high except in infancy and preschool age (Mohanty and Mohanty, 1997). But very little attention was given to this group as such until recently.

Despite the transitional and crucial nature of this phase of life with accelerated needs in all areas, adolescents have rarely been considered in our country as a distinct group with special needs apart from those of children and adults. Eventhough poor food habits and ignorance of special needs of adolescence mark the major causes of adolescent morbidity and poor achievement, very little is being done at present in educational institutions or other welfare programmes to ensure adequate

nutrition of the group particularly for 15-19 years. As a result this group continues to be exposed to various risks and is challenged by the specificity or gravity of this situation. It is already proved that optimum care and guidance provided during this period could help adolescents to develop to their optimum potential.

Moreover, within the typical gender stratified social structures in India, adolescent girls are especially disadvantaged. They are trapped in a vicious cycle of poor nutrition, excessive burden of work, early marriage, childbirth as well as high maternal mortality and morbidity. In terms of food intake, access to health care and growth pattern, they are worse off than their mothers (Gupta and Monica, 1997). Sharma *et al*. (2000) reported that in Indian households preferences were given to husbands and elders in the families and women and girls were given least priority in the allocation of food irrespective of land holding. Among most of the societies of this country boys and male members are preferred more than female members. These female children receive less nutrition both quantitatively and qualitatively leading to nutritional problems, health hazards and increased susceptibility to infectious diseases.

In addition to this, negative academic and psychosocial out comes are also associated with family level food insufficiency. Food insufficient children and teenagers are more likely to have been suspended from schools and have more difficulty in getting along with others.

Not only poverty and gender discrimination but adolescent dietary pattern, preferences and attitude too have an equally important role in the health and nutritional status. As revealed in many studies adolescents have varied preferences and dietary habits when compared to other age groups.

Today adolescents lead a hectic life full of excitements and without any rest due to modern life style, tuition, coaching class, extra curricular activities and other engagements. It is a period when individuals are

expected to take decisions about the future line of work and to strive for achieving their academic and professional goals.

The adolescents have no time to rest, eat or relax physically or psychologically. The adolescents of higher secondary schools are out of schooling but not entered the college and so are considered neither as children nor as adults, which adds to the turmoil. The intermediate years of higher secondary school students between school and college is the period when adolescents are taxed more than any other years in their whole life. These usually withhold them from taking family meals and encourage skipping of meals and to depend on snacks and soft drinks. Many of them skip breakfast and lunch and most of them take only dinner. Also this is a crucial phase of growth, the late adolescence that offers the last chance for the catch up growth in the life cycle of an individual. Hence it is useful if the study is focused on this group of adolescents, the higher secondary school students and on their diet and nutritional status.

Thus it is certain that adolescence is one of the most vulnerable periods of life with various health risks. Life style variations expose adolescents to different health promoting and health damaging behaviour. Adolescence is a period of high nutritional risks when increased demand for nutrients is often met with poor choices of food, unhealthy eating habits and deficient intake of calories, protein, vitamins and minerals. The wrong food choices made by adolescents negatively influence their growth and development, their future reproductive capacities and health of their children. In addition to this they are also susceptible to infection, skin disorders and problems of excessive dieting.

It is very clear that many factors determine the physical and psychological health of adolescents. Health and nutrition of adolescents have a major contribution in their general efficiency and well being.

In this context an attempt to understand the dietary profile of the adolescents and the determinants, which are most likely to affect their

physiological and psychological health is relevant. Kerala is a state where overburdened adolescents and over anxious parents exist who give undue importance to academic achievements and success in examinations of the adolescents but at the same time neglected the diet and accompanying health risks of these adolescents. A scientific probe in this area is worthwhile both to parents and adolescents. Besides, a systematic appraisal of the present dietary situation will help to reinforce the effectiveness of the rehabilitating and supplementary measures already initiated for adolescents and also to develop new ones, which will help to improve the quality of life of adolescents. Investing into adolescent health is a cost effective way to improve the health and wealth of a nation. Hence the present study is attempted with the major objective, 'to assess the dietary profile of higher secondary school children and to ascertain the influence of selected factors such as social and domestic condition (environment), knowledge, work load, dietary attitude and preferences, gender specific adjustments and psycho-social profile'. The main objective set forth is subdivided into specific objectives to make a more detailed empirical investigation possible. The specific objectives set forth for the study are:

i.   to assess the nutritional and health status of adolescent boys and girls from urban and rural areas

ii. to understand the food consumption pattern, food preferences and dietary adequacy of adolescent boys and girls

iii. to study the adolescents' knowledge and attitude towards nutrition, health and food and its relationship with dietary profile of adolescent boys and girls

iv. to find out the psycho-social adjustments of adolescent boys and girls and the relationship with dietary profile

v.   to understand the influence of socio-demographic features, sex and region on dietary profile of adolescent boys and girls

vi.   to investigate the work load, energy intake, energy expenditure and time utilization pattern of adolescent boys and girls

vii.   to estimate the energy balance of adolescent boys and girls

viii.   to ascertain the influence of selected determinants on dietary profile of adolescent boys and girls

ix.   to find out the association among and between the selected variables and with dietary profile

Review of Literature

2. REVIEW OF LITERATURE

The present investigation is carried out with a view to understand the adolescent's dietary profile and to probe into the determinants leading to this. A brief review of the related literature is attempted here. The review is classified into different sections for clearer perception. The different sections under which review is presented are.

2.1 Adolescent – definition and major characteristics

2.2 Importance of adolescents

2.3 Adolescent nutritional needs and requirements

2.4 Assessment of nutritional status

2.5 Nutritional problem and related health risks

2.6 Determinants of dietary profile

2.1 ADOLESCENT – DEFINITION AND MAJOR CHARACTERISTICS

Who is an adolescent ?

"Not yet old enough for a man.

Nor young enough for a boy"

(William Shakespeare)

The term adolescence means 'to grow into maturity' or 'to emerge' or 'to achieve identity'. A boy or a girl enters adolescence after undergoing metamorphic changes in all areas of development as an independent mature individual ready to begin adulthood. WHO defines adolescent as a person between 10-19 years of age (Riedner, 2001).

Adolescence is a time of major changes in person's life in the areas of physical, intellectual, emotional and social growth. So it is also a time of amazing nutritional needs. Adolescence is the phase that comes during

the second decade of human life (10-19 years). This is a period of rapid growth when young people acquire new capacities and physical changes with many new characteristics that create not only opportunity for their progress but also creates problems to their health and well being.

Adolescence is divided into three stages – early, middle and late. Early adolescence includes the onset of puberty and usually occurs by the age of 10-12 years in girls and 11-13 years in boys. Middle adolescence continues through the age of 12-15 years in girls and 13-16 years in boys. Late adolescence continues through the age of 16-21 years in both sexes (Mahan and Rees, 1984). Based on growth characteristics adolescence are arbitrarily divided into different stages, which include pre-adolescence (10-11 years), early adolescence (11-14 years) mid adolescence (14-16 years) and late adolescence (17-20 years) (Jayanthini, 2000). Adolescence is a period of time during which the child desperately try to reach adulthood. The child grows physically, mentally, socially and emotionally and these changes lead to maturity in all these areas (Bhattacharya, 1985). This stage, adolescence (10-20 years of age) in human life is considered as a bridging period from childhood to adulthood. During this period biological, cognitive, moral and social development occur (Ajit and Thomas, 2000). This is a transition period and growth during adolescence is an important determinant of adult body size. Almost 25 per cent of adult status is achieved during this period (Elizabeth, 2000).

Infact, adolescence is a particularly unique period in life because it is a time of intense physical, psychosocial and cognitive development. Increased nutritional needs at this juncture related to the fact that adolescents gain up to 50 per cent of their adult weight, more than 20 per cent of their adult height and 50 per cent of their skeletal mass during this period.

Bezbaruah (2003) pointed out rightly when he said that not quite children, not yet adult, adolescents dominate the Indian cityscape: 250

million are between 10 and 19 years of age. Never before have there been so many teenagers in India. Statistical data reveals adolescence aged 10-19 years account for more than $1/5^{th}$ of the world population. In India, this age group form 21.40 per cent of the total population. In Kerala, percentage of adolescent population between 15-19 years of age is about 8.25 per cent and 8.70 per cent for males and females respectively (Chandrika, 2001). The world's adolescent population is 1200 million persons. About 19 per cent of the total adolescent population faces a series of serious nutritional challenges not only affecting their growth and development but also their livelihood as adults. The adolescents yet remain as largely neglected, not much studied and hard to reach population.

2.2 IMPORTANCE OF ADOLESCENTS

Why adolescence is considered as an important period?

As mentioned earlier, adolescence is a period critically in need of appropriate nutrition to meet the accelerated growth spurt. However, this is also a period which is most likely to have more food inadequacy and health and nutritional disorder than any other period due to their improper dietary habits, specific dietary preferences, social influences, excess work load, and their psycho social needs bringing with it immediate and long term health risks (CHETNA Report, 1998).

Adolescence is considered as one of the most important milestones in the life of an individual as :

   i. It is the most crucial stage of human life with lots of social and parental pressure and personal turmoil

   ii. It is a vulnerable period with physical, psychological and emotional instability

iii. It is a period of more food inadequacy and health and nutritional disorders than any other period due to the considerable changes taking place in them.

Adolescents are very much confused and bewildered due to the tremendous physical and mental changes taking place in them at an accelerated phase. In addition to this is the burden and confusion due to the social and academic pressure bestowed on them by the fast changing life style of today.

2.3 ADOLESCENTS NUTRITIONAL NEEDS AND REQUIREMENTS

It is observed that adolescent boys and girls face many problems related to nutrition. There is great physical need for food, in order to provide for rapid skeletal and muscle growth. Both boys and girls are maturing and facing psychological and social pressures that affect their emotional development. It is a period of transition to adult life. These changes call for vigor, stamina and a wholesome outlook on life, qualities that are best achieved with good nutritional health.

During this period of growth and development along with the tremendous physical activities their calorie, protein, vitamin and mineral intake are increased (Agarwal, 2002). It has been observed that the extra nutritional demands of pregnancy comes at the heels of the adolescent growth spurt, which itself requires additional nutritional inputs, and results in the poor nutritional status of pregnant adolescent (Ramachandran, 1989). Appropriate diet during early years of life may reduce the risk of diet related chronic diseases in later life (NIN, 1999). According to Delange (1994) poor nutritional status will lead to poor educational attainment and decreased economic productivity.

2.3.1 Recommended Nutritional and Dietary Requirement of an Adolescent

The nutritional requirement and quantity of food recommended by ICMR (1989) for age group 10-18 years are given in Table 1 and Table 2.

Table 1 Recommended dietary allowances for an adolescent

Age in years	10-12		13-15		16-18	
Nutrients	Boy	Girl	Boy	Girl	Boy	Girl
Energy (kcal)	2190	1970	2450	2060	2640	2060
Protein (g)	54	57	70	65	78	63
Fat (g)	22	22	22	22	22	22
Calcium (mg)	600	600	600	600	500	500
Iron (mg)	34	19	41	28	50	30
Retinol (μg)	600	600	600	600	600	600
β-carotene (μg)	2400	2400	2400	2400	2400	2400
Thiamine (mg)	1.1	1.0	1.2	1.0	1.3	1.0
Riboflavin (mg)	1.3	1.2	1.5	1.2	1.6	1.2
Niacin (mg)	15	13	16	14	17	1.4
Pyridoxin (mg)	1.6	1.6	2.0	2.0	2.0	2.0
Ascorbic acid (mg)	40	40	40	40	40	40
Folic acid (μg)	70	70	100	100	100	100
Vitamin B_{12} (μg)	0.2-1.0	0.2-1.0	0.2-1.0	0.2-1.0	0.2-1.0	0.2-1.0

(ICMR, 1989)

The quantity of food requirement for normal adolescent boys and girls in India recommended by ICMR (1989) is given next.

Table 2. Balanced diet for an adolescent

Food groups (g)	Boys		Girls	
	Vegetarian	Non-Vegetarian	Vegetarian	Non-Vegetarian
Cereals	420	420	320	320
Pulses	70	50	70	50
Green leafy vegetables	100	100	150	150
Other vegetables	175	175	150	150
Fruits	100	100	100	100
Milk	600	400	600	400
Meat, fish and egg	-	80	-	80
Sugar and jaggery	30	30	30	30
Fats and oils	40	40	30	30

(ICMR, 1989)

As it is a period during which final growth spurt occurs, many body changes take place due to the influence of hormones. The growth spurt signalling the onset of puberty depends on the child's attaining critical body composition of 10.00 per cent of body fat. However, 22.00 per cent of body fat is required to maintain regular ovulation. Adolescents attain their adult stature between 18-20 years of age but bone mass continues to increase up to the age of 25. The profound growth of adolescents leads to increased demand for energy, protein, minerals and vitamin.

Caloric needs increase with the metabolic demands of growth and energy expenditure. Protein intake meets growth needs and for the pubertal changes in both sexes and for developing muscle mass in boys. Calcium and iron are needed during adolescence as calcium is needed for bone growth and iron for haemoglobin synthesis, for expansion of blood volume and for myoglobin needed for muscle growth. The need for thiamine, riboflavin and niacin increases directly with increased caloric intake. Skeletal growth requires vitamin D while the structural and functional integrity of newly formed cells depend on the availability of vitamin A, C and E (Srilakshmi, 2002).

2.4 ASSESSMENT OF NUTRITIONAL STATUS

Kamath (1986) defined nutritional status as a state of health enjoyed as a result of nutrition. Nutritional assessment is the process whereby the state of nutritional health of an individual or group is determined. ICMR (1992) emphasized that in order to assess nutritional status heavy reliance must be placed on measurement of external morphology of body. Anthropometry has been accepted as one of the important tools for the assessment of nutritional status of a population and to monitor the growth and health of individual (Gorstein *et al*., 1994). According to WHO (1995) stunting in adolescence is considered as an indication of past under nutrition and is cumulative indication of nutritional status. The standard height and weight for adolescent boys and girls of 9 to 18 years are given by NCHS (Table 5).

Table 3. Standard height and weight of adolescents (9 – 18 years)

Age in years		9	10	11	12	13	14	15	16	17	18
Height (cm)	Boy	132.2	137.5	143.3	149.7	156.5	163.1	169.0	173.5	176.2	176.8
	Girl	132.2	138.3	144.8	151.5	157.1	160.4	161.8	162.4	163.1	163.7
Weight (kg)	Boy	28.10	31.40	35.30	39.80	45.00	50.80	56.70	62.10	66.30	68.90
	Girl	28.50	32.50	37.00	41.00	46.10	50.30	53.10	55.90	56.70	56.60

(NCHS, 1990)

According to Bamji (1998) biochemical test conducted on easily accessible body fluids such as blood and urine, can help to diagnose disease at the subclinical stage and confirm clinical diagnosis at the disease stage – clinical signs and symptoms being often non-specific. According to Swaminathan (1993) clinical examination is the most important part of nutritional assessment as one gets direct information of the signs and symptoms of dietary deficiency prevalent among the people.

2.5 NUTRITIONAL PROBLEMS AND RELATED HEALTH RISKS

Adolescence is one of the vulnerable periods of life with various nutritional problems and health risks. Asha and Suryakanta (1992) reported that the weight for height of adolescents in India were less than standard value. Mony's (1993) study in Thiruvananthapuram district on the anthropometric measurements of adolescents in the age group 16-18 years indicated that weight for age and height for age of adolescent boys and girls were below the NCHS standard as well as Indian standards. Kurz and Johnson (1994) reported stunting during adolescents in developing countries. Nedberg (1990) conducted several studies and demonstrated inferior anthropometric status and higher mortality among girls than among boys in South Asia.

A study conducted in Bangalore on 400 adolescents revealed that majority of the respondents was moderately anaemic with mean haemoglobin ranging from 10-11.9 g/dl (Devi and Nath, 2003). According to Chaudary and Garg (2003), the haemoglobin levels, calorie and protein intake of adolescents in India were found to be below RDA and their height and weight were below NCHS standard. Anaemia is the most wide spread nutrient deficiency disorder among young children and women of reproductive age (Nair, 1999) with less extent among adult man (Rao, 1999). During adolescence, the risk of iron deficiency anaemia appears for both boys and girls and it remains as such during their reproductive life (Gawarikar *et al*., 2002). Iron deficiency anaemia is a major global nutritional problem and is prevalent in 50-80 per cent of population in different parts of India (Vijayalekshmi, 2002). The study done in 300 schoolgirls of Bikaner City by Khatri (2003) revealed that 70 per cent of them were anaemic. A recent study done in Shanghai showed iron deficiency anaemia among 9.48 per cent and 49.80 per cent of 7-17 years children and adolescents respectively (Sun *et al*., 2003). Current status of prevalence of anaemia among the pregnant women is 75 per cent and that of non-pregnant women is 67 per cent. Overall the national prevalence of anaemia among women is 68 per cent (Joshi *et al*., 2003). Adolescents girls are at higher risk of anaemia than boys due to iron loss during menstruation, rapid growth rate, lower than recommended calorie intake and severe dieting (Niemann *et al*., 1990). Two billion people suffer from anaemia due to iron deficiency (WHO, 1991).

Low calcium intake can result in decreased peak bone mass in adulthood and increase the risk for development of osteoporosis in later life (Bonjour *et al*., 1991). The risk factors of osteoporosis in adolescents include diet, tobacco use, lack of exercise, low sunlight exposure and anorexia nervosa (Paul, 2002). Caries in adolescent is a result of nutritional deficiencies as well as the result of micro organic bacteria, general hygiene and family history.

Goitre grade I or more was seen in 28.3 per cent subjects while dental caries in 37.20 per cent and vitamin A and B deficiency in 2.30 per cent and 7.30 per cent of the subjects respectively (Kapoor and Mehra, 2003). Tiwari (1998) defined IDD as the disorders caused due to deficiency of nutritional iodine in the food/diet. Swarajyalakshmi and Rao (1991) reported increased prevalence of iodine deficiency in adolescence as this may be due to increased demand on the thyroid hormones during period of growth, puberty and adolescence. The overall prevalence of goitre and other IDD is higher in females than males due to increase in prenatal losses, in both instances the difference was found to be statistically significant.

NNMB (1984) reported vitamin A and B-complex deficiency are high among the adolescent boys and girls between the age group 12 to 21 years and also pointed out the occurrence of angular stomatitis common among the adolescents of Kerala. Clinical examination of adolescents in the age group of 16-18 years revealed that anaemia, pigmentation of skin and dental caries were the most common clinical manifestations in both boys and girls (Mony, 1993). Dental caries, vitamin B complex deficiency and vitamin A deficiency signs are noticed in adolescent boys (Kamble *et al.*, 2001). 15-20 per cent teenagers in middle-income groups wear glasses or lenses (Bezbaruah, 2003).

Obesity in adolescent usually results from poor food choices and lack of exercise. High fat and low carbohydrate intake during adolescence are thought to increase future risk of cardio vascular disease and some types of cancer (Himes and Dietz, 1994). Obese adolescents fall victims of increased risk for high blood cholesterol level, abnormal glucose tolerance and high blood pressure. Obesity in adolescent is a reflection of life style changes, nutrition transition, some degree of urbanization, reduced physical activity, television watching and food habits with more fat consumption (Ahamed, 2001). A survey done among 285 obese

adolescents found that only four per cent were found to be overweight because of clinical reasons and others were fat because they ate too much of wrong foods and did not exercise enough (Bezbaruah, 2003).

Prolong nutritional deficiency and health problems in adolescent girls during the years of growth spurt can lead to poor nutritional status and poor reproductive health. According to a national survey at least 30 per cent of teenagers have bad teeth and one third of young girls have reproductive tract infections (Bezbaruah, 2003). Poor reproductive health in girls can lead to dysmenorrhoea, menorrhagia, amenorrhoea, disorders of reproductive organs presently and high risk pregnancy, high risk babies in future (Nirmala, 2000). The MMR in India is 453/ 1,00,000 and in Kerala is 87/1,00,000 and higher than developed countries where the ratio is 10-20/1,00,000 (Kensid, 1990). Currently the main indicator of women's health is recognized as the tip of the iceberg of the problems caused by sexuality and reproduction (Sai and Nassim, 1989).

Adolescents are more prone to infection with the changes in the life style like increase social contact with peers and strangers. It includes tuberculosis, chest infection, urinary tract infection and sexually transmitted diseases. Many chronic diseases may appear in adolescence like hypertension, diabetes, muscular and skeletal problems most of which are diet or life style related (Ajit and Thomas, 2000).

Due to lack of hygiene and cleanliness certain skin disorders can occur in adolescents including acne vulgaris, fungal infection like athlete foot (Ajit and Thomas, 2000). Adolescent girls have eating disorders like anorexia nervosa and bulimia and they avoid fatty foods and sugary items for fear of acne vulgaris (Elizabeth, 2001). Bezbaruah (2003) has reported that anorexia is rising steadily with one in 100 teenagers and also one in every ten anorexic teens is a male. Fever, cough, cold, abdominal pain, headache and vomiting were common health problems of the slum girls in low socio economic status group and health problems like cough, cold,

vomiting, boil and wounds, ear infection, diarrhoea in middle socio economic status groups (Patnam and Salgode, 2002). Substance abuse including alcoholism, smoking, chewing tobacco or using of drugs can lead to health risks like lung cancer, cardiovascular diseases, coronary thrombosis, liver injury (Clark *et al.*, 2001) oral cancer and osteoporosis (Lal, 2002).

Thus the review of the research done on adolescents point out that irrespective of regional variations our adolescents were having nutritional status with below normal (physical status) height and weight and have specific signs and symptoms of nutritional deficiencies.

2.6 DETERMINANTS OF DIETARY PROFILE

Determinant is defined as a factor, which determines the nature or outcome of something. Here the factors, which determine the dietary profile of adolescents is studied. Profile is a short descriptive article about someone or appears in outline. Here in this study dietary profile is the short outline description of adolescents based on their diet (Soanes, 2003). Studies indicated that the dietary profile of the adolescents could be determined by many factors. Some of the very common factors that may have an impact on the dietary profile of the adolescents are discussed here.

2.6.1 General Factors

Paramjit *et al.* (1983) also observed that income, occupational level and family size were the major variables affecting the food intake of families. The effect of nutrition, intelligence and academic performance can be understood only in terms of family, social environment and the kind of economic and educational resources the family has, as revealed by Johnson *et al.* (1989) and Ricciuti (1993). Socio-economic and demographic factors play an important role also on the pattern of consumption of food and nutrition (Rahman and Rao, 2002).

2.6.1.1 Socioeconomic Status and Related Factors

As pointed out earlier, adolescents are one of the most important groups of any society because they have an influential effect on the future socio-economic and cultural status of the society (Pourmoghim and Aminpour, 2003). Socio economic status is known to be key determinant of health status of any individual as it affects educational background, food consumption pattern and other life style behaviour factors (Cheng, 2003). A study done by Arora (1991) revealed that socio economic level of respondents such as social, economic, religious and family background in general have a very distinctive part to play in determining the attitude and food behaviour pattern of the individual.

2.6.1.2 Income

Senauer (1990) reviewed the factors concerning household behaviour on food consumption and nutrition and found that income, price changes, agricultural household, agricultural commercialistion, household economics and education determines the intra household allocation of food and thereby nutritional status of the population. Nutritional deficiency is known to co-exist with infection due to lack of food, super imposed infection and infestations, which are the cumulative result of poverty and under nutrition (Leela and Priya, 2002). Park (1997) reported that inspite of low income a high standard of living is enjoyed by Keralites. Higher socio-economic status seems to have a healthier overall diet (Roos, 2000). A study done by Pereria *et al*. (2000) on adolescent girls revealed that variation in socio-economic status causes much difference in their anthropometric measurements confirming the impact of socio economic status. Kunwar *et al*. (1998) reported that a very important determinant of child health is socio economic status of the family especially income of the family and maternal education.

2.6.1.3 Education

Education plays a very important role in achieving the economic status. Higher the education higher would be the possibilities of achieving a higher economic status (Singh, 1997). Rahman and Rao (2001) reported that food choices, intake and consumption pattern are also related to socio-economic status, activity of daily living and education. The prevalence of anaemia in relation to education of adolescent girls and mothers when determined by Gawarikar *et al.* (2002) pointed out that severe anaemia was slightly higher in illiterate groups and that the difference between mild and moderate anaemia were only marginal. Bhatnagar and Singal (1984) stated that the increase in knowledge of respondents was highly affected by their educational status. Saha and Kanchan (1991) found that the pregnant mothers in rural areas were not aware of special health care needs of the pregnancy mainly due to the lack of education, awareness and knowledge. Gajanan (1993) revealed that literate mothers belonging to higher socio-economic status had better knowledge regarding dietary requirements compared to the illiterate and economically poor women.

2.6.1.4 Occupation

The socio-economic status of the family is also determined by parental occupation. Parent's occupation will affect the parent child relationship and thus home climate and mother's occupation has a greater effect on home climate than fathers revealed by Singh (1997). Manocha *et al.* (1988) studied an inverse relationship between social mobility and dietary intake and it was found that adolescent girls belonging to low income groups being less literate, eat more dense calorific food than females of high income groups and middle income groups who are more literate. Wardle and Marsland (1990) was of opinion that dieting was more common in adolescent girls from higher socio-economic background. Prevalence of severe anaemia *i.e.*, (Hb <8 g/dl) was equal in labour class

and service class and trade class. Mild anaemia (Hb<12 g/dl) was highest in service class (Gawarikar *et al*., 2002).

2.6.1.5 Family Size

Family size, percapita income and literacy level too have a significant effect on dietary pattern and nutrient adequacy revealed by Rahman and Rao (2002). Park (1997) found that average family size in India is four. Thimmayamma (1983) had reported that as family size increases the food distribution among the family members become improper.

2.6.1.6 Gender Specificity

Gender corresponds to the roles attributed by society to women and men, which describes as feminine and masculine (Mac. Kinnon, 1982). Many studies revealed that gender roles and inequalities have an impact on the nutritional status of adolescent. Gender differences are created artificially, partly through socialization and partly through positive and negative discrimination in family laws and religion, media, economic structure, laws and legal system, cultural beliefs and practices, education and health care etc. (Bezbaruah, 2003). Iftikhar (1985) studied the difference in male-female status in the household and found that male adults and children were served first the better quality food, which lead to increased malnutrition and mortality among female adults and female children. According to International Institute of Population Science (1995), the male mortality is 2.2 per cent while that for female population is 3.4 per cent. In urban population the mortality rate is higher for females when compared to males in the age group 15-19. Sharma *et al*. (2000) had reported that in Indian households preferences were given to husbands and elders in the families while women and girls were given least priority in the allocations of food irrespective of land holding. Hence in societies where preferences are given for boys and male members, female children received less nutrition both quantitatively and qualitatively leading to poor health, nutritional hazards and increased

susceptibility to infectious diseases. Adolescent girls are more neglected in India than adolescent boys in case of nutrition, medical care, education, employment and self development reported Shivpuri (1990) and they are neglected from her birth and systematically deprived of physical and psychological inputs (Pande and Devi, 1990) and then they are neglected in the society throughout their lifecycle and this is more in lower socio economic classes in rural societies (Puri, 1991). Under conditions of wide gender disparities, which exist in India, malnourishment and limited access to health care are considerably more evident among females than among males from birth onwards. Gender bias in the allocation of meagre food supplies in adolescent girls result in the poor health and nutritional status of women rendering a women's pelvis to small which causes obstructed labour and even death (Pillai, 1993). Studies which have monitored growth and nutritional status among children confirm gender disparities in growth and severe malnutrition from an early age (Government of Maharashtra and UNICEF-WHO, 1991). Bhagat's (1992) study confirms this when he reported that one million girl babies in South Asian countries were killed during 1992. Similarly adolescent girls are a neglected sector of population in India and are poorly fed members of the family (Akkamahadevi *et al*., 1998).

2.6.1.7 Ordinal Position

Ordinal position of a child also is likely to have an impact on physical and mental health status. Singh (1997) has reported that with an increase of sibling number there is an apparent increase in moderate and severe form of PEM. Kaplan (1970) found that last born males of high socioeconomic status were more likely to have higher self-esteem than middle, first born and only children. Lester *et al*. (1992) reported that when last born females exhibited higher self esteem while first born males scored higher on this measure. Harris and Marrow (1992) found first born males to be more dominant than first born females but the opposite was

true for last born. But Harris and Marrow (1992) had also reported that birth order has no effect on the self-perception of responsibility. Kirkcaldy (1992) too reported that birth order showed no effect on work attitudes.

2.6.1.8 Lifestyle

Lifestyle is the way of living by an individual. It is primarily decided by home, friends, neighbourhood, society and culture. Besides the globalisation of culture, advancement of science and technology and communication strategies also decides the lifestyle of an individual (Nair and George, 2001). Rapid urbanization and technology advancement has brought wide spread changes in the lifestyle of people (Muratee, 1992). But some of the changes, knowingly or unknowingly disturbed the balance and thus lifestyle made negative impact on practices like eating and dietary habits (George, 2001). Adolescents, being in the most impressionable stage of life are fortunately or unfortunately the earliest victim of all new trends.

2.6.2 Food Habits and Preferences

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 repetitive act that he performs under the impetus of need to provide himself with nourishment and simultaneously to meet an assortment of social and emotional goals (Gift *et al*., 1972). The food habits of adolescents are mainly influenced by urban life style, mass media and peers. Adolescence is a period of high nutritional risks 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 and fun drinks kill the appetite and promote skipping of meals and finally result in nutritional deficiencies (Elizabeth, 2001). Urbanization has changed the family structure and life of people including food habits and living style (WHO, 1987 and Saibaba, 1986). Devadas and Eswaran (1986) analysed food habits of people and found that the food habits were

mainly affected by the availability of food, which itself is affected by environment, religion, superstition, ignorance and purchasing power. Studies conducted in Thiruvananthapuram by Jyothi (1993), Karuna (1993) and Ranganath (1996) in Kerala Agricultural University revealed that food consumption of low income strata was observed to be habitual non vegetarian type with rice as the staple food. The studies conducted by Johnson *et al*. (1994) on the pregnancy outcome, dietary intake and anthropometric measurements and their relationship in the life style practices revealed that daily diet in most of the women comprised of energy rich food articles like cereals especially rice, fats and oil and sugar.

According to Eggert (1984) food preferences are formed as a result of complex interaction of many factors in an individual's environment. Teenagers' food choices are influenced by social pressures to achieve cultural ideals of thinness or athletic prowess or to gain peer acceptance or assert independence from parental authority (Ostbye *et al*., 1993). All over the world snack consumption is considerably higher among school children and adolescents (Sadana *et al*., 1997). Robson *et al*. (1991) found that majority of the adolescent's preferred sweet preparation such as cake, pudding and biscuits. According to Bhat and Wahray (2000), street foods were considered as an important source of economical and nutritious food particularly by urban poor. A study done in Kerala Agricultural University by Kavitha (1999) showed that the food habits among adolescents indicated that about 94.67 per cent of adolescents ate confectionaries at least once in a day. Junk foods such as chocolate bars, potato chips, soft drink, fruit flavoured drink, cream filled cup cakes which are popular among adolescents are described as having the opposite profile as they contained a lot of non-permitted colours but are valued because of its taste and convenience (Chapman and Maclean, 1993; Gayathri and Rani, 1993).

Snacks chosen by teenagers are of low nutrient density, high sugar, high fat foods, such as candy, soft drinks and pastries (Wenck *et al.*, 1980). Surveys in North America among teenage girls showed that they consume excess fat and less micro nutrients than recommended nutrient intake (Farthing, 1991). National surveys shows that the average intakes by adolescent girls are only 1800 kcal/day and by adolescent males are 2600 kcal/day (Niemann *et al.*, 1990). The diet of adolescent girls is often lacking in essential nutrients like vitamin B_6, iron, calcium, magnesium and copper (Niemann *et al.*, 1990).

A study done by Wong *et al.* (1992) found that both children and adolescents tend to consume higher fat food products as they watch television a lot. Morton (1996) opined that television influences more than family in setting child's food preferences. According to Anuradha (1981) intake of pulses and leafy vegetables in the age group of 13-15 and 16-18 years were grossly deficient.

Both boys and girls were found to have different food habits. A study shows that adolescents are found to fast and binge alternatively to get peer acceptance (Bartell, 2000) whereas another study done by (Elizabeth, 2001) reveals that many adolescent girls resort to dieting and starvation to become slim and to get appreciated by their friends. Western culture norms and expectation about female beauty is a major source of risk for development of eating disorders (Eisler and Hersen, 2000).

2.6.3 Health and Nutritional Attitude and Knowledge

Nutrition plays an important role in physical, mental and emotional development of human being (Sangwan *et al.*, 1993). Health is not a static phenomenon but a dynamic life process, which begins at birth and is governed by a genetic, nutritional and environmental factors throughout life (Thilakavathi and Purushothaman, 2001).

Adolescence is one of the most challenging periods in human development particularly girls who are to be future mothers producing healthy children. Childhood malnutrition predisposes women to reproductive health risks. Health problems in childhood, adulthood and during childbearing increase the health risks to both mothers and child. Therefore a good knowledge about nutritional needs bring health to next generation (Esfarjani *et al.*, 2003).

Attitude is a tool that serves the human needs to see order and consistency in what people say, think and do, so that given certain behaviour, predictions can be made about future behaviour (Henerson *et al.*, 1987) whereas knowledge is a body of understood information possessed by an individual or by culture which is in accordance with established fact. Perron and Endres (1985) studied the relationship between nutrition knowledge and attitude and dietary practices of adolescents and found that nutrition knowledge and attitude were positively connected indicating that the more nutrition knowledge a subject had the more positive was adolescents' attitude towards nutrition and vice versa. Kohli (1986) reported that adolescents gathered information regarding foods from general reading and also from mass media besides parents who served as a source of information. Russo *et al.* (1986) observed that as education increases the awareness increases and attitudes modifies. The newspapers give a real human interest story and perform a community service by presenting health care informations (Moyer, 1990). A study conducted by Phillip *et al.* (1998) revealed that interview with two dimensional and three dimensional visuals had resulted in maximum knowledge gain and knowledge retention. Singh (1995) reported that there was significant difference in gain in knowledge of the tribal women exposed to nutrition education training.

2.6.4 Psycho-social and Environmental Factors

Food insufficiency has an impact not only on physical health but also in an individual's mental health and ability. Adolescents of today are living in a world of revolution in six major areas – education, violence, sex, family relationships, materialism and computer, all of which have an impact on adolescent development and behaviour (Indira, 2001). Alaemo *et al.* (2001) in a study done in US children and teenagers found that negative academic and psycho-social outcomes are associated with family level food insufficiency. Food insufficient children and teenagers were more likely to have psychosocial difficulties, has seen psychologist, have been suspended from school and have difficulty in getting along with others. Physical health of an adolescent reflects his/her overall growth, personality development, learning and academic performance (Paul and Nair, 2002). Indira (2001) had classified the reasons for poor academic performance which included sensory deficits, physical illnesses, emotional disorders, psychological disorders and poor motivations. The environmental factors which lead to poor academic performance include home, school, peers, teachers, deprived or discordant home atmosphere, lack of encouragement, problems with siblings, educational background of parents, over expectation of parents, adolescents, pre-occupation and more interest in co-curricular activities.

2.6.5 Time and Energy Utilization Pattern

Adolescents often lead hectic life without any rest. A study done by Samuelson (2000) revealed that food habits of adolescents are characterized by irregular meal pattern. Much of their diet may be in the form of snacks – from vending machines, school snack bars, fast food outlets. Sometimes teenagers skip breakfast as they are leading very busy lives and also due to lack of time (Wenck *et al.*, 1980). A study done by Malathi (2002) reported that the busy adolescents often skip breakfast and take snacks and soft drinks for lunch and have junk food instead of taking dinner. Leisure time is

lead by television viewing and it constitutes the principal source of inactivity for children and adolescents (Dietz, 1993). Garby *et al*. (1990) had reported that energy expenditure at rest and various degrees of physical activity changes with environmental changes. Durnin (1990) was of the opinion that measuring the energy expenditure will provide some of the essential information in dietary modification.

Thus it could be observed that adolescence is one of the vulnerable periods of life with various health risks. Life style variations and dietary habits expose adolescents to different health promoting and health damaging behaviour. Adolescence is a period of high nutritional risks when increased demand for nutrients are often met with poor choices of food, unhealthy eating habits and poor diet with deficient intake of calories, proteins, vitamins and minerals. The wrong food choices negatively influence the growth and development, health and reproductive capacities. Added to this is the academic and psychosocial pressure which adolescent had to face and which has direct influence on their diet, food intake and their health and nutritional status.

Materials and Methods

3. MATERIALS AND METHODS

The methodology adopted for the study entitled "Determinants of dietary profile of higher secondary school children" is presented in this chapter.

The major objective of the study is to assess the dietary profile of higher secondary school children and to ascertain the influence of selected factors such as social and domestic environment, knowledge, attitude and preferences, gender specific adjustments and psycho-social profile.

3.1 CONDUCT OF THE STUDY

3.1.1 Locale of the Study

The sample for the study was selected from higher secondary school in Neyyattinkara Education District and Thiruvananthapuram South Education District. The schools Venganoor Vikraman Padmanabhan Saraswathi Higher Secondary School (VPSHSS) for Boys and Venganoor Girls Higher Secondary School (VGHSS) for girls and Kamaleswaram Government Higher Secondary School were purposively selected due to their proximity to College of Agriculture and easy accessibility for the investigator for observation. Also due representation was given to schools from urban and rural areas : schools for girls, boys and mixed population and also schools with different management like government and private agencies to get a representative cross section of the school going population.

3.1.2 Selection of Respondents

Major Sample: The main respondents for this study constituted adolescent girls and boys within the age group 15-18 studying in XI standard selected from three higher secondary schools of Thiruvananthapuram. Eventhough higher secondary classes include both

XI and XII standard students but while selecting the sample for the present study the students from XII standard were purposively excluded. As the students had to appear for the public examination at the end of the academic year the school authorities were reluctant to spare them or their classes. Also the students were having a tight schedule with coaching classes at school and home so that it will be difficult to get them and sit through and answer the series of tests and measures used in this study.

Moreover, if necessary, it is not easy to approach them after the exams as they all leave the school for higher studies after their final exam. In order to avoid these difficulties the sample for the study were restricted to XI standard students who have no public exam during the academic year and will be available in the school fully for two years.

Hundred respondents selected randomly in equal numbers from two rural based private managements, boys and girls higher secondary schools of Venganoor and from 100 respondents from urban based government managed mixed higher secondary school of Kamaleswaram majoring in Science/Computer Science/ Commerce / Humanities formed the major sample. The distribution of sample is given in Table 4.

Table 4 Distribution of sample based on location of school and sex

Region	Name of school	Boys	Girls	Total
Rural	VPSHSS Venganoor	50		50
	GHSS Venganoor		50	50
Urban	GHSS Kamaleswaram	50	50	100
	Total	100	100	200

Subsample for Indepth Study: Besides the major sample a subsample of ten students from each school selected from major sample were included for indepth study. The subsample thus consisted of 20 boys and

20 girls selected randomly from the major sample based on their willingness to participate.

Table 5 Distribution of subsample based on location of school and sex

Region	Name of school	Boys	Girls	Total
Rural	VPSHSS Venganoor	10		10
	GHSS Venganoor		10	10
Urban	GHSS Kamaleswaram	10	10	20
	Total	20	20	40

3.2 VARIABLES

Keeping in view of the objective the variables were identified first and then appropriate tools were selected after pre-testing and standardizing, before conducting the study. The details of variables and tools are given next.

3.2.1 Variables Identified: The variables selected included both dependent and independent variables.

Dependent variables   -   Nutritional status and dietary pattern

Independent variables   -   Attitude and knowledge on food, nutrition and health, psycho-social adjustments, socio-demographic, work load and time utilization and energy balance

3.2.2 Tools Identified

Success of every research study depends upon the use of appropriate and well-designed tools or technique to elicit information from the sample.

A survey of relevant literature in the field reveals that certain standard measures and tool are available to assess the nutritional status of

the individual. The standard tools, which were found to be appropriate for the present study were used. But wherever suitable instrument are not available for the present study due to cultural differences or either adaptation of standard instruments were made to suit the local condition a new tests were constructed using standard procedures.

The tools used for the study are given below.

Tools

1) Nutritional status

    a) Anthropometry – Platform weighing balance, measuring tape

    b) Biochemical   – Cyanomethaemoglobin

    c) Clinical   – NIN proforma

2. Dietary pattern

    a) Food habits   – Questionnaire

    b) Food use frequency and food preference – Specially prepared rating scale

    c) Food consumption pattern – One day weighment

3. Knowledge and attitude towards food, nutrition and health

    a) Attitude   – Likert type

    b) Knowledge   – Teacher made test

4. Psycho-social profile   – Inventory (adapted from SC and CA inventory)

5. Socio-demographic features – Specially developed questionnaire

6. Work load and time utilization pattern – Activity time log

7. Energy balance   – Energy intake and expenditure

3.2.3 Data collection procedure

After selecting school, the school authorities were contacted and a schedule for data collection was prepared with the help of teachers. Either morning or afternoon section of the school as chosen by school authorities was fixed for data collection. The test was administered by the

investigator herself. The tools were administered to 50 students from standard XI selected randomly from each school.

Before starting the data collection, the students was assured that the data was collected for research purpose only and will not use for any other purpose and request them to give honest answer without consulting with each other.

The students were asked to write the name, full address of their house, school, class and division in each of the answer sheet before starting the test for easier identification. The instructor read out to the whole classes and subjects were given time to mark the answer. After finishing the first test inventory was collected and next test were administered as that of first test.

From the major sample a subsample was selected randomly after getting the willingness of the respondents to co-operate extra information, which include weighment of food consumed as well as heamoglobin level of subsample were collected through house visit.

3.3 ASSESSMENT OF DEPENDENT VARIABLES

The dependent variables identified for the study include nutrition and health status of the sample collected through anthropometrical, biochemical, clinical and dietary assessment method.

Nutritional status is defined as the state of health of an individual as influenced by intake of the essential food and nutrients (American Dietetic Association, 1969). Nutritional status is one of the critical indicators of health, therefore regular nutritional assessment is important to maintain the health of respondents (Mourya and Jaya, 1997). Kamath (1986) defined nutritional status as the state of health enjoyed as a result of nutrition.

The method followed mainly to assess the nutritional status includes anthropometric, biochemical assessment, clinical assessment and dietary assessment.

3.3.1 Assessment of Anthropometry

Anthropometry has been accepted as an important tool for assessment of nutritional status (Vijayaraghavan, 1987). Nutritional anthropometry is measurement of human body at various ages and level of nutritional status. This is based on the concept that an appropriate measurement should reflect any morphological variation occurring due to significant functional and physiological change (Rao, 1996). Anthropometry remains the conventional benchmark for evaluating the nutritional profile of children, particularly for epidemiological purpose (Sachdev, 2003). In this study height and weight of each of the 200 respondents were taken as suggested by Jelliffee (1966) (Appendix II).

Weight: Weight is a measurement of body mass (Rao and Vijayaraghavan, 1986). Comparison of weight for age value, 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 an individual, changes in food consumed or even changes in one's physical activity.

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

Height: Height or the total length, apart from nutritional and environmental factors is influenced by hereditary factors. The extend of height deficit in relation to age as compared to regional standards is regarded as a measure of the duration of malnutrition (Gopaldas and Sheshadri, 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 subjects were asked to remove their slippers and to stand with the centre of the back touching the wall, with feet parallel and heels, buttocks, shoulder and back of head touching the wall. The head was held comfortably erect, the arms hanging loosely by the side. A smooth, thin ruler was held on the top of the head in the centre, crushing the hair at right angle to the wall and the height read off 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: Body mass index is expressed as the ratio of weight to height square [weight (kg)/height^2 (m)] (James *et al*., 1988). This is used as a good parameter to grade chronic energy deficiency. BMI is regarded as a good indicator of nutritional status. The BMI has good correlation with fatness. It may also be used as an indicator of health risk. Based on BMI, respondents were classified into the following grade.

Based on BMI, respondents were classified into under weight, normal and over weight. The presumptive diagnosis of under weight include for severe (<16.00 kg m^{-2}), moderate ($16.00 - 16.99$ kg m^{-2}), mild ($17.00 - 18.49$ kg m^{-2}) whereas over weight include grade I ($25.00 - 29.99$ kg m^{-2}), grade II ($30.00 - 39.99$ kg m^{-2}), grade III (>40.00 kg m^{-2}) and in case of normal it is $18.50 - 25.00$ kg m^{-2} (Demographic and Health Survey, 1999).

In addition to this BMI is also classified based on Eliz Health Path for Adolescents (EHPA) as under weight (<15.00 kg m^{-2}), normal ($15.00 - 22.00$ kg m^{-2}), over weight ($22.00 - 25.00$ kg m^{-2}) and obesity ($25.00 - 30.00$ kg m^{-2}) (Elizabeth, 2001).

Mid Upper Arm Circumference : Measurement of mid upper arm circumference is the most useful, practical method for assessing muscle

mass, as this region is easily accessible and measurement requires only a flexible fibre glass tape (Gopaldas and Sheshadri, 1987).

Mid upper arm circumference of the respondents were also measured to the nearest 0.1 cm with a tape placing gently but firmly round the limb to avoid compression of the soft tissues. The mid point of the left arm while in hanging pose is taken.

3.3.2 Biochemical Investigation

Biochemical investigation of heamoglobin is one of the most important tools for assessing the nutritional status of the subject. Park (1997) stated that haemoglobin level is a useful index of the overall state of nutrition irrespective of its significance in anaemia. The haemoglobin level of the subsample consisting of 40 respondents was estimated through 'Cyanmethaemoglobin' method. The procedure for estimation of haemoglobin is by taking 20 μl of blood measured accurately from a haemoglobin pipette and delivered on to Whatman No.1 filter paper of size 2 x 4 cm. The filter paper is then air dried and labelled. This can be stored upto one week. The portion of filter paper containing the blood is cut and dipped in 5 ml of Drabkin's solution taken in a test tube. Wait for 30 minutes, mix the contents and take the reading at 540 nm of unknown sample and that of standard of known haemoglobin content against a reagent blank (Raghuramulu *et al*., 2003). This procedure was followed here in the haemoglobin estimation of the sub sample and the reading obtained was tabulated for further investigation.

3.3.3 Clinical Examination

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 a part of nutritional assessment through which direct information of signs and symptoms of dietary deficiency prevalent could be obtained (Swaminathan, 1993). The presence or absence of clinical

deficiency symptoms, which is an index of nutritional status were assessed here by a qualified physician using a proforma prepared by NIN (1986) (Appendix II). The incidence of the clinical signs and symptoms prevalent were then tabulated.

3.3.4 Dietary Pattern

Swaminathan (1985) reported that diet survey constitutes an essential part of any complete study of nutritional status of individual or group, providing essential information on nutritional level, source of nutrients, food habits and attitude. Diet study constitutes an essential part of any complete study of nutritional status of an individual providing information on nutrient intake level (Gopaldas and Sheshadri, 1987). Hence diet survey was included here to assess the dietary habits of the respondents.

Food consumption pattern is one of the important determinants of nutritional status (Deshpande *et al*., 2001). Food habits of an individual are the characteristics repetitive act that one performs under the impetus of need to provide himself with nourishment and simultaneously, to meet an assortment of social and emotional goals (Gift *et al*., 1972). A study on dietary habits and nutritional status of adolescents by Samuelson (2000) showed that adolescent's food habits are characterized by irregular meal pattern.

A diet survey was done using a questionnaire to assess the food habits, dietary pattern of the 200 adolescent respondents (Appendix III). The information regarding their food use frequency and food preferences was collected using a checklist. Besides this, their food habits like nibbling habits, the food fads and fallacies and habits of taking food from outside the home were also assessed. This questionnaire was pre-tested and standardised before administering among the respondents.

Food use frequency and preference: Frequency of use of different food items in the dietaries of the respondents clearly indicate the adequacy of

the diets consumed by them. In this study, food use frequency and food preferences were measured using a checklist on a eight point scale and four point scale respectively. The locally popular foods and those frequently advertised through media were listed down and respondent's use and preference for each item was rated separately.

The total score for each food groups used by respondents as well as preference score of the respondents for different food items were calculated separately using the formula suggested by Reaburn *et al.* (1979).

$$\text{Percentage of total score} = \frac{R_1S_1 + R_2S_2 + \dots R_nS_n}{N}$$

S_n = Scale of rating,

R_n = Percentage of respondents selecting a rating

N = Maximum scale rating

The percentage of respondents using each food item and also their preference for each food item was then computed.

One day weighment : Gore *et al.* (1977) suggested that only weighment method can give reasonably accurate values of dietary intake. According to Rao (1975) any single day or two days weighment method would be as efficient a tool as that of seven days.

However, as one day weighment is very time consuming, investigation on 200 respondents were not possible within the limited time. Hence one day weighment for the actual consumption was done only on the subsample consisting of 40 respondents whose food intake for the whole day was measured (Appendix IV). The investigator first weighed the raw foods included in the meals for the whole day and then cooked weight of each preparation using a standardised measuring vessel. The amount of each food consumed and the plate waste was then also

weighed to get exact amount of food consumed. The raw equivalent of the food consumed was calculated from total raw amount of each ingredient (g), total cooked amount (g) and individual intake of cooked amount. The nutritive value of food consumed was then calculated using food composition table (ICMR, 1989). The quantity and quality intake of food items were then compared with recommended dietary allowances of foods and nutrients for adolescents.

In addition to this health history of respondents were collected from parents through questionnaire. Information regarding birth weight immunization taken, previous record of severe illness or surgery and morbidity during the previous year and general health pattern from birth to date was collected.

3.4 ASSESSMENT OF INDEPENDENT VARIABLES

Knowledge and attitude towards food, nutrition and health, psycho-social adjustments, socio-demographic feature, workload and time utilization pattern, energy balance of the sample were the factors identified as independent variables.

3.4.1 Nutritional Knowledge and Attitude

Knowledge and attitude towards food, nutrition and health were assessed using Teacher made and Likert scales test respectively.

Knowledge is a body of understood information possessed by an individual or by culture, which is in accordance with established fact. Attitude is a tool that serves the human needs to see order and consistency in what people say, think and do, so that given certain behaviour, predictions can be made about future behaviour (Henerson *et al.*, 1987).

Knowledge: In order to assess the knowledge of respondents about health, nutrition and food, Teacher type test was administered. These statements were prepared by reviewing the chapters on health and nutrition in the biology textbooks of VIII, IX and X standard. The

statements were made on various aspects of food, nutrition and health which included sources of nutrients, their functions and deficiencies, food processing, adulterants, food fads, health problems, diet, life style and hygiene. Care was taken to use simple and clear statements with no ambiguity in language or idea to avoid confusion and doubts. Both positive and negative statements were formed and were evenly distributed throughout. The statements were first circulated among 10 experts and the most appropriate statements were selected on a priority bases. These statements were then circulated among groups of adolescent population and the most reliable statements were finally identified and were grouped in three sections on food, nutrition and health. The final schedule consisted of 60 numbers of statements with 20 each for health, nutrition and food (Appendix V). Each statement of the knowledge test was provided with two response categories namely "Yes', 'No' with a score '1' for correct answer and '0' for wrong answer. The scores were added to get the total score of each respondent. The maximum score is 60.

Attitude: In order to assess the attitude towards food, nutrition and health of respondents, Likert scale was used. A five point scale was developed which rated as strongly agree, agree, doubtful, disagree and strongly disagree against a series of selected statements to assess the respondent's attitude on food, nutrition and health (Appendix VI). As that for knowledge test the statements were first circulated among experts and then a group of adolescents before finalizing. Care was taken to include positive and negative statements. The score was 5, 4, 3, 2, 1 for positive and it was in the reverse manner for negative statements.

3.4.2 Psychosocial Profile

Psycho social profile of the sample was assessed using psycho social assessment inventory, adapted from standard test SC inventory and CA inventory (Syamakumari, 1993). An exhaustive survey of related literature revealed the different attributes essential for a comprehensive assessment

of psychosocial profile. The statements for measuring the various attributes finally decided upon were adapted from the standard scale and were modified. The test was then constructed in such a way as to enable a person to measure each of the components separately or the test as a whole. The components included in the scale are physical assessment, which measures the individuals' perception of the physique, appearance, physical soundness, abilities and possessions. The personality assessment gives the respondents' perception of his own behaviour, traits and tendencies. The next component, moral measures the respondents' attitude, believes, value and principles. The component achievement studies the individual's own evaluation of his abilities, talents, achievements, aspirations, motivation, failure etc. The individual's perception of social adequacy and failure and how others should be or how they view him is assessed. Besides this respondent's view on the discrimination faced due to gender, ordinal position and also their own rating of their confidence and failure were also included. Both positive and negative statements were included and were arranged in a random order and scored against a five response category *viz.*, strongly agree, agree, doubtful, disagree and strongly disagree. These response categories were scored by giving weightage of 5, 4, 3, 2, 1 for positive and 1, 2, 3, 4, 5 for negative statements. The test was circulated among experts and selected adolescents and based on their responses the inventory was finalized with eight components and each component consisting of 20 statements and a total score of 100 for each and 800 for the whole text (Appendix VIII).

Gender discrimination is a part of the preferential culture in our country which can have remarkable repercussions on the physical and psychological health of growing children. It can affect their food consumption, nutritional status and psycho-socio adjustment. Here the views and perceptions of adolescents and their parents in this regard were collected during interview.

Further the adolescent's perception of parental discrimination in this regard exhibited in the family and its influence in their psycho-socio adjustments were assessed using psycho-social assessment inventory.

3.4.3 Socio-demographic Feature

A comprehensive information of sample with special reference to the socio-economic and demographic details of their families were collected from the respondents and from their parents. The details regarding their age, religion, caste, health status, family type and size, parents' education, occupation, sibling constellation in the family and infrastructure facilities possessed in their houses were ascertained using an interview schedule (Appendix I), which was modified and structured after pilot study and circulation among experts.

3.4.4 Workload and Time Utilization Pattern

In order to assess the life style and workload of the adolescents and its relation to their nutritional status, the time utilization pattern of the respondents were studied.

A study done by Malathi (2002) reported that the busy adolescent often skip breakfast and have snacks and soft drinks for lunch and also have junk foods instead of taking dinner. A regular and balanced diet is important to maintain proper health and nutritional balance of every individual. Moreover, there should be a balance also with the energy intake through food and the energy required to meet one's daily activity. In order to assess the energy adequacy of the respondents and to know the time utilization pattern, each respondent was asked to prepare a time log stating the time spent on each activity from the time he gets up in the morning to the time he goes to bed at night. The average work load per day was thus computed by finding the number of hours spent inside and outside home for each activity. From the time log the time spent for each activity was calculated which was then classified as sedentary, light,

moderate and heavy to estimate the time spent for each type of activities (Appendix VII).

3.4.5 Energy Balance

Energy expenditure from a physiological point of view is made up of two factors, BMR and physical activity. Energy requirement of the respondents were determined by monitoring their time utilization pattern and by measurements of energy expenditure. Assessment of energy requirement is then based on specifying the needs for the basal metabolism, external activity and specific dynamic action.

The basal energy requirement is regularly estimated as the energy need per kg of body weight, which is assumed as one calories for every hour. Thus the basal energy expenditure for 24 hours for young adolescent is calculated as 1 x 24 x body weight. But some energy is saved during sleep and the savings for sleep is calculated as 0.1 x body weight x hours of sleep. This is reduced from the total basal energy expenditure for 24 hours will give the basal energy expenditure of the individual.

Energy expenditure for external activities was calculated by grouping the activity as sedentary, light, moderate, heavy and sleeps. Energy expenditure for sedentary, light, moderate heavy and sleep is determined as given next.

Sedentary activity   –   0.02 Kcal x body weight x minutes

Light activity   –   0.03 Kcal x body weight x minutes

Moderate activity   –   0.04 Kcal x body weight x minutes

Heavy activity   –   0.08 Kcal x body weight x minutes

Sleep   –   0.01 Kcal x body weight x minutes

(Swaminathan, 1991)

Specific dynamic action of a mixed diet consisting of carbohydrate, protein and fats is calculated as eight per cent.

Therefore total of these activities gives the energy expenditure of adolescent below 18 years for 24 hours.

The energy intake of respondents per day was estimated from the quantity of food consumed. This was then compared with RDA to find the adequacy of intake.

Energy balance of each respondent was computed from the total energy intake and expenditure.

3.5 ANALYSIS OF DATA

The data collected was scored, coded and consolidated before subjecting to statistical analysis and interpretations. The statistical measures used were percentage analysis, 't' test and ANOVA for comparison and for determining the variances among the variables. Pearson's Product Movement Coefficient of Correlation and Chi square were computed for finding out the significant relationships and association of various dependent and independent variables and also their interrelationships, direction and degree of relationship. The result of the statistical analysis were interpreted and discussed based on earlier empirical evidences and findings.

Results

4. RESULTS

The results of this study were illustrated in this chapter under different sections along with statistical analysis. Keeping in view of the objective set for the study the data collected from the major and subsample were statistically analysed and the results were presented under the following heads.

4.1 Major sample

4.1.1 Socio-economic and demographic profile

4.1.2 Health and nutritional status

4.1.3 Dietary pattern

4.1.4 Knowledge regarding health, nutrition and food

4.1.5 Attitude towards health, nutrition and food

4.1.6 Gender specific roles and relations

4.1.7 Time utilization pattern

4.1.8 Energy Expenditure Pattern

4.2 Subsample

4.2.1 Nutritional status

4.2.2 Dietary adequacy

4.2.3 Nutritional adequacy

4.2.4 Dietary Profile Index

4.2.5 Relationship of dependent variable with DPI

4.2.6 Relationship of independent variable with DPI

4.2.7 Workload and time utilization

4.2.8 Interrelationship of the selected determinants of the dietary profile

4.1 MAJOR SAMPLE

4.1.1 Socio-economic and Demographic Profile

4.1.1.1 Demographic Profile

Age: Table 6 revealed that the majority *i.e.*, 52.00 per cent of the adolescents were 16.5 years of age while the distributions of others were between the age group of 15.5 to 18.0 years.

Religion: As indicated in Table 6 majority of the respondents, 71.50 per cent were Hindus. Of the rest 20.00 per cent were Muslims and 8.50 per cent were Christians.

Caste : When caste wise distribution of the respondents were studied the majority of the respondents were from OBC category *i.e.*, 64.50 per cent, while 21.50 per cent were from forward caste and 13.50 per cent from scheduled caste. Only 0.50 per cent was from scheduled tribe.

4.1.1.2 Social Profile

The family structure, composition, education and employment characteristics of the sample were included under the section social profile.

Family type: Family type was classified into nuclear, joint, extended based on composition. Joint families include parents, children, grand parents and other relatives whereas extended families had parents their children and one or two relatives residing in the family and nuclear families had only parents and their children under the same roof. Here in this sample majority were from nuclear families, 165 out of 200 (82.50 per cent). Of the rest 9.50 per cent were from extended families and 16 (8.00 per cent) from joint families (Table 7).

Family size: The family sizes were classified as small (1-4 members), medium (5 – 6 members) and large ($\geq$ 7 members). Of the total sample 113 (56.50 per cent) were from small families whereas the remaining 76

Table 6. Distribution of respondents based on demographic profile

	Urban		Rural		Total N = 200
	Boys (n=50)	Girls (n=50)	Boys (n=50)	Girls (n=50)	
Age					
15.5	6 (12.00)	5 (10.00)	21 (42.00)	21 (42.00)	53 (26.50)
16.0	-	-	2 (4.00)	2 (4.00)	4 (2.00)
16.5	25 (50.00)	35 (70.00)	21 (42.00)	23 (46.00)	104 (52.00)
17.5	14 (28.00)	10 (20.00)	5 (10.00)	4 (8.00)	33 (16.50)
18.0	5 (10.00)	-	1 (2.00)	-	6 (3.00)
Total	50 (100)	50 (100)	50 (100.00)	50 (100.00)	200 (100.00)
Religion					
Hindu	32 (64.00)	32 (64.00)	40 (80.00)	39 (78.00)	143 (71.50)
Christian	3 (6.00)	-	4 (8.00)	10 (20.00)	17 (8.50)
Muslim	15 (30.00)	18 (36.00)	6 (12.00)	1 (2.00)	40 (20.00)
Total	50 (100.00)	50 (100.00)	50 (100.00)	50 (100.00)	200 (100.00)
Caste					
Forward	14 (28.00)	7 (14.00)	16 (32.00)	6 (12.00)	43 (21.50)
SC	3 (6.00)	11 (22.00)	4 (8.00)	9 (18.00)	27 (13.50)
ST	-	-	1 (2.00)	-	1 (0.50)
OBC	33 (66.00)	32 (64.00)	29 (58.00)	35 (70.00)	129 (64.50)
Total	50 (100.00)	50 (100.00)	50 (100.00)	50 (100.00)	200 (100.00)

Numbers in parenthesis indicate percentage

Table 7. Distribution of respondents based on their familial details

Familial details	Urban		Rural		Total N = 200
	Boys (n=50)	Girls (n=50)	Boys (n=50)	Girls (n=50)	
Family type					
1. Nuclear	37 (74.00)	41 (82.00)	42 (84.00)	45 (30.00)	165 (82.50)
2. Joint	7 (14.00)	7 (14.00)	2 (4.00)	-	16 (8.00)
3. Extended	6 (12.00)	2 (4.00)	6 (12.00)	5 (10.00)	19 (9.50)
Total	50 (100.00)	50 (100.00)	50 (100.00)	50 (100.00)	200 (100.00)
Family size					
1. Small	27 (54.00)	21 (42.00)	28 (56.00)	37 (74.00)	113 (56.50)
2. Medium	18 (36.00)	25 (50.00)	20 (40.00)	13 (26.00)	76 (38.00)
3. Large	5 (10.00)	4 (8.00)	2 (4.00)	-	11 (5.50)
Total	50 (100.00)	50 (100.00)	50 (100.00)	50 (100.00)	200 (100.00)

Numbers in parenthesis indicate percentage

(38.00 per cent) and 11 (5.50 per cent) belonged to medium and large families respectively (Table 7).

Education status of parents: The parental educational level of the sample when assessed ranged from illiteracy to post graduation and technical education. When father's educational status was assessed, it revealed that 8.00 per cent had education only upto to upper primary and the majority of fathers had education upto high school level *i.e.*, 54.50 per cent. Sixteen per cent had studied upto pre-degree whereas 11.50 per cent had education upto graduation. When 3.50 per cent had post graduate degrees and 3.00 per cent had studied upto lower primary only. The number of illiterate was very few only six (3.00 per cent). In case of mothers education 50.00 per cent of them had high school education while 24.00 per cent studied up to pre degree level. As indicated in the Table 8, 8.50 per cent were graduates, 6.00 per cent had education upto upper primary and 4.50 per cent upto lower primary. The number of illiterates were few *i.e.*, 4 (2.00 per cent) so also the number of technical education *i.e.* 1 (0.50 per cent) only (Table 8).

When region wise comparisons were made more or less similar educational pattern was seen except in case of illiteracy and graduation. No illiterate mothers were seen in urban sample.

Employment status of parents: Employment status of the parents' was also studied. As illustrated in Table 9 none of the adolescents' fathers were unemployed. Thirty seven per cent of the fathers were casual labourers while 29.50 per cent were government employees. 24.50 per cent fathers were self-employed while 9.00 per cent had private jobs.

In case of mothers' employment status the majority was housewives both in rural and urban areas. In urban area one per cent of the mothers were in government service while 0.50 per cent was self-employed. None of the mothers in rural areas were employed.

Table 8. Distribution of respondents based on the education status of parents

Sl. No.	Educational level	Fathers Educational Status				Total N=200	Mothers Educational Status				Total N=200
		URBAN		RURAL			URBAN		RURAL		
		BOYS n=50	GIRLS n=50	BOYS n=50	GIRLS n=50		BOYS n=50	GIRLS n=50	BOYS n=50	GIRLS n=50	
1	Illiterate	1 (2.00)	1 (2.00)	2 (4.00)	2 (4.00)	6 (3.00)	-	-	2 (4.00)	2 (4.00)	4 (2.00)
2	Lower primary	1 (2.00)	1 (2.00)	2 (4.00)	2 (4.00)	6 (3.00)	2 (4.00)	2 (4.00)	2 (4.00)	3 (6.00)	9 (4.50)
3	Upper primary	5 (10.00)	6 (12.00)	2 (4.00)	3 (6.00)	16 (8.00)	2 (4.00)	5 (10.00)	2 (4.00)	5 (10.00)	12 (6.00)
4	High school	22 (44.00)	24 (48.00)	31 (62.00)	32 (62.00)	109 (54.50)	12 (24.00)	30 (60.00)	31 (62.00)	27 (54.00)	100 (50.00)
5	Technical	-	-	1 (2.00)	-	1 (0.5)	-	-	1 (2.00)	-	1 (0.50)
6	Pre-degree	10 (20.00)	10 (20.00)	9 (18.00)	3 (6.00)	32 (16.00)	20 (40.00)	11 (22.00)	8 (16.00)	9 (18.00)	48 (24.00)
7	Graduate	8 (16.00)	8 (16.00)	1 (2.00)	6 (12.00)	23 (11.50)	10 (20.00)	1 (2.00)	3 (6.00)	3 (6.00)	17 (8.50)
8	Post graduate	3 (6.00)	-	1 (2.00)	3 (6.00)	7 (3.50)	4 (8.00)	1 (2.00)	3 (6.00)	1 (2.00)	9 (4.50)

Numbers in parenthesis indicate percentage

Table 9. Distribution of respondents based on their employment status of parents

Sl. No.	Employment category	Father's Employment Status				Total N=200	Mother's Employment Status				Total N =200
		URBAN		RURAL			URBAN		RURAL		
		BOYS n=50	GIRLS n=50	BOYS n=50	GIRLS n=50		BOYS n=50	GIRLS n=50	BOYS n=50	GIRLS n=50	
1	Government	19 (38.00)	10 (20.00)	14 (28.00)	16 (32.00)	59 (29.5)	1 (2.00)	1 (2.00)	-	-	2 (1.0)
2	Private	5 (10.00)	4 (8.00)	4 (8.00)	5 (10.00)	18 (9.00)	-	-	-	-	-
3	Casual labourer	14 (28.00)	22 (44.00)	18 (36.00)	20 (40.00)	74 (37.00)	-	-	-	-	-
4	Self employment	12 (24.00)	14 (28.00)	14 (28.00)	9 (18.00)	49 (24.5)	1 (2.00)	-	-	-	1 (0.5)
5	Unemployment	-	-	-	-	-	48 (96.00)	49 (98.00)	50 (100.00)	50 (100.00)	197 (98.50)

Numbers in parenthesis indicate percentage

4.1.1.3 Sibling Constellation

Data regarding number of siblings and ordinal position of respondents in their families are given in Table 10.

Number of siblings: As noted, majority (50.00 per cent) of the sample had only one sibling, 34.50 per cent had two siblings while 4.50 per cent were only child in the families and rest 11.00 per cent had more than two siblings.

Ordinal position: When ordinal positions of subjects were taken majority of them 107 out of 200 (53.50 per cent) were first born while 31.00 per cent were last born and 15.50 per cent middle born.

4.1.1.4 Economic Profile

Kunwar *et al*. (1998) reported that the important determinant of child's health was the socioeconomic status of family. Hence it is inevitable to consider this aspect for the study.

The main features included under this parameter were monthly income and expenditure pattern of the families of the sample.

Monthly income: As not much variance was seen between the monthly income level of respondent families they were divided into different groups in this study for clearer perception. Based on the monthly income of the family they were classified into low income (Rs. ≤ 2250), lower middle (Rs.< 2251–3500), middle income (Rs. 3501–5000), upper middle income (Rs.5001–10,000) and high income (Rs. 10,000–20,000). The table reveals that nearly half of the respondents belonged to low-income group (42.00 per cent) while the rest were mainly from lower middle-income families (30.00 per cent) and middle-income families (17.00 per cent). Only 19 out of 200 (9.50 per cent) were from upper middle-income group while just 1.00 per cent belonged to high-income families (Table 11).

Monthly expenditure pattern: Along with income status, the monthly expenditure pattern especially on food, education and other items were

Table 10. Distribution of respondents based on sibling constellation

Numbers of siblings	Urban		Rural		Total N = 200
	Boys (n=50)	Girls (n=50)	Boys (n=50)	Girls (n=50)	
1. None	1 (2.00)	3 (6.00)	3 (6.00)	2 (4.00)	9 (4.50)
2. One	26 (52.00)	15 (30.00)	24 (48.00)	35 (70.00)	100 (50.00)
3. Two	18 (36.00)	20 (40.00)	18 (36.00)	13 (26.00)	69 (34.50)
4. Three	1 (2.00)	7 (14.00)	3 (6.00)	-	11 (5.50)
5. Four	2 (4.00)	-	2 (4.00)	-	4 (2.00)
6. Five	2 (4.00)	3 (6.00)	-	-	5 (2.50)
7. Six	-	2 (4.00)	-	-	2 (1.00)
Ordinal Position					
1. First	31 (62.00)	21 (42.00)	26 (52.00)	29 (58.00)	107 (53.50)
2. Middle	8 (16.00)	10 (20.00)	7 (14.00)	6 (12.00)	31 (15.50)
3. Last	11 (22.00)	19 (38.00)	17 (34.00)	15 (30.00)	62 (31.00)

Numbers in parenthesis indicate percentage

Table 11. Distribution of respondents based on monthly income

Sl. No.	Income class	Monthly income range	Urban		Rural		Total (N = 200)
			Boys (n = 50)	Girls (n = 50)	Boys (n = 50)	Girls (n = 50)	
1	Low income	≤ 2250	15 (30.0)	17 (34.0)	25 (50.0)	27 (54.0)	84 (42)
2	Lower middle	2251 – 3500	13 (26.0)	22 (44.0)	13 (26.0)	12 (24.0)	60 (30.0)
3	Middle income	3501 – 5000	11 (22.0)	7 (14.0)	9 (18.0)	8 (16.0)	35 (17.5)
4	Upper middle	5001 – 10,000	11 (22.0)	4 (8.0)	2 (4.0)	2 (4.0)	19 (9.50)
5	High income	10,001 – 20,000	-	-	1 (2.0)	1 (2.0)	2 (1.0)

Numbers in parenthesis indicate percentage

assessed to understand how they spent their money. The details of monthly expenditure pattern of the families of the sample, on major items like food, clothing, housing, traveling, education, entertainment, health care, savings and miscellaneous are presented in Table 12.

It was clear from the data that every family studied spent relatively more for food while rest of the money was spent on non-food items. Nearly 86.50 per cent of sample studied spent about Rs. 100–1000 for their food irrespective of the variations in their income level while about 13.50 per cent *i.e.*, 27 out of 200 sample spent more than Rs. 1000 per month on food.

As far as expenditure on non-food items was concerned it was seen that 71.00 per cent of the whole sample spent between Rs. 100–1000 per month for children's education.

The expenditure under housing was comparatively lower where 62.50 per cent spent Rs. 100 - 1000. 3.50 per cent spent more than Rs. 1000.

Another interesting revelation was that the expenditure on transportation was very low compared to other items. Majority (57.50 per cent) spent less than Rs. 100 for traveling per month where as only 49.50 per cent spent Rs. ≤ 100 for miscellaneous purposes. The monthly expenditure on clothing and entertainment was very little, as 56.00 per cent and 45.50 per cent did not spent every month on clothing or entertainment respectively. Moreover, 41.50 per cent did not have any allocation for healthcare. Thirty per cent had no regular savings. And in case of savings 21.50 per cent saved less than Rs. 100 per month.

4.1.1.5 Living Conditions

Details regarding the existing facilities were collected to assess the living conditions of the sample. The parameters included were type of house, availability of basic facilities and conveniences.

Table 12. Distribution of respondents based on monthly expenditure pattern

Sl. No.	Item	Expenditure range in Rs/-	URBAN		RURAL		Total N=200
			BOYS n=50	GIRLS n=50	BOYS n=50	GIRLS n=50	
1	Food	100-500	13 (26.00)	19 (38.00)	29 (58.00)	26 (52.00)	87 (43.50)
		501-1000	26 (52.00)	25 (50.00)	13 (26.00)	22 (44.00)	86 (43.00)
		>1000	11 (22.00)	6 (12.00)	8 (16.00)	2 (4.00)	27 (13.50)
2	Clothing	Nil	27 (54.00)	36 (72.00)	19 (38.00)	30 (60.00)	112 (56.00)
		≤100	1 (2.00)	-	7 (14.00)	4 (8.00)	12 (6.00)
		100-500	14 (28.00)	8 (16.00)	21 (42.00)	14 (28.00)	57 (28.5)
		501-1000	7 (14.00)	5 (10.00)	2 (4.00)	1 (2.00)	15 (7.5)
		>1000	1 (2.00)	1 (2.00)	1 (2.00)	1 (2.00)	4 (2.00)
3	Housing	≤ 100	11 (22.00)	10 (20.00)	25 (50.00)	22 (44.00)	68 (34.00)
		100-500	25 (50.00)	18 (36.00)	25 (50.00)	25 (50.00)	93 (46.50)
		501-1000	9 (18.00)	20 (40.00)	-	3 (6.00)	32 (16.00)
		>1000	5 (10.00)	2 (4.00)	-	-	7 (3.50)
4	Transportation	≤ 100	29 (58.00)	25 (50.00)	34 (68.00)	27 (54.00)	115 (57.50)
		100-500	13 (26.00)	20 (40.00)	15 (30.00)	21 (42.00)	69 (34.50)
		501-1000	8 (16.00)	3 (6.00)	1 (2.00)	2 (4.00)	14 (7.00)
		>1000	-	2 (4.00)	-	-	2 (1.00)
5	Education	≤ 100	11 (22.00)	15 (30.00)	16 (32.00)	11 (22.00)	53 (26.50)
		100-500	26 (52.00)	25 (50.00)	24 (48.00)	20 (40.00)	95 (47.50)
		501-1000	10 (20.00)	10 (20.00)	10 (20.00)	17 (34.00)	47 (23.50)
		>1000	3 (6.00)	-	-	2 (4.00)	5 (2.50)

Table 12. Continued

Sl. No.	Item	Expenditure range in Rs/-	URBAN		RURAL		Total n=200
			BOYS n=50	GIRLS n=50	BOYS n=50	GIRLS n=50	
6	Entertainment	Nil	25 (50.00)	20 (40.00)	21 (42.00)	25 (50.00)	91 (45.50)
		≤ 100	14 (28.00)	17 (34.00)	20 (40.0)	19 (38.00)	70 (35.00)
		100-500	10 (20.00)	13 (26.00)	9 (18.00)	6 (12.00)	38 (19.00)
		501-1000	1 (2.00)	-	-	-	1 (0.50)
7	Health care	Nil	23 (46.00)	25 (50.00)	11 (22.00)	24 (48.00)	83 (41.50)
		≤ 100	19 (38.00)	15 (30.00)	25 (50.00)	12 (24.00)	71 (35.50)
		100-500	7 (14.00)	10 (20.00)	12 (24.00)	13 (26.00)	42 (21.00)
		501-1000	1 (2.00)	-	1 (2.00)	1 (2.00)	3 (1.50)
		>1000	-	-	1 (2.00)	-	1 (0.50)
8	Savings	Nil	19 (38.0)	7 (14.00)	18 (36.00)	16 (32.00)	60 (30.00)
		≤ 100	4 (8.00)	12 (24.00)	13 (26.00)	14 (28.00)	43 (21.50)
		100-500	9 (18.00)	15 (30.00)	11 (22.00)	6 (12.00)	41 (20.50)
		501-1000	9 (18.00)	9 (18.00)	6 (120.0)	10 (20.00)	34 (17.00)
		>1000	9 (18.00)	7 (14.00)	2 (4.00)	4 (8.00)	22 (11.00)
9	Miscellaneous	≤ 100	19 (38.0)	27 (54.00)	23 (46.00)	30 (60.00)	99 (49.50)
		100-500	20 (40.00)	23 (46.00)	18 (36.00)	19 (38.00)	80 (40.00)
		501-1000	11 (22.00)	-	7 (14.00)	1 (2.00)	19 (9.50)
		>1000	-	-	2 (4.00)		2 (1.00)

Numbers in parenthesis indicate percentage

Type of house: Under the head, the type of house, the roof, floor and wall of the houses studied to find out their living condition and found that majority (90.50 per cent) of adolescents had their own house, while 6.00 per cent resided in rented house and 3.50 per cent resided in quarters. In case of the roof of houses 60.50 per cent of the houses had concrete roof, 17.50 per cent had tiled roof while 15.00 per cent had sheets as roof and 7.00 per cent had thatched roof. Table 13 indicated that about 128 (64.00 per cent) of the sample had brick walls for their houses, while 25.50 per cent had stonewalls and 21 (10.50 per cent) had mud wall. Regarding the floor of house, it was shown that majority of them *i.e.,* 130 (65.00 per cent) had concreted floors while 22.00 per cent had mosaic floors and the rest 13.00 per cent had tiled floors, No houses with mud or cowdung floors were seen.

Basic utility services: The basic utility services present in the houses of the sample were considered and is given in Table 14. In case of water, 77 per cent of rural families and 41.00 per cent of urban families had their own well in their houses.

Majority of their houses had electricity and electrical appliances *i.e.,* 99.00 per cent of urban houses and 93.00 per cent of rural houses had electricity. Only one houses, of the urban sample and 7.00 per cent of houses in rural sample were not electrified but use kerosene lamps.

All families studied had latrines in their houses irrespective of regional difference. But more houses in urban area had attached latrines while attached latrines were seen only in few houses in the rural areas. So also the difference could be noted in the number of latrines present also. When 65.00 per cent had at least one latrine in their house, 25.00 per cent had two latrines and 9.50 per cent had three latrines in their houses.

However, in case of waste disposal, 60.00 per cent had own pits while, 12.50 per cent had no waste disposal facilities at all. 19.00 per cent had common pit for waste disposal facility in their area while 8.50 per cent

Table 13. Distribution of respondents based on type of house

	Urban		Rural		Total (N = 200)
	Boys (n = 50)	Girls (n = 50)	Boys (n = 50)	Girls (n = 50)	
House					
Own	44 (88.00)	46 (92.00)	41 (82.00)	50 (100.00)	181 (90.50)
Rented	4 (8.00)	2 (4.00)	6 (12.00)	-	12 (6.00)
Quarter	2 (4.00)	2 (4.00)	3 (6.00)	-	7 (3.50)
Roof					
Concrete	39 (78.00)	27 (54.00)	25 (50.00)	30 (60.00)	121 (60.50)
Tiled	8 (16.00)	15 (30.00)	7 (14.00)	5 (10.00)	35 (17.50)
Sheet	2 (4.00)	8 (16.00)	13 (26.00)	7 (14.00)	30 (15.00)
Thatched	1 (2.00)	-	5 (10.00)	8 (16.00)	14 (7.00)
Wall					
Brick wall	41 (82.00)	22 (44.00)	30 (60.00)	35 (70.00)	128 (64.00)
Stone wall	6 (12.00)	27 (54.00)	10 (20.00)	8 (16.00)	51 (25.50)
Mod wall	3 (6.00)	1 (2.00)	10 (20.00)	7 (14.00)	21 (10.50)
Floor					
Mosaic	9 (18.00)	10 (20.00)	7 (14.00)	18 (36.00)	44 (22.00)
Tiled	10 (20.00)	10 (20.00)	4 (8.00)	2 (4.00)	26 (13.00)
Concrete	31 (62.00)	30 (60.00)	39 (78.00)	30 (60.00)	130 (65.00)

Numbers in parenthesis indicate percentage

Table 14. Distribution of respondents based on necessities available

	Urban		Rural		Total (N = 200)
	Boys (n = 50)	Girls (n = 50)	Boys (n = 50)	Girls (n = 50)	
Water					
Own well	11 (22.00)	9 (18.00)	34 (68.00)	33 (66.00)	87 (43.50)
Common well	2 (4.00)	3 (6.00)	4 (8.00)	1 (2.00)	10 (5.00)
Municipality	5 (10.00)	-	1 (2.00)	1 (2.00)	7 (3.50)
Corporation	21 (42.00)	20 (40.00)	2 (4.00)	4 (8.00)	47 (23.50)
Common pipe	11 (22.00)	18 (36.00)	9 (18.00)	11 (22.00)	49 (24.50)
Light					
Electricity	49 (98.00)	50 (100.00)	45 (90.00)	48 (96.00)	192 (96.00)
Kerosene	1 (2.00)	-	5 (10.00)	2 (4.00)	17 (8.50)
Latrine					
Present	50 (100.00)	50 (100.00)	50 (10.00)	50 (100.00)	200 (100.00)
Attached	20 (40.00)	12 (24.00)	9 (18.00)	23 (46.00)	64 (32.00)
No. 1	28 (56.00)	38 (76.00)	39 (78.00)	25 (50.00)	130 (65.00)
No. 2	17 (34.00)	9 (18.00)	8 (16.00)	17 (34.00)	51 (25.50)
No. 3	5 (10.00)	3 (6.00)	3 (6.00)	8 (16.00)	19 (9.50)
Waste disposal					
Own pith	19 (38.00)	19 (38.00)	39 (78.00)	43 (86.00)	120 (60.00)
Common pith	12 (24.00)	16 (32.00)	4 (8.00)	6 (12.00)	38 (19.00)
Municipality	14 (28.00)	2 (4.00)	1 (2.00)	-	17 (8.50)
None	5 (10.00)	13 (26.00)	6 (12.00)	1 (2.00)	25 (12.50)

Numbers in parenthesis indicate percentage

make use of municipality facilities. Region wise difference can be noted between rural and urban families *i.e.,* more rural families used own pit for waste disposal while in urban families other provision like common pit and municipality services were available.

Conveniences available: As the technology advances most of houses had better facilities, which include electrical appliances, transport facilities, printed media and kitchen appliances. In case of electrical appliances about 29.00 per cent had at least two electrical appliances like television and tape recorder for entertainment when 27.00 per cent had three electrical appliances, very few (1.50 per cent) had five electrical appliances in their houses. Not much variation was seen between rural and urban families.

In case of transport facilities, data presented revealed that majority (53.50 per cent) had at least one vehicle while 22.50 per cent had no vehicle of their own and rest had two or three vehicles in their houses.

In case of printed media, when 40.50 per cent subscribe for newspaper 24.50 per cent did not have any. The pattern was more or less similar in urban and rural families.

As indicated in Table 15 in case of labour saving kitchen appliances 21 per cent had five kitchen appliances *viz*., refrigerator, gas stove, mixy, grinder and pressure cooker and 1.50 per cent had six kitchen appliances while 13.50 per cent had no such kitchen appliances at all. Much of the labour saving kitchen appliances were seen in urban areas than in rural areas.

4.1.1.6 Leisure Time Activity

When leisure time activities indulged by the respondents were studied not much variation could be observed between boys and girls or urban and rural sample (Table 16).

Table 15. Distribution of respondents based on convenience available

	Urban		Rural		Total (N = 200)
	Boys (n = 50	Girls (n = 50)	Boys (n = 50	Girls (n = 50)	
Electrical appliances					
One	11 (22.00)	8 (16.00)	20 (40.00)	8 (16.00)	47 (23.50)
Two	14 (28.00)	16 (32.00)	15 (30.0)	13 (26.00)	58 (29.00)
Three	11 (22.0)	18 (36.00)	7 (14.00)	18 (36.00)	54 (27.00)
Four	11 (22.0)	8 (16.00)	8 (16.00)	11 (22.00)	38 (19.00)
Five	3 (6.00)	-	-	-	3 (1.50)
Transport facilitates					
None	8 (16.00)	10 (20.00)	13 (26.00)	14 (28.00)	45 (22.50)
One	26 (52.00)	26 (52.00)	28 (56.00)	27 (54.00)	107 (53.50)
Two	11 (22.00)	14 (28.00)	9 (18.00)	8 (16.00)	42 (21.00)
Three	5 (10.00)	-	-	1 (2.00)	6 (3.00)
Printed media					
None	13 (26.00)	6 (12.00)	18 (36.00)	12 (24.00)	49 (24.50)
One	18 (36.00)	17 (34.00)	18 (36.00)	28 (56.00)	81 (40.50)
Two	14 (28.00)	21 (42.00)	14 (28.00)	6 (12.00)	55 (27.50)
Three	3 (6.00)	6 (12.00)	-	4 (8.00)	13 (6.50)
Four	2 (4.00)	-	-	-	2 (1.00)
Kitchen appliance					
None	2 (4.00)	5 (10.00)	15 (30.00)	5 (10.00)	27 (13.50)
One	5 (10.00)	12 (24.00)	11 (22.00)	12 (24.00)	40 (20.00)
Two	6 (12.00)	9 (18.00)	3 (6.00)	6 (12.00)	24 (12.00)
Three	11 (22.00)	13 (26.00)	6 (12.00)	7 (14.00)	37 (18.50)
Four	12 (24.00)	5 (10.00)	4 (8.00)	6 (12.00)	27 (13.50)
Five	11 (22.00)	6 (12.00)	11 (22.00)	19 (28.00)	42 (21.00)
Six	3 (6.00)	-	-	-	3 (1.50)

Numbers in parenthesis indicate percentage

Table 16. Distribution of respondents based on leisure time activity

Sl. No.	Leisure time activities	Urban		Rural		Total (N = 200)
		Boys (n=50)	Girls (n=50)	Boys (n=50)	Girls (n=50)	
1	Watching TV	25 (50.00)	23 (46.00)	16 (32.00)	23 (46.00)	87 (43.50)
2	Listening to music	9 (18.00)	16 (32.00)	8 (16.00)	13 (26.00)	46 (23.00)
3	Watching movies	7 (14.00)	8 (16.00)	9 (18.00)	1 (2.00)	25 (12.50)
4	Reading	6 (12.00)	1 (2.00)	9 (18.00)	8 (16.00)	26 (13.00)
5	Telephoning	1 (2.00)	-	1 (2.00)	-	2 (1.00)
6	Computer game	-	-	4 (8.00)	-	4 (2.00)
7	Hobby	-	2 (4.00)	3 (6.00)	3 (6.00)	8 (4.00)
8	Day dreaming	2 (4.00)	-	-	2 (4.00)	4 (2.00)

Numbers in parenthesis indicate percentage

Majority of adolescents of urban and rural spent their leisure time by watching television *i.e.,* about 48.00 per cent and 39.00 per cent respectively. Next to television viewing, preference was given to listening to music *i.e.,* about 25.00 per cent of urban and 21.00 per cent of rural adolescents liked to listen to music during their leisure time. Besides, this going for movies another past time enjoyed by 15.00 per cent of urban adolescents and 10.00 per cent of rural adolescents. Only a few were interested in reading. Rural boys (18.00 per cent) were more interested in reading than urban boys, whereas urban girls showed very little interest in reading. Eight per cent of rural boys spent their leisure time on computer game. While 6.00 per cent of rural adolescent boys and girls indulged in some hobbies during their leisure time only 4.00 per cent of urban girls spent their time on hobbies and the urban boys did not indulged in hobbies at all. The table revealed that all of the adolescents did not spend time on day dreaming when 4.00 per cent of urban boys and 4.00 per cent of rural girls

revealed that they day dream during leisure time.

4.1.1.7 Sources of Information

The main sources of information regarding nutrition, health and food for adolescents were given in Table 17.

Table 17. Distribution of respondents based on sources of information on food, nutrition and health

Sl. No.	Sources of information	Urban		Rural		Total N = 200
		Boys (n=50)	Girls (n=50)	Boys (n=50)	Girls (n=50)	
1	Person	45 (90.00)	42 (84.0)	46 (92.00)	48 (96.00)	181 (90.50)
2	Print	2 (4.00)	4 (8.00)	2 (4.00)	2 (4.00)	10 (5.00)
3	Media	3 (6.00)	4 (8.00)	2 (4.00)	-	9 (4.50)

Numbers in parenthesis indicate percentage

It revealed that 90.00 per cent of urban boys got information regarding food, nutrition and health from their mothers. Six per cent got information through mass media particularly television and 4.00 per cent received information through printed media *i.e.*, newspaper whereas in case of girls 84.00 per cent of urban girls got information from people *i.e.,* not only from mothers but also from siblings, teachers etc. About 8.00 per cent depended on printed and electronic media for information. Everyone regardless of region and sex difference received a part of information from textbook and teachers. In case of rural adolescents 92.00 per cent of boys and 96.00 per cent of girls get their information on food, nutrition and health mainly from mothers and then teachers. Very few (2.00 per cent) of them depended on printed media while 4.00 per cent of rural boys depended on electronic media.

4.1.2 Health and Nutritional Status

A General health and nutritional status of the sample were also assessed. Questions regarding their birth history, health status,

immunization and record of illness were included in the interview schedule. Birth weight of majority (64.00 per cent) were found to be normal, 24.00 per cent of the respondents' birth weight were found to be below normal whereas only 12.00 per cent of respondents' birth weight were above normal. But the birth lengths of the respondents' were not available as it was not noted by the parents at the time of birth. In case of delivery, majority (98.00 per cent) of the respondents were delivered normally while two per cent were born by caesarian. Immunisation was given to all the respondents in time as per schedule. In addition to this only few reported the record of illness like mumps and diarrhoea.

Anthropometry is one of the most frequently used methods for assessing nutritional status. Parameters like height, weight, BMI of the sample were taken into consideration.

The height and weight of the respondents were measured and these ranged from 150–189 cm and 40–80 kg respectively for urban boys, 144–168 cm and 36–65 per kg respectively for urban girls 154–185 cm and 38–75 kg respectively for rural boys and 142–173 cm and 36–67 kg respectively for rural girls (Fig. 2).

According to Gomez classification, malnutrition was classified into severe, moderate, mild and normal based on the degree of severity. As indicated in Table 18, majority (63.00 per cent) of them came under normal group with no malnutrition while 33.50 per cent came under the mildly malnourished group.

According to Mc Larens' classification based on height for age, the sample was classified as dwarf, short and normal. The result indicated in Table 19, that majority (97.50 per cent) were normal and only 2.50 per cent came under the short group.

As indicated in the Table 20 height of sample of different age groups were grouped based on percentiles. The data revealed that among
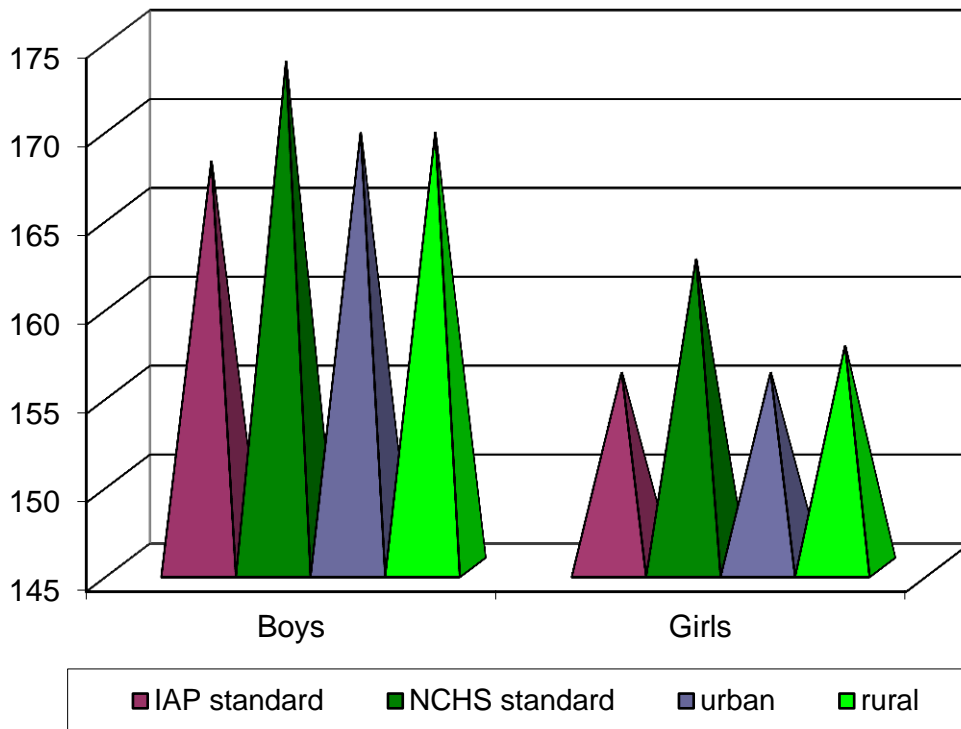
Fig. 1 Mean height of the respondents
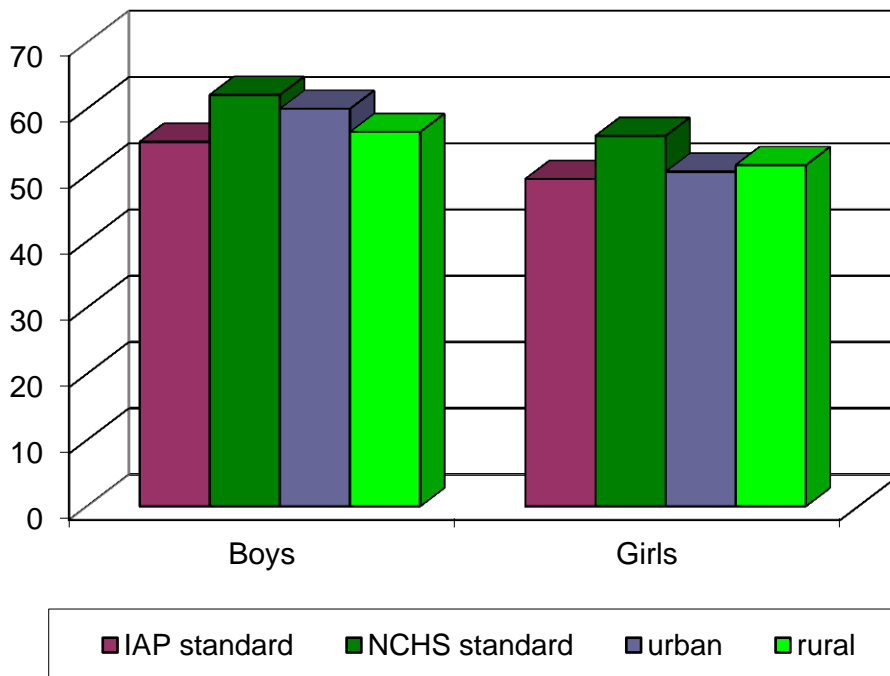
Fig. 2 Mean weight of the respondents

Table 18. Classification based on degree of malnutrition assessed through weight for age profile (Gomez)

Cut-off level as percentage of NCHS median	Type/degree of malnutrition	Urban n = 100		Rural n = 100		Total (N = 200)
		Boys (n = 50)	Girls (n = 50)	Boys (n = 50)	Girls (n = 50)	
< 60	Severe	-	-	-	-	-
60 – 75	Moderate	1 (2.00)	2 (4.00)	2 (4.00)	2 (4.00)	7 (3.50)
75 – 90	Mild	16 (32.00)	14 (28.00)	16 (32.00)	21 (42.00)	67 (33.50)
> 90	Normal	33 (66.00)	34 (68.00)	32 (64.00)	27 (54.00)	126 (63.00)

Numbers in parenthesis indicate percentage

Table 19. Classification based on height for age profile (Mc Larens)

Cut-of level as percentage of NCHS median	Classification	Urban		Rural		Total (N = 200)
		Boys (n = 50)	Girls (n = 50)	Boys (n = 50)	Girls (n = 50)	
80 %	Dwarf	-	-	-	-	-
80 – 93 %	Short	2 (4.00)	1 (2.00)	-	2 (4.00)	5 (2.50)
93 – 105 %	Normal	48 (96.00)	49 (98.00)	50 (100.00)	48 (96.00)	195 (97.50)

Numbers in parenthesis indicate percentage

Table 20. Distribution of respondents on height for age

Age	Area	*Percentiles												Total
		3rd		10th		25th		50th		75th		97th		
		Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	
15.5	Urban	-	-	-	-	1	-	2	3	1	2	2	-	11
	Rural	-	1	1	4	2	5	3	4	8	5	7	2	42
16.0	Urban	-	-	-	-	-	-	-	-	-	-	-	-	-
	Rural	-	-	-	-	1	2	-	-	1	-	-	-	4
16.5	Urban	2	1	-	-	3	8	8	12	9	7	3	7	60
	Rural	-	3	-	2	7	2	7	6	6	7	1	3	44
17.5	Urban	1	-	1	-	2	4	2	1	5	3	3	2	24
	Rural	2	2	-	1	-	1	1	-	1	-	1	-	9
18.0	Urban	-	-	-	-	1	-	-	-	2	-	2	-	5
	Rural	-	-	-	-	-	-	-	-	1	-	-	-	1
Total		5	7	2	7	17	22	23	26	34	24	19	14	200

* IAP standard for affluent children for 15 – 18 years of age

adolescents boys 34.00 per cent were under 75th percentiles and 23.00 per cent belonged to 50th percentiles. It was noted that 19.00 per cent belonged to 97th percentiles and rest were below 50th percentiles mainly 25th, 10th and third percentiles. Similarly in case of girls, 26.00 per cent belonged to 50th percentile, 24.00 per cent to 75th, 14.00 per cent to 97th percentile and rest came below 50th percentiles mainly 25th, 10th and third percentiles. Table 21 showed the distribution of sample based on weight for age. In case of boys 7.00 per cent were under 97th percentiles, 13.00 per cent under 75th percentiles, 36.00 per cent were under 50th percentiles and rest were below 50th percentiles, while in case of girls, 30.00 per cent belonged to 50th, 19.00 per cent were under 75th percentiles and only one per cent were under 97th percentile. The rest of the respondents were below 50th percentile.

4.1.2.1 Body Mass Index

Body mass index (BMI) expressed as the ratio of weight to height squares (weight, (kg) / height^2 (m)) could be used as a good parameter to grade Chronic Energy Deficiency (CED) (Nutrition News, 1991). Relevant anthropometric data were utilized to develop certain approved indices inorder to assess health and nutritional status of the subjects. Thus BMI of the subjects were worked out using their actual weight and height and the details are presented in Table 22. Scrutiny of the data revealed that when 38.50 per cent were normal, 28.00 percent had mild CED, 17.00 per cent had moderate CED and 14.00 per cent had severe CED. So also 2.50 per cent had grade I over weight.

Classification based on Eliz Health Path for Adolescents (EHPA)

The Eliz Health Path for Adolescents (EHPA) shows that reading within the green zone is normal *i.e.,* from 15–22. Reading below BMI 15 indicates underweight, reading above 22 indicate overweight and above 25 indicates obesity among adolescents (Fig. 3).

Table 21. Distribution of respondents based on weight for age

Age	Area	*Percentiles												Total
		3rd		10th		25th		50th		75th		97th		
		Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	
15.5	Urban	-	-	-	-	1	2	3	2	1	1	1	-	11
	Rural	-	3	2	3	4	4	9	5	4	6	2	-	42
16.0	Urban	-	-	-	-	-	-	-	-	-	-	-	-	-
	Rural	-	-	2	-	-	-	-	2	-	-	-	-	4
16.5	Urban	1	3	4	5	7	8	8	13	3	5	2	1	60
	Rural	1	4	3	5	6	5	8	5	3	4	-	-	44
17.5	Urban	3	-	3	1	2	3	5	3	-	3	1	-	24
	Rural	1	-	1	1	1	3	1	-	1	-	-	-	9
018.0	Urban	-	-	-	-	2	-	1	-	1	-	1	-	5
	Rural	-	-	-	-	-	-	1	-	-	-	-	-	1
Total		6	10	15	15	23	25	36	30	13	19	7	1	200

* IAP standard for affluent children for 15 – 18 years of age

Table 22. Distribution of respondentss based on BMI

BMI	Urban		Rural		Total (N = 200)
	Boys (n = 50)	Girls (n = 50)	Boys (n = 50)	Girls (n = 50)	
Under weight Severe < 16.00 kg /m^2	9 (18.00)	6 (12.00)	8 (16.00)	5 (10.00)	28 (14.00)
Moderate 17.00 – 18.49 kg /m^2	8 (16.00)	8 (16.00)	10 (20.00)	8 (16.00)	34 (17.00)
Mild 17.00 – 18.49 kg /m^2	12 (24.00)	15 (30.00)	15 (30.00)	14 (28.00)	56 (28.00)
Normal 18.5 – 25.00 kg /m^2	19 (38.00)	20 (40.00)	17 (34.00)	21 (42.00)	77 (38.50)
Overweight Grade I : 25.00 – 29.99 kg /m^2	2 (4.00)	1 (2.00)		2 (4.00)	5 (2.50)

Numbers in parenthesis indicate percentage

According to EHPA classifications of sample majority (90.50 per cent) were normal, 5.00 per cent were underweight, 3.00 per cent were over weight and 1.50 per cent were obese as shown in Table 23.

4.1.2.2 Clinical Examination

Clinical examination of the subjects was conducted to assess the presence of nutritional deficiency disorders and symptoms. Majority of them had no prominent deficiency disorders except anaemia. When clinical deficiency symptoms were assessed the few symptoms detected were given in the Table 24. The symptoms detected were anaemia, thyroid enlargement, bleeding gum, mottled enamel, angular stomatitis and lack of lustre in hair. About 40.50 per cent were normal without anaemia or any other deficiency symptoms. The thyroid enlargement was seen among 12.50 per cent and other symptoms like bleeding gum, angular stomatitis and lack of lustre were prevalent in mild form in 6.00 per cent and 2.00 per cent respectively.

4.1.3 Dietary Pattern

4.1.3.1 Food Use Frequency

The frequency of use of different foods in general meal pattern was assessed by means of a checklist in which a number of common and locally popular food items in each of the major food groups were listed down and the respondents rated it according to their frequency of use ranging from daily use to very rare use. The details of frequency of use of food were calculated based on the modality suggested by Reaburn *et al*. (1979). The mean food use frequency score computed for urban and rural adolescents on the basis of the frequency of consumption of each item are given in Table 25.

The data presented in the table revealed that both urban and rural boys and girls secure a food use frequency score of 100 with respect to consumption of cereals, nuts and oil seeds, condiments and spices, fats and edible oils, sugar and jaggery, etc.

Table 23. Distribution of respondents based on EHPA

BMI	Urban		Rural		Total (N = 200)
	Boys (n = 50)	Girls (n = 50)	Boys (n = 50)	Girls (n = 50)	
Under weight < 15	4 (8.00)	2 (4.00)	3 (6.00)	1 (2.00)	10 (5.00)
Normal 15 – 22	43 (86.00)	45 (90.00)	47 (94.00)	46 (92.00)	181 (90.50)
Overweight 22 – 25	1 (2.00)	2 (4.00)	-	3 (6.00)	6 (3.00)
Obesity 25 - 30	2 (4.00)	1 (2.00)	-	-	3 (1.50)

Numbers in parenthesis indicate percentage
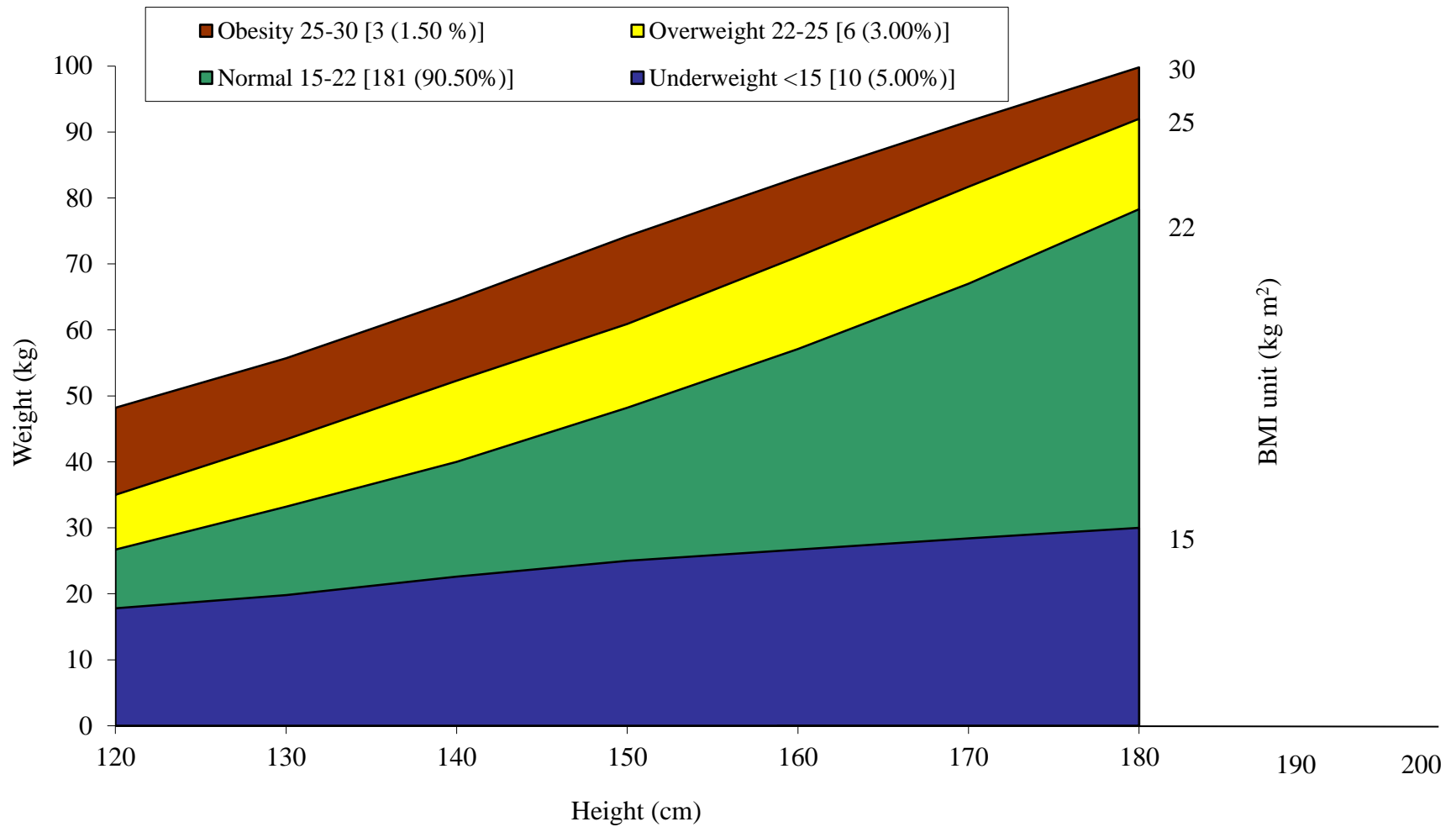
Fig. 3 BMI classification based on Eliz Health Path for adolescent (EHPA)

Table 24. Distribution of respondents based on nutritional deficiency symptoms

Symptoms		Severe	Moderate	Mild	Nil
Lack lustre	UB				50 (100.00)
	UG				50 (100.00)
	RB			3 (6.00)	47 (94.00)
	RG			1 (2.00)	49 (98.00)
Total				4 (2.00)	196 (98.00)
Angular stomatitis	UB				50.0 (100.00)
	UG				50.0 (100.00)
	RB			6 (12.00)	44 (88.00)
	RG			6 (12.00)	44 (88.00)
Total				12 (6.00)	188 (94.00)
Mottled enamel	UB			1 (2.00)	49 (98.00)
	UG				50 (100.00)
	RB			3 (6.00)	47 (94.00)
	RG			6 (12.00)	44 (88.00)
Total				10 (5.00)	190 (95.00)
Bleeding gum	UB				50 (100.00)
	UG				50 (100.00)
	RB		2 (4.00)	3 (6.00)	45 (90.00)
	RG		1 (2.00)	5 (10.00)	44 (88.00)
Total			3 (1.50)	8 (4.00)	189 (94.50)
Thyroid enlargement	UB				50 (100.00)
	UG			10 (20.00)	40 (80.00)
	RB			9 (18.00)	41 (82.50)
	RG			6 (12.00)	44 (88.00)
Total				25 (12.50)	175 (87.50)
Anaemia	UB		6 (12.00)	16 (32.00)	28 (56.00)
	UG	6 (12.00)	20 (40.00)	11 (22.00)	13 (26.00)
	RB		6 (12.00)	9 (18.00)	35 (70.00)
	RG	3 (6.00)	21 (42.00)	21 (42.00)	5 (10.00)
Total		9 (4.50)	53 (26.50)	57 (28.50)	81 (40.50)

Numbers in parenthesis indicate percentage

Table 25. Distribution of respondents based on food use frequency score

Food groups	Urban		Rural	
	Boys (n=50)	Girls (n=50)	Boys (n=50)	Girls (n=50)
Cereals	100.00	100.00	100.00	100.00
Millets	49.00	47.00	38.00	62.00
Pulses	80.50	79.00	81.50	74.50
Leafy vegetables	77.00	76.00	73.00	75.00
Roots and tubers	96.50	95.50	95.00	100.00
Other vegetables	84.50	89.00	83.00	90.00
Nuts and oil seeds	100.00	100.00	100.00	100.00
Condiments & spices	100.00	100.00	100.00	100.00
Fruits	94.00	92.00	89.00	95.50
Meat	64.00	72.00	58.50	66.50
Poultry	66.50	66.50	71.50	71.50
Fish	70.00	80.50	74.00	67.00
Milk and Milk products	96.00	97.00	97.50	100.00
Fats and edible oils	100.00	100.00	100.00	100.00
Sugars	100.00	100.00	100.00	100.00

Among vegetables, consumption of roots and tubers were high compared to other vegetables where it ranged from 95.00 per cent to 100.00 per cent whereas in case of leafy vegetables frequency of use was very low and ranged from 73.00 per cent to 77.00 per cent. But in case of other vegetables frequency of consumption was slightly higher than leafy vegetables and ranged from 83.00 per cent to 90.00 per cent. Moreover, the table indicated that the use of vegetables was more frequent among girls both in rural and urban areas than boys. The use of leafy vegetables was more frequent in urban boys than rural boys.

In case of millets, frequency score showed that use of millet was very low compared to other groups. The frequency of consumption of pulses was 74.50 per cent to 81.50 per cent respectively in rural girls and boys. But in case of fruits, use of it was comparatively high among rural girls *i.e.,* 95.50 per cent compared 92.00 per cent in urban girls whereas it was 94.00 per cent for urban boys and 89.00 per cent for rural boys.

In case of consumption of animal foods like milk, fish, poultry and meat, consumption of milk the score ranged from 96.00 per cent to 100.00 per cent. Next to milk, the consumption of fish was high and ranged from 67.00 per cent to 80.50 per cent. The use of fish was high among urban girls compared to other groups. Among meat and poultry, the use of poultry was high among rural adolescents *i.e.*, 71.50 per cent. However, a clear cut variation in use of meat was detected. The frequency score was very low 58.50 per cent for rural boys and comparatively quite high, 72.00 per cent for urban girls.

4.1.3.2 Food Preference

As in food use frequency, the preference for food items in different food groups was assessed using a checklist (Table 26). In addition to food groups other items such as different food preparations (main dishes), snacks (ready to eat), desserts and beverages were also included. Preference score of different food groups and other items were calculated using the same method as suggested by Reaburn *et al*. (1979).

Table 26. Distribution of respondents based on food preference score

Food groups	Urban		Rural	
	Boys (n=50)	Girls (n=50)	Boys (n=50)	Girls (n=50)
Cereals	98.00	98.50	100.00	93.50
Millets	70.00	41.00	68.00	56.00
Pulses	96.00	98.00	97.50	90.50
Leafy vegetables	92.50	98.00	87.00	90.00
Roots and tubers	99.00	98.50	98.50	100.00
Other vegetables	99.50	95.50	93.00	100.00
Nuts and oil seeds	100.00	98.50	99.50	100.00
Condiments and spices	97.00	100.00	100.00	100.00
Fruits	100.00	100.00	96.00	100.00
Meat	95.00	80.00	87.50	94.50
Poultry	70.00	86.00	71.50	97.00
Fish	90.00	93.50	90.50	87.00
Milk and Milk products	96.50	98.00	90.50	97.00
Fats and edible oils	97.50	99.50	100.00	94.00
Sugars	100.00	100.00	100.00	100.00
Food preparation	100.00	100.00	100.00	100.00
Snack	100.00	100.00	100.00	100.00
Desserts	91.00	98.00	89.00	95.00
Beverages	99.00	99.50	91.00	100.00

The preference score for cereals in rural area was 93.50 for girls and 100.00 for boys and the preference was more or less similar among urban boys and girls *i.e.,* about 98.00 and 98.50 respectively. The preference for millets among girls was much lower and it ranged from 41.00 to 56.00 per cent whereas preference score for leafy vegetable was 87.00 to 98.00 per cent and for other vegetables, the preference for roots and tubers was more and it ranged from 98.50 to 100 percent whereas preference score for leafy vegetable was 87.00 to 98.00 per cent and for other vegetables it was 93.00 per cent to 100.00 per cent.

Preference for nuts and oil seeds, condiments and spices was rather high *i.e.*, it ranged from 98.50 per cent to 100.00 per cent and 97.00 per cent to 100.00 per cent respectively. The result regarding the preference for milk was high when compared with other animal foods and ranged from 90.50 to 98.00 per cent. The preference for meat was also high among urban boys *i.e.*, 95 per cent compared to other groups and this score ranged from 80.00 per cent to 95.00 per cent. A very high preference was given for poultry by rural girls *i.e.*, 97.00 per cent but only 70.00 per cent urban boys preferred poultry. The preference of fish was high among urban girls and *i.e.*, about 93.50 per cent while comparing with other groups.

In case of other items, such as food preparation, snacks, desserts and beverages, the preference score for food preparation and snacks was high *i.e.*, 100.00 per cent. The preference for desserts as well as for beverage was also high *i.e.*, about 89.00 to 98.00 per cent and 91.00 per cent to 100.00 per cent respectively. The preference for desserts as well as for beverages was rather high among urban adolescents when compared to rural.

4.1.4 Knowledge Regarding Nutrition, Health and Food

The respondents' knowledge regarding nutrition, health and food were assessed using knowledge scales. Data obtained were scored and were

grouped into five groups like those with excellent knowledge, good knowledge, average knowledge, poor knowledge and very poor knowledge and details are presented in Table 27.

Regarding the knowledge on nutrition 48.00 per cent of urban boys 24.00 per cent of urban girls, 22.00 per cent of rural boys and 28.00 per cent of rural girls had good knowledge. When majority (76.00 per cent) of rural boys had average knowledge on nutrition, 60.00 per cent of rural girls, 42.00 per cent of urban boys and 68.00 per cent of urban girls had average knowledge on nutrition. But very few had poor knowledge among boys and girls both in rural and urban region *i.e.*, 6.00 per cent of rural boys, 12.00 per cent of rural girls, 10.00 per cent of urban boys and 8.00 per cent of urban girls.

Similarly, when knowledge on health was considered regional difference was noted and sex wise difference was seen only in urban sample. It was noted that 48.00 per cent of adolescents in rural area and 40.00 per cent of urban boys and 54.00 per cent of urban girls had good and correct knowledge on health. Similarly 46.00 per cent of rural boys, 34.00 per cent of rural girls, 46.00 per cent of urban boys and 42.00 per cent of urban girls had average knowledge whereas only 10.00 per cent of urban boys, 2.00 per cent of urban girls, 6.00 per cent of rural boys and 10.00 per cent of rural girls had poor knowledge. About 4.00 per cent of urban boys, 2.00 per cent urban girls and 8.00 per cent rural girls had excellent knowledge regarding health.

In case of knowledge regarding food when 54.00 per cent of rural boys, 38.00 per cent of rural girls, 48.00 per cent of urban boys and 30.00 per cent of urban girls had average knowledge, 38.00 per cent of rural girls, 30.00 per cent rural boys and 64.00 per cent of urban girls and 48.00 per cent of urban boys had good knowledge. 18.00 per cent of rural girls had excellent knowledge regarding food aspects compared to urban girls (6.00 per cent), urban boys (4.00 per cent) and rural boys (2.00 per cent).

Table 27. Distribution of respondents based on knowledge regarding nutrition, health and food

	Nutrition				Health				Food			
	Urban		Rural		Urban		Rural		Urban		Rural	
	Boys (n = 50)	Girls (n = 50)	Boys (n = 50)	Girls (n = 50)	Boys (n = 50)	Girls (n = 50)	Boys (n = 50)	Girls (n = 50)	Boys (n = 50)	Girls (n = 50)	Boys (n = 50)	Girls (n = 50)
Excellent >16	-	-	-	-	2 (4.00)	1 (2.00)	-	4 (8.00)	2 (4.00)	3 (6.00)	1 (2.00)	9 (18.00)
Good 12 – 16	24 (48.00)	12 (24.00)	11 (22.00)	14 (28.00)	20 (40.00)	27 (54.00)	24 (48.00)	24 (48.00)	24 (48.00)	32 (64.00)	15 (30.00)	19 (38.00)
Average 8 – 12	21 (42.00)	34 (68.00)	36 (76.00)	30 (60.00)	23 (46.00)	21 (42.00)	23 (46.00)	17 (34.00)	24 (48.00)	15 (30.00)	27 (54.00)	19 (38.00)
Poor 4 – 8	5 (10.00)	4 (8.00)	3 (6.00)	6 (12.00)	5 (10.00)	1 (2.00)	3 (6.00)	5 (10.00)	-	-	7 (14.00)	3 (6.00)

Numbers in parenthesis indicate percentage

4.1.5 Attitude towards Nutrition, Health and Food

The respondent's attitudes regarding nutrition, health and food were assessed using a five point Likert scale. The result presented in Table 28 revealed that 2.00 per cent urban girls showed a strong positive and right attitude towards nutrition whereas 92.00 per cent of urban girls, 88 per cent of rural girls, 80.00 per cent of rural boys and 60.00 per cent of urban boys showed a favourable attitude though it was not so strong. The rest 40.00 per cent of urban boys had average attitude towards nutrition, which included both positive and negative view.

In case of their attitude towards health, Table 28 revealed that about 16.00 per cent rural girls had a positive attitude whereas 78 per cent of urban boys, 90 per cent of urban girls, 82.00 per cent rural boys and 82.00 per cent rural girls had favourable attitude and only 6.00 per cent of urban boys, 2.00 per cent of urban girls, 6.00 per cent rural boys and 2.00 per cent rural girls had average outlook.

The table also revealed the attitude of urban and rural respondents towards food aspects in which only a few, *i.e.,* 2.00 per cent of urban boys, 4.00 per cent of urban girls and 2.00 per cent of rural girls had strong positive and right attitude whereas majority 78.00 per cent of urban boys, 84.00 per cent of urban girls, 84.00 per cent urban boys and 66 per cent of rural girls had favourable attitude. 20.00 per cent of urban boys 12.00 per cent of urban girls, 16.00 per cent of rural boys and 32.00 per cent of rural girls had average score towards food aspect, which include both positive and negative view.

Interestingly, not a single respondent expressed a purely negative or wrong attitude towards nutrition, health and food.

4.1.6 Gender Specific Roles and Relations

Gender specific roles and relations play a vital role in this society besides dietary attitude, preferences, adequacy etc. From the survey it

Table 28. Distribution of respondents based on attitude towards nutrition, health and food

	Nutrition				Health				Food			
	Urban		Rural		Urban		Rural		Urban		Rural	
	Boys (n = 50)	Girls (n = 50)	Boys (n = 50)	Girls (n = 50)	Boys (n = 50)	Girls (n = 50)	Boys (n = 50)	Girls (n = 50)	Boys (n = 50)	Girls (n = 50)	Boys (n = 50)	Girls (n = 50)
Excellent	-	1 (2.00)	-	-	8 (16.00)	4 (8.00)	6 (12.00)	8 (16.00)	1 (2.00)	2 (4.00)	-	1 (2.00)
Good	30 (60.00)	46 (92.00)	40 (80.00)	44 (88.00)	39 (78.00)	45 (90.00)	41 (82.00)	41 (82.00)	39 (78.00)	42 (84.00)	42 (84.00)	33 (66.00)
Average	20 (40.00)	3 (6.00)	10 (20.00)	6 (12.00)	3 (6.00)	1 (2.00)	3 (6.00)	1 (2.00)	10 (20.00)	6 (12.00)	8 (16.00)	16 (32.00)

Numbers in parenthesis indicate percentage

was clear that the majority (71.50 per cent) of them revealed that household work were done by girls and among this 96.00 per cent by rural girls.

When they were asked to voice their opinion on the choice of the sex of their youngsters 41.00 per cent of adolescents preferred boys as youngsters which included 44.00 per cent boys and 38.00 per cent girls whereas 59.00 per cent preferred girls as youngsters, which included 56.00 per cent of boys and 60.00 per cent of girls. But when youngsters were born 21.00 per cent of adolescents said they felt lonely.

They all revealed that no gender discrimination was shown between boys and girls in the case of preference for education or food selection at home. But in case of their attitude towards intelligence 50.00 per cent of boys said that boys were more intelligent, whereas 20.00 per cent of boys said girls were more intelligent and 30.00 per cent of boys agreed that both boys and girls had equal intelligence. In case of girls 31.00 per cent said boys were more intelligent than girls and 23.00 per cent of girls said girls were more intelligent than boys but majority (36.00 per cent) of girls said both were equally intelligent. The perception of adolescents hailing from families of different socio-economic status was more or less similar in this area. The family status as such did not seem to have much influence on gender perception and discrimination.

In case of finance 51.00 per cent said, that their family finance was managed by both parents whereas in 40.00 per cent families fathers managed the family finance while in 9.00 per cent families mothers managed the finance.

4.1.7 Time Utilization Pattern

In order to assess the workload of the adolescents, the time utilization pattern of the respondents were studied and time spend for each activity per day by the urban and rural boys and girls are given next.

Table 29. Twenty four hour time log of the sample based on their activities

Region	Sex	Mean time spent for each activity /day				
		Sedentary (in minutes)	Light (in minutes)	Moderate (in minutes)	Heavy (in minutes)	Sleep (in minutes)
Urban	Boy	105.00 (± 6.31)	259.40 (± 9.05)	573.40 (± 10.86)	22.80 (± 6.42)	480.60 (± 6.97)
	Girl	81.90 (± 4.39)	271.20 (± 12.27)	623.70 (± 10.74)	17.40 (± 5.77)	447.00 (± 6.30)
Rural	Boy	90.70 (± 7.45)	306.68 (± 15.94)	587.40 (± 12.21)	37.50 (± 6.09)	429.80 (± 8.62)
	Girl	117.80 (± 7.21)	246.00 (± 9.16)	638.40 (± 10.95)	-	439.80 (± 5.20)

Numbers in parenthesis indicate SE

The students were asked to prepare a 24 hour time log of their activities. These activities were grouped as sedentary, light, moderate, heavy besides sleep as mentioned earlier. Under sedentary activities come rest and leisure time activities which include watching television, movies, listening to music and other activities done while sitting that require little or no arm movement. Light activities include cooking and eating food, personal care and other activities done while standing that require some arm movement. Under moderate activities come studying, walking moderately fast, other activities done while standing that require moderate arm movement. Heavy activities include exercise, walking fast, hand washing large articles, dancing, hanging out clothes, sweeping cleaning, mopping etc. The average time spent by each group of boys and girls of urban and rural are presented in Table 29. In group wise distribution it was clear that time spent by rural girls for sedentary activities were more *i.e.*, 117.80 minutes compared to other groups. In case of light activities, it was the rural boys who spent more time (306.68 minutes) compared to others while time spent for moderate activities by rural girls were high *i.e.*, 638.40 minutes compared to other groups. In case of heavy activity, rural girls did not spend any time for it while rural boys spent about 37.50 minutes. Urban boys spent more time for sleep *i.e.,* about 480.60 minutes

than others (8 hours) so too urban girls 447.00 minutes (7.45 hours). From this it was clear that there was regional difference in time utilization pattern. The table also pointed out that the higher secondary school children spent more time on moderate activities which included writing, studying, walking moderately and they indulged only very little in heavy activities.

4.1.8 Energy Expenditure Pattern

Currently energy requirements were defined in terms of energy expenditure rather than in terms of energy intake as it may vary from day to day. Here the energy expenditure per day by the respondents were assessed. The mean of energy expenditure of each group in kcal is given in Table 30 along with the recommended dietary allowance (RDA).

Table 30. The mean energy expenditure / day of the respondents

N = 200

	Urban		Rural	
	Boy	Girl	Boy	Girl
Recommended energy requirement (kcal)	2640	2060	2640	2060
Mean of energy expenditure	2100.10	1859.90	2099.57	1783.70

Though the energy expenditure was not in par with the RDA, statistical inference showed the differences as insignificant. But as indicated in table, both urban and rural boys spent less energy than the standard energy requirements for the age group and that the energy expenditure for boys was comparatively lower than girls.

4.2 SUBSAMPLE

The analysis of the data collected from the major sample revealed a general picture of health and nutritional status of the sample, their life style activities, knowledge and attitude towards nutrition, health and food along with the family details of the adolescent population.

As mentioned earlier an in-depth study was also carried out on a sub sample selected from the major sample, for a closer view of the adolescent dietary profile and factors influencing it. The data collected was statistically analysed.

4.2.1 Nutritional Status

4.2.1.1 Anthropometry

The same method used for the major sample was followed for the sub sample too. The height, weight, MUAC and BMI of the sample was measured as for the major and was compared statistically. The results of the comparison made between rural and urban sample and that of boys and girls are presented in Table 31.

Table 31. Region wise comparison of anthropometric measurements

Sl. No.	Variables	Urban (n=20)	Rural (n=20)	t
1	Height (cm)	165.10	160.45	1.48
2	Weight (kg)	49.40	45.15	2.66*
3	BMI (kg/m^2)	18.46	17.57	1.83
4	MUAC (cm)	24.58	23.34	1.47

* Significant at 5 per cent level

The data presented in the table revealed that except for weight (2.66*), other anthropometric measurements had no significant difference between urban and rural sample. The table also indicated that the urban adolescents had comparatively better anthropometric measurements than rural adolescents.

When sex wise comparisons of anthropometric measures and BMI with standards were made variations were observed between boys and girls in most of the areas studied. The details are presented in Table 32.

Table 32. Sex wise comparisons of anthropometric measurements and BMI

Sl. No.	Variables	Boys (n=20)	Girls (n=20)	IAP std		NCHS	
				Boys	Girls	Boys	Girls
1	Height (cm)	171.09	154.46	167.9	156.0	173.5	162.4
2	Weight (kg)	49.90	44.65	55.0	49.4	62.10	55.90
3	BMI (kg/m^2)	17.36	18.67	18.49-25			
4	MUAC (cm)	24.37	23.55	24.82			

** Significant at 1 per cent level

While comparing with national and international standards it could be seen that the level was lower than the standards in the anthropometric measurements *viz*., height and weight of the adolescents studied. But when sex wise comparison was done difference could be noted between boys and girls in rate of deviation from the standard values. But the height of boys was better than the IAP standard, though they were far below the NCHS standard. When BMI and MUAC were compared with the standard, the girls had better BMI than boys, but in case of MUAC, boys were better than girls when compared with standard, even if both were lower than normal level.

Still in order to see whether the difference seen among boys and girls of both rural and urban region is significant, ANOVA was done further. The results are presented in Table 33.

Table 33. Group wise comparison of anthropometric measurements

Sl. No.	Variables	Mean score				F	CD
		Urban (n=20)		Rural (n=20)			
		Boys (n = 10)	Girls (n = 10)	Boys (n = 10)	Girls (n = 10)		
1	IAP Height (cm)	2.80	1.21	-0.12	-2.46	5.18*	2.80
	Weight (kg)	-5.13	-3.29	-14.69	-11.57	4.02*	7.68
2	NCHS Height (cm)	-0.66	-1.98	-3.48	-5.51	3.83*	3.05
	Weight (kg)	-16.01	-12.20	-24.47	-19.53	3.21*	8.37
3	MUAC	-3.10	1.06	-9.75	-2.52	2.13	8.86

* Significant at 5 per cent level

The data presented in Table 33 indicated a significant difference at five per cent in the percentage deviation of height and weight among boys and girls from urban and rural areas. However, percentage deviation of height from IAP standard pointed out that urban boys were almost meeting the required standard in their height though rural boys were shorter than standard. The rate of deviation from standard was more for rural girls even if boys and girls of rural area were shorter than the standard. When percentage deviation of weight with both IAP and NCHS standard was done adolescents from rural and urban area irrespective of sex differences were much below the standard in their weight.

In case of girls, they were far below from both the standard in height and weight. In the case of MUAC also it was slightly lower than the standard for all except urban girls, who had a shade higher than the normal standard. But the ANOVA results revealed that the difference seen between boys and girls of rural and urban region was not statistically significant.

4.2.1.2 Biochemical

Biochemical assessment of the sub sample was done by the estimation of haemoglobin level in their blood sample. The haemoglobin level of urban and rural respondents was compared using t- test and the result are given in Table 34.

Table 34. Region wise comparison of haemoglobin level

Sl. No.	Variable	Mean		t
		Urban (n=20)	Rural (n=20)	
1	Haemoglobin (g/dl)	10.12	10.64	0.82

The table revealed that there was no significant difference between urban and rural sample in their haemoglobin level.

Rural Boys
(11. 21)

Urban Boys
(11.32)

Rural Girls
(10. 06)

Urban Girls
(8.90)
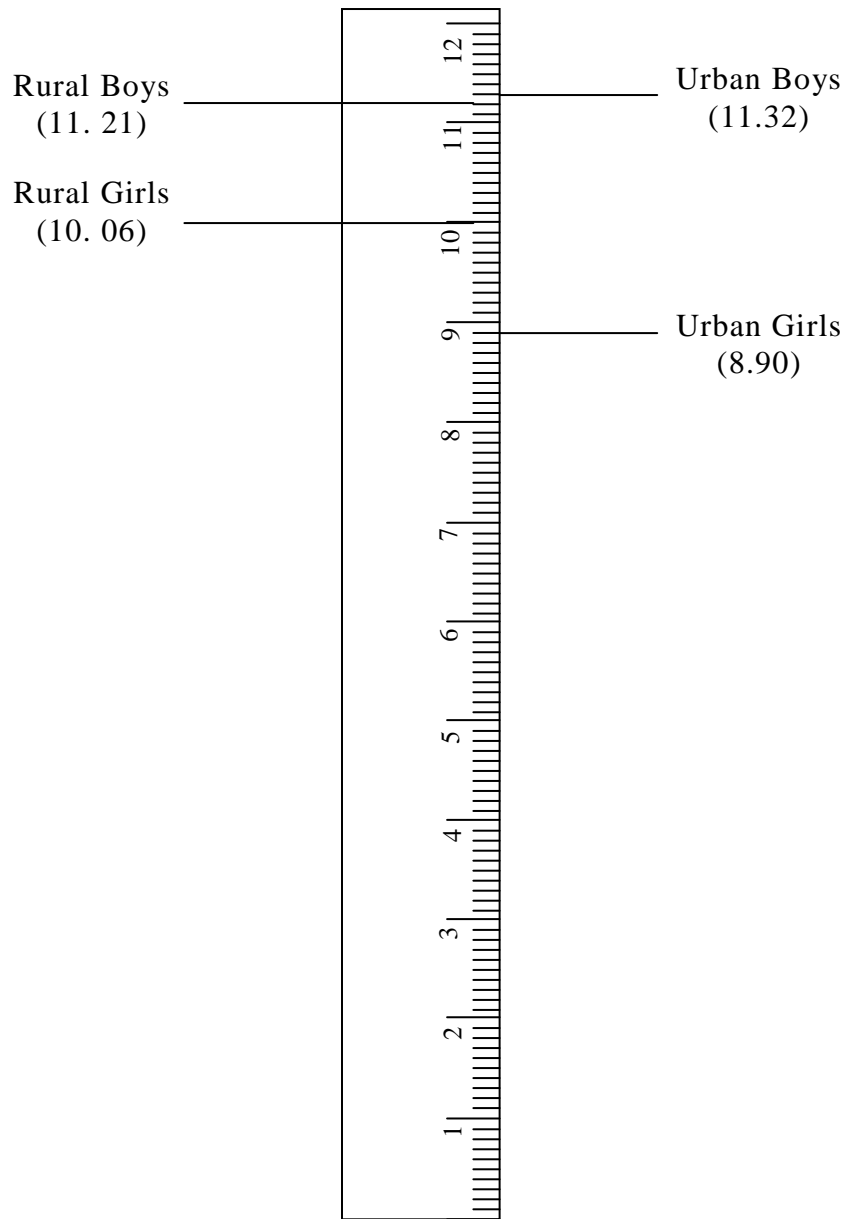
Fig. 4. Haemoglobin level

Table 35. Sex wise comparison of haemoglobin level

Sl. No.	Variable	Mean		t	Normal
		Boys (n=20)	Girls (n=20)		
1	Haemoglobin (g/dl)	11.26	9.48	3.09**	>11

** Significant at 1 per cent level

When sex wise comparison was made (Table 35) a highly significant difference was noted between boys and girls.

When comparing the haemoglobin level with mean value suggested by WHO, it was found that haemoglobin level of both urban and rural adolescents were lower than standard. But when sex wise comparison was made haemoglobin level of boys seemed to be higher than normal in both urban and rural area.

Table 36. Group wise comparison of haemoglobin level

Sl. No.	Variable	Mean				F	CD
		Urban (n=20)		Rural (n=20)			
		Boys (n = 10)	Girls (n = 10)	Boys (n = 10)	Girls (n = 10)		
1	Haemoglobin	11.32	8.90	11.21	10.06	3.87*	1.65

* Significant at 5 per cent level

The results of ANOVA carried out further (Table 36) revealed that the haemoglobin level differ significantly at 5 per cent level *i.e.*, 3.87*.

The variation was not so significant between boys of rural and urban region but it was more or less similar. Similarly significant variation was seen between urban boys and girls but not so between rural boys and girls. On the whole urban boys had better haemoglobin level than all other groups.

4.2.1.3 Clinical

The result of clinical assessment carried out with the help of a physician to determine the prevalence of nutritional deficiency symptoms is presented in Table 37.

Table 37. Group wise distributions of nutrient deficiency symptoms

Sl. No.	Variable	Urban (n=20)		Rural (n=20)		Total
		Boys (n = 10)	Girls (n = 10)	Boys (n = 10)	Girls (n = 10)	
1	Anaemia	8 (80.00)	10 (100.00)	7 (70.00)	9 (90.00)	34 (85.00)
2	Angular stomatitis	-	-	1 (10.00)	2 (20.00)	3 (7.50)
3	Bleeding gum	-	-	-	1 (10.00)	1 (2.50)
4	Thyroid enlargement	-	2 (20.00)	1 (10.00)	1 (10.00)	4 (10.00)

Numbers in parenthesis indicate percentage

The clinical symptoms of nutritional deficiencies noted among the adolescents were anaemia, angular stomatitis, bleeding gum and thyroid enlargement. As revealed in table majority (85.00 per cent) of adolescents suffered from anaemia irrespective of sex or regional difference. But very few cases of angular stomatitis (7.50 per cent) were seen among rural sample and a few cases of bleeding gum only in rural girls. As can be noted 20 per cent of thyroid enlargement was seen in urban girls and one each in rural boys and girls.

4.2.2 Dietary Adequacy

Adequacy of diet of the sub sample was assessed by the raw and cooked weight of the food intake of each of the respondents and then determining the quantitative and qualitative adequacy. Comparison was made between rural and urban sample and also between boys and girls.

Table 38. Region wise comparison of quantitative assessment of different food groups

Sl. No.	Food groups	Mean		t
		Urban (n=20)	Rural (n=20)	
1	Cereals	317.10	265.40	0.91
2	Pulses	22.15	15.84	0.50
3	Green leafy vegetable	4.00	11.70	1.01
4	Other vegetable	120.31	118.45	6.55**
5	Fruits	42.50	34.00	0.52
6	Milk	306.50	171.75	2.02*
7	Fat	33.75	23.40	1.11
8	Fish	70.85	60.40	0.63
9	Sugar	39.25	26.75	2.55*

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

From Table 38, it was clear that there was no remarkable difference in the food intake by rural and urban respondents except in the consumption of vegetables, milk and sugar. The intake of vegetables differed significantly at 1.00 per cent level *i.e.*, 6.55** and the intake of milk and sugar differed at 5.00 per cent level *i.e.*, 2.02* and 2.55* respectively. The urban sample had higher intake than rural in majority of food groups except in case of green leafy vegetables.

The sex wise comparison carried out is presented in Table 39.

Table 39. Sex wise comparison of quantitative assessment of different food groups

Sl. No.	Food groups	Mean		RDA		Percentage RDA met	
		Boys (n=20)	Girls (n=20)	Boys	Girls	Boys	Girls
1	Cereals	375.50	207.00	420	320	89.40	64.69
2	Pulses	19.87	18.12	70	50	28.38	36.24
3	Green leafy vegetable	7.20	8.50	100	150	7.20	8.50
4	Other vegetable	133.65	105.11	175	150	76.37	70.07
5	Fruits	57.90	18.60	100	100	57.90	80.60
6	Milk	285.50	192.75	400	400	71.37	48.18
7	Fat	36.25	20.90	40	30	90.62	69.66
8	Fish	66.55	64.70	80	80	83.18	80.87
9	Sugar	36.25	29.75	30	30	120.00	99.16

While comparing RDA with the food intake it was found that consumption was lower than recommended except in case of sugar consumption for both boys and girls. The consumption of sugar by boys were higher than standard whereas other food groups was lower than RDA. In the case of girls, the consumption was lower for all groups except sugar, which was 99.16 per cent of the RDA. It could be seen that the consumption of pulses was very low, only 28.38 per cent and 36.24 of RDA for boys and girls respectively. Similarly, the intake of green leafy vegetables was highly deficient *i.e.*, only 7.20 per cent and 8.50 per cent of RDA was consumed by boys and girls respectively. Consumption of meat was
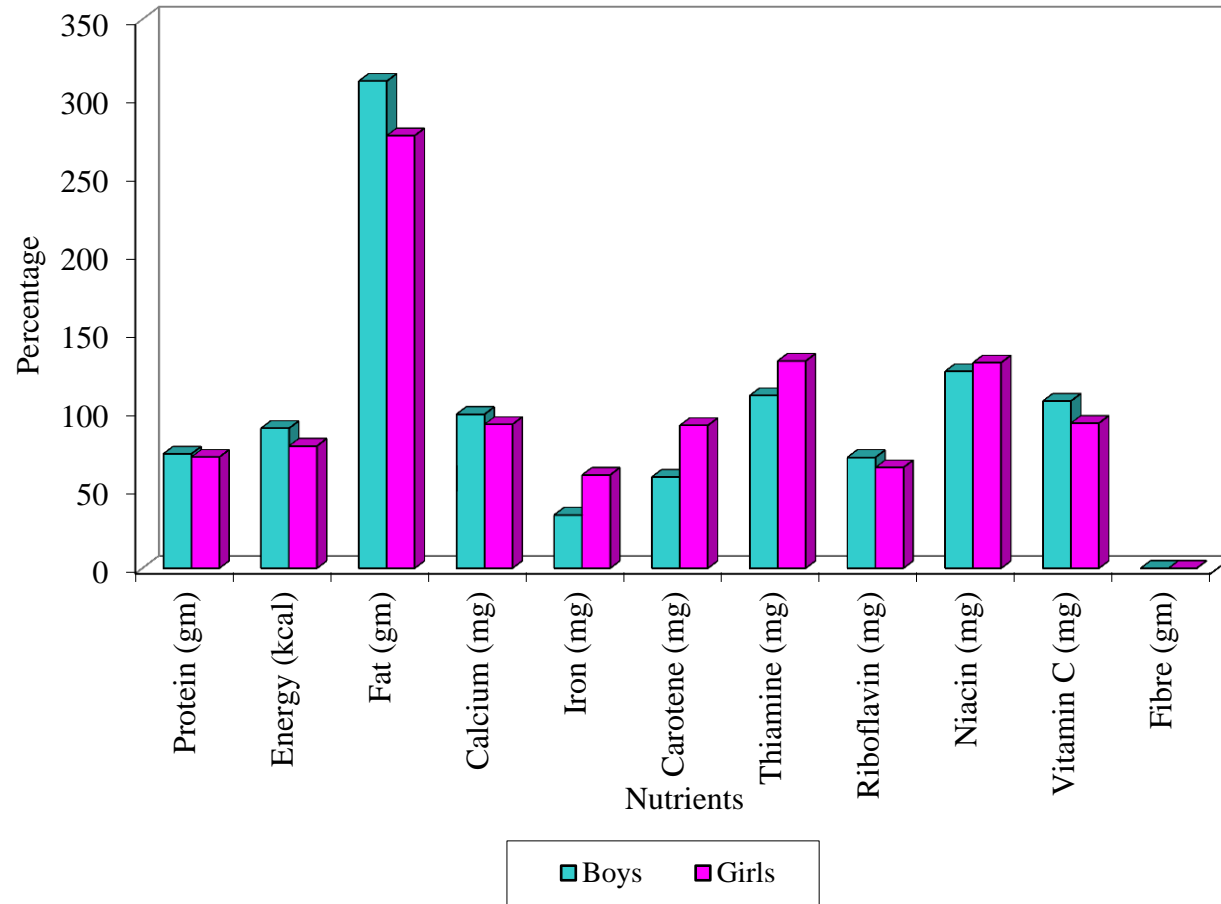
Fig. 5 Percentage of RDA met for nutrient intake

comparatively less frequent whereas fish was consumed daily by the majority. The intake of fruits was much below the requirement for boys 57.90 per cent whereas for girls it was better *i.e.*, about 80.60 per cent of the recommended allowances.

Table 40. Group wise comparison of quantitative assessment of different food groups

Sl. No.	Food groups	Mean				F	CD
		Urban (n=20)		Rural (n=20)			
		Boys (n=10)	Girls (n=10)	Boys (n=10)	Girls (n=10)		
1	Cereals	-21.20	-84.60	-67.80	-141.40	0.94	146.61
2	Pulses	-37.10	-18.60	-23.16	-44.15	0.93	35.27
3	Green leafy vegetables	-92.00	-150.00	-93.60	-133.00	14.34**	21.95
4	Fruits	-35.00	-80.00	-49.20	-82.80	2.40	43.44
5	Milk	-6.00	-181.00	-223.00	-233.50	2.63	186.87
6	Fats and oil	-3.00	0.50	-4.50	-18.70	0.86	26.00
7	Meat and fish	-11.80	-6.50	-15.00	-24.10	0.19	48.49
8	Sugar	10.00	8.50	2.50	-9.00	3.19*	13.87

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

The ANOVA result (Table 40) revealed that the rate of deviation of food intake from the recommended allowances was confirmed statistically. It was found that the intake was lower than recommended for cereals, pulses, fruits, milk, fats and oils, meat and fish for the whole sample. However, in the case of consumption of green leafy vegetables significant difference was seen between boys and girls in both regions. The intake was comparatively more among rural girls than other three groups, but it was slightly better for urban boys when compared with rural boys. In the case of sugar consumption it was higher for all the groups except rural girls and ANOVA results further revealed a significant difference between rural and urban adolescents too.

4.2.3 Nutritional Adequacy

One day weighment of diet was done for deriving the quantity and quality of the diet consumed by the respondents. The nutrient present in food consumed in a day by each respondent was separately assessed and the

mean of the different nutrient content in the diets of both the urban and rural sample is given in Table 41.

Table 41. Region wise comparison of sample based on daily nutrient intake

Sl. No.	Nutrient intake	Mean		t
		Urban (n=20)	Rural (n=20)	
1	Protein (g)	57.28	44.13	1.79
2	Energy (kcal)	2219.55	1738.55	1.94
3	Fat (g)	76.02	52.99	1.81
4	Calcium (mg)	504.55	444.22	0.66
5	Iron (mg)	18.02	16.76	0.25
6	Carotene (µg)	914.38	961.13	0.08
7	Thiamine (mg)	1.54	1.22	0.66
8	Riboflavin (mg)	1.10	0.80	1.77
9	Niacin (mg)	22.78	16.88	1.13
10	Vitamin C (mg)	38.18	41.44	0.31
11	Fibre (g)	6.33	5.63	0.60

The data presented in table revealed that though slight variation was noted in the nutrient intake between urban and rural respondents, they were not significant statistically.

The sex wise comparison carried out is presented in Table 42.

Table 42. Sex wise comparison of sample based on daily nutrient intake

Sl. No.	Nutrient intake	Mean		RDA		Percentage RDA met	
		Boys (n=20)	Girls (n=20)	Boys	Girls	Boys	Girls
1	Protein (gm)	56.83	44.58	78	63	72.85	70.76
2	Energy (kcal)	2353.54	1604.56	2640	2060	89.14	77.89
3	Fat (gm)	68.32	60.68	22	22	310.54	275.81
4	Calcium (mg)	490.54	458.23	500	500	98.10	91.64
5	Iron (mg)	16.96	17.82	50	30	33.92	59.40
6	Carotene (µg)	1395.82	479.69	2400	2400	58.15	90.98
7	Thiamine (mg)	1.43	1.32	1.3	1.0	110.00	132.00
8	Riboflavin (mg)	1.13	0.77	1.6	1.2	70.62	64.16
9	Niacin (mg)	21.33	18.34	17	14	125.47	131.00
10	Vitamin C (mg)	42.62	36.99	40	40	106.55	92.47
11	Fibre (gm)	6.03	5.93	-	-	-	-

It could be seen that the diets of both boys and girls were highly deficient in all the macro nutrients except fat and in the important micro nutrients like iron, calcium, carotene, thiamine and riboflavin.

Table 43. Group wise comparison of sample based on daily nutrient intake

Sl. No.	Nutrient intake	Mean				F	CD
		Urban (n=20)		Rural (n=20)			
		Boys (n=10)	Girls (n=10)	Boys (n=10)	Girls (n=10)		
1	Protein (gm)	-21.09	-5.33	-21.24	-32.08	2.51	19.92
2	Energy (kcal)	-79.58	-181.00	-493.43	-729.54	1.79	632.29
3	Fat (gm)	60.50	47.54	32.15	29.83	1.23	37.11
4	Calcium (mg)	-23.78	32.90	4.87	-116.42	0.49	263.59
5	Iron (mg)	-28.90	-15.05	-37.17	-9.29	6.66**	14.16
6	Carotene (µg)	-783.46	-2187.76	-1124.88	-1652.84	1.28	1517.94
7	Thiamine (mg)	0.43	0.34	-0.16	0.30	0.29	1.43
8	Riboflavin (mg)	-0.27	-0.31	-0.65	-0.52	1.25	0.45
9	Niacin (mg)	7.57	6.99	1.08	2.77	0.36	15.07
10	Vitamin C (mg)	14.17	-17.80	-8.91	11.79	2.56	28.08

** Significant at 1 per cent level

It could be seen from Table 42, that the intake was lower for all the nutrients except fat irrespective of sex variation. But ANOVA (Table 43) results revealed that there was a significant difference at one per cent level (6.66**) in the intake of iron between boys and girls. When sex wise comparison were made girls intake of iron was better than boys though the intake was far below the requirement for both sexes. No significant difference was seen between rural and urban adolescents showing that they have more or less similar intake of nutrients.

4.2.4 Dietary Profile Index

The dietary profile was the short outline description of adolescents based on their diet. Here the nutritional status and dietary details of the respondents were included for describing dietary profile index of adolescents. Under nutritional status the subsamples anthropometric levels, heamoglobin level through biochemical assessment and nutrient

intake were considered. Also, dietary pattern was included. Thus the major features constituting dietary profile were included to compute a dietary profile index of the respondents.

A Dietary Profile Index (DPI) was worked out using certain related indicators and the influence of selected factors on the DPI was determined. The various characteristics included for deriving the DPI were anthropometric measurements of the respondents like height, weight, MUAC, their haemoglobin level obtained through biochemical assessment and their nutrient intake mainly protein, energy, fat, calcium, iron, carotene and vitamin C intake from qualitative assessment of their diets. The DPI thus derived for subsample was given in Appendix IX.

The association of selected factors excluding those included on the derived dietary profile index was assessed statistically and results are presented in Table 44 to 46 for dependent and from Table 47 to 51 for independent variables.

4.2.5 Relationship of Dependent Variable with DPI

The association of DPI and nutritional deficiency symptoms, food intake and energy expenditure pattern of the sample was determined separately for boys and girls.

4.2.5.1 Nutritional Deficiency Symptoms

The association of nutritional deficiency symptoms with DPI is presented in Table 44.

Table 44. Association of clinical symptoms with DPI

	Variables	χ^2	
		Urban (n=20)	Rural (n=20)
1	Anaemia	1.87	0.02
2	Angular stomatitis	1.01	-
3	Bleeding gum	-	1.01
4	Thyroid enlargement	-	0.17

The χ^2 results indicated insignificant association between dietary profile index and nutritional deficiency symptoms in the sample.

4.2.5.2 Dietary Pattern

Coefficient correlation was done to find out the relationship of DPI and food intake. The result of food group is given in Table 45.

Table 45. Group wise correlation of food intake with DPI

	Food Groups	Mean Boys (n=20)	γ	Mean Girls (n=20)	γ	Mean N = 40	γ
1	Cereals	375.50	0.12	207.00	0.25	291.25	0.35
2	Pulses	19.87	0.18	18.12	0.41**	18.99	0.29
3	Green leafy vegetables	7.20	0.15	8.50	0.07	7.85	0.04
4	Other vegetables	133.65	0.44**	105.11	0.11	119.38	0.30
5	Fruits	57.90	0.21	18.60	0.05	38.25	0.29
6	Milk	285.50	0.38*	192.75	-0.23	239.12	0.21
7	Fat	36.25	0.22	20.90	0.39*	28.57	0.37
8	Fish	66.55	0.04	64.70	0.03	65.62	0.04
9	Sugar	36.25	0.02	29.75	0.05	33.00	0.07

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

A highly significant relationship at 1 per cent level was seen between the consumption of vegetables by the boys and their DPI. Similarly consumption of milk also showed a significant relationship but at 5 per cent level.

However, in case of girls' significant relationship at 1 per cent level was seen only in the consumption of pulses and 5 per cent level for fat consumption.

Though DPI of the group had no significant relationship with food consumed by them, significant relationship did exist with consumption of certain food groups for both boys and girls indicating that food consumption can influence the DPI.

4.2.5.3 Association of DPI and Dietary Habits

Table 46. Association of DPI and food habits of the sub sample

Sl. No.	Food habits	χ^2	
		Urban (n=20)	Rural (n=20)
1	Nibbling	8.08**	0.13
2	Opinion on dietary	0.10	1.01
3	Skipping meal	0.20	0.29
4	Timing of meals	0.59	0.13
5	Choosy	0.01	0.13

** Significant at 1 per cent level

The Table 46 indicated the relationship of DPI and food habits of adolescents. It showed that DPI and food habits do not have any significant relationship in any of the areas studied except nibbling habits, which was highly significant at 1 per cent level.

4.2.6 Relationship of Independent Variables with DPI

Independent variables included were the respondents, knowledge and attitude towards nutrition, health and food, psychosocial profile, socio-demographic features, workload and energy utilization.

4.2.6.1 Correlation of DPI and Attitude of Respondents towards Nutrition, Health and Food

Table 47. Correlation of DPI and attitude towards nutrition, health and food

Sl. No.	Attitude	Boys (n=20)	γ	Girls (n=20)	γ	Mean N = 40	γ
1	Nutrition	62.55	0.10	66.60	0.17	64.45	-0.06
2	Health	70.55	-0.04	72.70	-0.02	71.62	-0.09
3	Food	64.70	0.49	67.90	0.06	66.30	0.11

When boys' and girls' attitude towards nutrition, health and food was correlated with DPI no significant relationship could be noted, but the

direction of relationship for attitude towards health and nutrition, was noted to be negative for boys and girls.

4.2.6.2 Correlation of DPI and Knowledge of respondents towards nutrition, health and Food

Table 48. Correlation of DPI and knowledge towards nutrition, health and food

	Knowledge	Boys (n=20)	γ	Girls (n=20)	γ	Mean N = 40	γ
1	Nutrition	11.95	0.09	11.95	0.27	11.95	0.15
2	Health	11.85	0.32*	13.3	-0.21	12.57	-0.12
3	Food	12.75	0.57**	14.1	-0.18	13.42	0.03

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

When DPI was correlated with knowledge on nutrition, health and food, a positive and significant correlation, in case of food at 1 per cent level and 5 per cent level in case of health was seen among boys. But regarding girls, even though relationship was present a negative relationship existed between DPI and health as well as between DPI and food. The group as a whole did not show any statistically significant relationship but negative relationship was indicated in case of knowledge on health and DPI.

4.2.6.3 Correlation of DPI and Psychosocial Adjustments of Respondents

Table 49. Correlation of DPI and psychosocial adjustments

	Domain	Boys (n=20)	γ	Girls (n=20)	γ	Mean N = 40	γ
1	Physical	68.30	0.04	70.25	0.21	69.27	0.04
2	Personality	66.50	0.22	66.55	-0.09	66.52	0.01
3	Achievement	68.15	0.26	69.60	-0.40**	68.87	-0.16
4	Moral	69.90	0.04	74.50	-0.14	72.20	-0.19
5	Social	69.45	0.14	73.70	-0.35*	71.57	-0.24
6	Self confidence	75.20	0.18	70.90	-0.32*	73.05	0.009
7	Family	69.70	-0.16	73.20	-0.43**	71.45	-0.40
8	Gender	63.55	-0.01	61.35	0.09	62.45	0.14

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

The Table 49 gives the results of correlation between DPI and the variable dimensions of psychosocial areas studied. It was observed that in case of boys there was no significant relationship between DPI and any of the area studied under psychosocial adjustments. Also the slight relationship existed with family and gender relationship was in the negative direction and others in positive direction.

But in case of girls significant relationship existed at 1.00 per cent level in negative direction in the areas of family relationship and achievement and 5.00 per cent level in the negative direction for social and self-confidence.

It was evident that though DPI did not show statistically any significant relationship with any of the domains of psychosocial profile studied, relationship either in positive or negative direction existed with most of the domains. It was observed that for half the area studied *viz*., achievement, moral, social and family, the relationship was in the negative direction while for other areas *viz*., physical, personal, self-confidence and gender, it was in the positive direction.

4.2.6.4 Association of Socio-demographic Variables and DPI

Research studies done earlier had implied many a times the profound influence of socio-demographic features on the diet and nutritional status of a population. Hence the assessment of the socio-demographic feature of the present sample was determined with DPI. The degree of association between DPI and socio demographic variables obtained through χ^2 values is presented next.

Table 50. Association of DPI with selected socio demographic variables

	Variables	χ^2	
		Urban (n=20)	Rural (n=20)
1	Religion	0.04	0.14
2	Caste	1.87	0.29
3	Family type	0.59	0.17
4	Family size	0.01	1.17

No significant association was seen with any of the socio demographic features studied.

4.2.6.5 Association of DPI and Parental Education and Occupational Status of the Respondents

Table 51. Association of DPI and parental education and occupational status

	Variables	χ^2	
		Urban (n=20)	Rural (n=20)
1	Fathers education	0.35	0.17
2	Mothers education	0.35	0.13
1	Fathers occupation	0.59	0.13
2	Mothers occupation	0.59	0.17

Similarly DPI of the sample showed no significant association with parental education and occupation level.

4.2.7 Workload and Energy Utilization

The workload of the adolescent was next determined by assessing their energy utilization for a day from their food consumption and activity.

4.2.7.1 Energy Intake of the Sample in Comparison with RDA

The energy intake of the sub sample was computed from the quantity of food consumed by the respondents in a day. It was further compared with RDA and the results are given in Table 52.

The results revealed that only very few (27.50 per cent) among the sub sample were getting required energy from food. For the rest (72.50 per cent), the energy consumption was much below the normal allowances recommended for a day.

While urban and rural comparison was made, it was proved that 45.00 per cent of urban sample had better energy consumption while 55.00 per cent of urban sample had lower energy consumption. However, in case of rural sample only 5.00 per cent of them had energy intake more than the standard requirement while for the rest it was less than the standard requirement.

Table 52. Energy intake of the respondents in comparison with RDA

Area		Boys (n = 20)		Girls (n = 20)	
		*RDA 2640		*RDA 2060	
		Energy intake	± RDA	Energy intake	± RDA
N = 20 Urban	1	1734.40	-905.60	879.84	-1180.16
	2	2822.68	182.68	1474.41	-585.59
	3	1991.79	-648.21	2646.88	586.88
	4	3021.30	381.30	2519.00	459.00
	5	4279.40	1639.40	2161.21	101.21
	6	3059.00	419.00	2746.00	686.00
	7	1759.30	-880.70	1582.20	-477.80
	8	2356.39	-283.61	1838.25	-221.75
	9	1426.04	-1213.96	1315.64	-1944.36
	10	3154.20	514.20	1623.21	-436.79
N = 20 Rural	1	1944.00	-696.00	1194.00	-866.00
	2	1428.74	-1211.26	902.22	-1157.78
	3	1574.52	-1065.48	1206.65	-853.35
	4	2814.60	174.60	1190.15	-869.85
	5	2250.80	-389.20	1967.16	-92.84
	6	1500.50	-1139.50	1721.90	-338.10
	7	2470.80	-169.20	1875.59	-184.41
	8	1099.00	-1541.00	1284.84	-775.16
	9	2529.00	-111.00	1127.52	-932.48
	10	3854.50	1214.50	834.52	-1225.48

*ICMR (1989)

When sex wise comparison was made 35.00 per cent of boys and 10.00 per cent of girls were found to have higher energy intake while for the rest it was lower than standard requirements.

4.2.7.2 Energy Balance Based on Energy Intake and Expenditure

Energy balance was determined from the energy intake and energy expenditure. Energy intake was assessed from the food consumed by the individual in a day. The total energy expenditure was estimated from the calorie needed for basal metabolism (corrected for saving in sleep) energy required for different types of activities and for specific dynamic action of the food. Energy intake, expenditure and balance of sub sample are given in Table 53.

The result revealed that 40 per cent of samples were positively energy balanced, as intake was greater than energy expenditure. But majority (60.00 per cent) was negatively energy balanced.

When region wise comparison was made 27.50 per cent of urban adolescents and 12.50 per cent of rural adolescents were positively energy balanced and the rest were negatively balanced.

In case of sex wise comparison it showed that 25.00 per cent of boys were positively energy balanced and rest 75.00 per cent were negatively balanced whereas in case of girls 15.00 per cent were positively energy balanced and 85.00 per cent were negatively energy balanced.

4.2.8 Interrelationship of selected determinants of the Dietary Profile

The results of the analysis of inter-relationship of different variables selected for the present study are presented in Appendix X, XI and XII.

The data was statistically treated to find out if there was any significant relationship with the variables selected for the study *viz.*, anthropometric measurements, biochemical status, dietary and nutrient intake, their knowledge and attitude towards nutrition, health and food and also their psycho social adjustments.

Table 53. Energy balance of the respondents based on energy intake and expenditure

AREA		Boys (n = 20)			Girls (n = 20)		
		Energy intake	Energy expenditure	Energy balance	Energy intake	Energy expenditure	Energy balance
N = 20 Urban	1	1734.40	2451.45	-717.05	879.84	1715.70	-835.86
	2	2822.68	1651.20	1171.48	1474.41	2056.20	-581.79
	3	1991.79	1663.20	328.59	2646.88	1738.80	908.08
	4	3021.30	2175.00	846.30	2519.00	1925.70	593.30
	5	4279.40	2054.25	2225.15	2161.21	2047.50	113.71
	6	3059.00	2097.90	961.10	2746.00	2082.60	663.40
	7	1759.30	2346.75	-587.45	1582.20	2102.10	-519.85
	8	2356.39	1904.85	451.54	1838.25	2046.00	-207.75
	9	1426.04	1866.90	-440.86	1315.64	1867.80	-552.16
	10	3154.20	1875.00	1279.20	1623.21	1825.95	-202.74
N = 20 Rural	1	1944.00	2032.50	-88.50	1194.00	1795.20	-601.20
	2	1428.74	2046.00	-617.26	902.22	1573.65	-671.43
	3	1574.52	1732.90	-158.38	1206.65	1700.47	-493.82
	4	2814.60	1957.50	857.10	1190.15	1656.90	-466.75
	5	2250.80	2319.45	-68.65	1967.16	1436.40	530.76
	6	1500.50	1835.40	-334.90	1721.90	1781.30	-59.40
	7	2470.80	2905.50	-434.70	1875.59	1872.00	3.59
	8	1099.00	2251.80	-1152.80	1284.84	1675.80	-390.96
	9	2529.00	2100.00	429.00	1127.52	1401.75	-274.23
	10	3854.50	1728.00	2126.50	834.52	1784.25	-949.73

Anthropometry: As revealed in Appendix X, height was significantly related with weight, energy intake, cereal consumption at one per cent level and intake of fats and oils at five per cent level. Eventhough significant relationship was seen with BMI and social concepts it was in the negative direction. When sex wise comparisons were made, significant but negative relationship was observed with the anthropometric measurements of boys (Appendix XI) and their intake of carotene, consumption of green leafy vegetables, vegetables and fruits at five per cent level. But positive and significant relationship was seen with their anthropometric measurements and adjustment in personality. In case of girls (Appendix XII) their intake of energy and fat and also their consumption of sugar and fats and oils had a positive correlation with their height whereas their adjustment in personal and social areas were negatively related to their height.

In case of weight, a highly significant positive correlation at one per cent level was found with the respondents energy intake and consumption of fat. Also significant relationship at five per cent level was seen with cereal and sugar consumption. Same way weight showed a significant relationship with BMI also. Moreover, weight seemed to have a negative correlation with social adjustments. When cereal and sugar consumption and energy intake were significantly related to the weight of the respondents, both of boys and girls, boys' attitude on health was noted to have a negative correlation with the weight. The girls' perception of gender discrimination indicated a positive relation with their weight too.

As expected the BMI of boys and girls showed a positive correlation with fats and oils consumption, energy intake, consumption of foods like cereal, vegetable etc. But a significant and negative relationship was seen with the BMI of boys and their self-confidence and adjustment in moral areas. In case of girls, their achievement and adjustment in the family had a negative correlation with the BMI.

When the relationship of haemoglobin level was studied, energy consumption had shown a significant relationship while protein intake had shown significant but negative relationship both for boys and girls. The boys' attitude and knowledge on food too had shown a significant positive correlation with haemoglobin level.

Food Intake: Each food group was further separately correlated with each of the other variables.

The cereal consumption when correlated with different variables the following observations were made. Cereal consumption was significantly related at one per cent level to energy and at five per cent level with the carotene intake and consumption of vegetables. At the same time the cereal consumption seemed to have a highly significant relationship in the negative direction with social adjustment at one per cent level. The cereal consumption and energy intake showed a highly significant positive correlation both for boys and girls, (0.35*) and (0.56**) respectively. In addition, the boy's knowledge and attitude on nutrition, their adjustment to the family and also their vegetable consumption had a significant relationship with cereal consumption. Similarly, a significant but negative correlation was observed in fat consumption, the attitude towards health and also the social adjustment of boys. In case of girls, a negative significant correlation at five per cent level was seen with their cereal consumption and psychosocial adjustment particularly in the physical and achievement areas and also a highly significant correlation was seen with their self-confidence.

The pulse consumption also showed a significant positive correlation with energy intake and negative correlation with their self-confidence particularly for boys and a significant correlation was also seen with the consumption of green leafy vegetables also. In case of girls their pulse consumption was highly related to their protein, energy and fat intake.

Besides, in the case of green leafy vegetable consumption, a highly significant positive correlation at one per cent level was seen with calcium

and carotene intake and a significant correlation at five per cent level with the respondent's physical adjustment and attitude towards food. Similarly, a highly significant correlation was seen with the calcium (0.54**) and carotene intake (0.56**), their physical adjustment (-0.48**) and their perception of gender discrimination (-0.46**). Significant correlation was also observed at five per cent level with protein intake. In case of girls, a highly positive and significant correlation existed with their intake of green leafy vegetables and carotene (0.77**) and a negative but significant correlation with moral concepts and their attitude on nutrition.

Vegetable consumption seemed to have a positive correlation with intake of protein (0.47**), energy (0.33*), calcium (0.32*), carotene (0.42*), attitude towards food (0.39*), consumption of fruits (0.44**) and milk (0.43**) in case of boys whereas in case of girls a significant correlation was seen with personal adjustment (0.36*) and also their attitude towards nutrition (0.42**) and a negative correlation with their calcium intake (-0.36*), their age (-0.37*), family adjustment (-0.44**) and knowledge on food (-0.31*).

The consumption of fruits in turn showed a positive correlation with energy (0.39*), iron (0.37*), milk (0.31*), fat (0.33*) and a negative correlation with carotene (-0.44**). In case of boys, consumption of fruits was positively related with energy (0.37*), fat (0.32*) and carotene intake (0.45**) and also consumption of milk (0.38*). A significant relationship was also seen with their achievement (0.35*). In case of girls too, fruit consumption was positively related with their achievement (0.36*) and negatively related to their physical adjustment (-0.40**) and attitude on nutrition (-0.44**).

The results indicated a significant relationship with milk consumption and fat intake (0.33*) and also with age (0.31*) of the respondents. Milk consumption seemed to be very much related with the knowledge and attitude of boys on nutrition and health but a negative correlation was observed in their adjustment in physical, personality and moral areas. Unlike boys, for girls, the

relationship was in the opposite direction *i.e.,* the relationship was positive for moral and achievement areas, it was negative for physical adjustment and also for their knowledge and attitude towards nutrition (-0.44**).

The relationship varied for boys and girls in their fat consumption and in the different areas of psychosocial adjustment. When a negative correlation was seen with moral adjustment in case boys, it was in the social adjustments in case of girls. The attitude of girls towards food and also their perception of gender discrimination in their family too revealed a positive relationship with their fat consumption.

Similarly, when the correlation with sugar consumption was observed it showed a positive correlation with age and protein intake of the respondents. In addition calcium intake of girls also showed a positive correlation with their sugar consumption. The attitude of boys on nutrition seemed to have a positive and significant correlation with their sugar consumption. Moreover, sugar consumption seemed to have a negative correlation with the area of psychosocial adjustments, especially in the area of achievement in case of boys and social and personal adjustment areas of girls.

Nutrient Intake: The nutrient intake also showed a significant correlation with most of the variables studied like anthropometry, psychosocial adjustments, knowledge and attitude and also with their food consumption. In addition, when the relationships of different nutrients were studied some interesting relationships were indicated. Significant relationship was obtained for protein with energy, calcium and carotene intake. Besides, in case of girls a negative relationship was seen with their adjustment in physical areas.

In addition to the relationship with other food groups and anthropometric measurements, energy intake in turn was positively related at one per cent level with fat and carotene intake both for boys and girls. But a negative relationship was seen with social concepts and knowledge on health and with psychological domains especially social, self-

confidence and family. This was more or less in similar direction for both boys and girls.

Besides, the negative relationship with energy and fat intake seemed to have a significant relationship with the achievement both for boys and girls (0.37* and −0.34*). When the boys' attitude towards nutrition and health was seen to be positively related with fat intake at five per cent level, girls' social concepts was negatively related (-0.31*).

Similarly, calcium intake showed a significant correlation with carotene intake both in boys and girls. For boys, a significant correlation was obtained for their physical concepts and their concepts on gender discrimination (-0.30*) and attitude towards nutrition (0.32*). In case of girls also calcium intake showed a negative correlation with their knowledge on nutrition (-0.44**). Carotene intake on the other hand was negatively related with personality adjustments of boys (-0.34*) and views of gender discrimination (-0.49**) whereas the carotene intake showed a positive correlation with age (0.34*) in the case of girls.

Attitude Towards Nutrition, Health and Food: It was evident that attitude towards nutrition, health and food seemed to be very much related with their food and nutrient intake. So also it was clear from the table that each attitude studied has a significant relationship with many of the psychosocial domains studied, knowledge and attitude towards the three aspects studied.

The attitude towards nutrition showed a significant correlation with attitude towards health (0.38*) and with physical adjustment. In addition a negative correlation was seen with the moral concepts (-0.40**) and attitude of boys towards food, nutrition and health. In case of girls, a significant correlation was obtained with their physical adjustment (0.57**).

Similarly attitude towards health showed a positive significant

relation with physical adjustment (0.31*) and knowledge on food (0.38*). Moreover, in the case of girls, a significant relationship was seen with the moral concepts (0.32*) and attitude towards food too.

It was seen that the adjustment in moral areas (0.37*) and knowledge in health and food (0.39*) had a significant relationship with the attitude towards food. The boys' perception on gender discrimination seemed to have a negative correlation with their attitude towards food (-0.50**).

Knowledge on Nutrition, Health and Food: As expected, knowledge on nutrition was significantly related to their knowledge on health too. But knowledge in the other areas showed a negative correlation with the self-confidence of boys. But in the case of girls, a positive and significant correlation was seen in their adjustments in personal and physical areas.

Knowledge of health showed a significant correlation with the adolescents' knowledge in food (0.38*) particularly for boys. In case of girls, significant correlation existed with their perception of gender discrimination (0.43**).

The respondents' adjustment in physical and moral areas too was related significantly at five per cent and one per cent level respectively with their knowledge on food.

Psychosocial Adjustments: It was clear that the adjustment in the different psychosocial domains was very much related, either in positive or negative direction with most of the other variables studied particularly their food and nutrient intake and their knowledge in these areas. When different domains of psychosocial were studied, many of the areas showed significant correlation. When physical adjustment showed significant relationship with moral concept, personal concepts had a significant relationship with social concepts (0.32*) and self-confidence (0.31*). In the case of achievement, a significant relationship existed with their self-confidence and their

adjustment in the family. The achievement seemed to be closely related with adjustment in moral (0.32*), social (0.31*) areas and self-confidence of both boys and girls. Also the adjustment in family seemed to have a significant relationship with their achievement both for boys and girls (0.37* and 0.50**). Regarding the moral areas, it showed a one per cent level significance with the self confidence of boys and girls (0.55**, 0.60**) and their adjustment in social area (0.68**, 0.39*). But in case of boys, a negative significant relationship was seen with their perception of gender discrimination in the family while for girls a positive significant relationship was seen. Their adjustment in social area and their self confidence was seen to be closely related with adjustment in other areas particularly in moral, achievement, personal etc. Similarly, the self confidence of girls had no significant relationship with many of the other areas *viz.*, their adjustments in family and perception of gender discrimination but in case of boys a significant relationship existed with these two domains at five per cent level *i.e.,* (0.39*) and (−0.37*) respectively.

Discussion

5. DISCUSSION

The results presented in the previous chapter are discussed in this section with relevant empirical evidence.

5.1 Major sample

5.1.1 Socio-economic and Demographic Profile

5.1.2 Health and nutritional status

5.1.3 Dietary pattern

5.1.4 Knowledge and attitudes towards nutrition, health and food

5.1.5 Gender specific roles and relationships

5.1.6 Time utilization and energy expenditure pattern

5.2 Subsample

5.2.1 Health and nutritional status

5.2.2 Dietary adequacy

5.2.3 Dietary profile index and its relationship with the selected variables identified

5.1 MAJOR SAMPLE

5.1.1 Socio-economic and Demographic Profile

Adolescents are one of the most important groups of any society as they have an influential effect on the future socio-economic and cultural status of the society (Pourmoghim and Aminpour, 2003). It is now accepted that adolescent health status has an important impact on the health of children, the family and community in the future. Even with this knowledge, adolescents are still exposed to various health risks than any other group and suffer from preventable morbidity and mortality. Besides their socio-economic determinants, health and nutritional status,

knowledge and awareness, food habits and consumption, life style, workload and time utilization are few of the factors, which permeates all aspects of their health. The present study attempts to highlight these factors and their relationship with dietary profile of the adolescents. A knowledge of the demographic and socio-economic features of the sample is vital for understanding the dietary profile of the sample and also the related factors. A recent research reveals that socio-economic and demographic factors play an important role in the food consumption pattern (Rahman and Rao, 2002). Other research studies done earlier also indicate that the effect of nutrition can be understood only in terms of family and social environment and also the kinds of economic and educational resources of the children (Riccuiti, 1993). Moreover, the assessment of the demographic and socio-economic environment of the sample gives a vivid picture of the adolescents' physical, mental and social background.

The socio demographic parameters adopted here comprises of the sex, age, religion, caste and family details of the sample. As mentioned earlier, the main source of data for this exercise has been through direct interview with the subjects and their parents, using an interview schedule. Here in the present study the population of boys and girls are 50.00 per cent each selected equally from urban and rural areas. Among them majority (52.00 per cent) of the respondents are of 16.5 year age whereas 28.00 per cent belonged to less than 16.5 *i.e.,* between 15-16 and remaining 19.00 per cent are above 16.5 years of age *i.e.,* between 17.5 – 18 years.

Besides this, age and sex structure of the population, information on few other common socio demographic characteristics like religion, caste, family size, family type, education and employment status of the family, income level and its distribution, housing, domestic condition and infrastructure facilities possessed by the family, may help in

understanding the homogeneity and diversity in the socio-demographic factors of the sample.

It could be observed that with regard to religion and caste (Table 6), the group is relatively homogenous as majority of the sample (71.50 per cent) particularly from rural areas (79.00 per cent) are Hindus. This agrees with the earlier findings that Hindus constitute 57.00 per cent of the total population in rural Kerala (Kannan *et al.*, 1997). The rest 20.00 per cent are Muslims and 8.50 per cent Christians. It is observed that most of the Muslims are from urban area and the Christians from rural area. The caste wise distribution also shows more or less uniform distribution as 64.50 per cent belong to backward caste while 21.50 per cent are from forward caste and 14.00 per cent from SC/ST.

The familial background of the respondents are also studied in detail to understand the socio-economic conditions. Concerning the family type it is observed that 82.50 per cent of the respondents are from nuclear families while only 8.00 per cent are from joint families. It is observed by many that the concept of nuclear family is becoming more and more common in our society and joint family system is fast disappearing. The present study also reveals the same. Similar reports are given by Ranganath (1996) and Razeena (2000) in their studies done in Thiruvananthapuram district.

Regarding the family size, Park (1997) had reported that average family size in India is four. In the present study also majority (56.50 per cent) belong to small sized families with 1 to 4 members comprising of father, mother and one or two children. When the rest 38.00 per cent belong to medium sized families with 5-6 members only 5.50 per cent are from large sized families of 7-8 and above 8 members.

Interestingly, 53.50 per cent of the adolescents studied are found to be first born and 50.00 per cent of them have atleast one more sibling in the family and rest are either middle born (15.50 per cent) or last born

(31.00 per cent). This is in line with the previous study done by Chandran (2001) in which sample selected from Thiruvananthapuram district consisted mainly of first borns from small and nuclear families with one or two children.

Another interesting feature of the sample is the larger proportion of mothers with higher education than fathers. Majority of the mothers have studied upto pre degree level when compared with majority of fathers who have education upto high school only. The level of education ranges from primary education to postgraduate and B.Ed. and ITI. But when employment status is considered majority of mothers of the sample (98.50 per cent) are unemployed. In terms of main occupation 38 of rural fathers and 36 of urban fathers are casual labourers and rest 30.00 per cent are government employees. The rest are either self-employed or are working in private agencies. The employment status of the population is an important determining factor with respect to health and nutritional status as reported by Reddy *et al*. (1993). The present study also agrees with the earlier observations and census data available which indicate that the work participation rate of females has not increased as much as males in last decades in Kerala particularly in Thiruvananthapuram district (Eapen, 2000). It has been observed earlier that parent's occupation will affect parent child relationship and thus home climate (Singh, 1997). Here when parental education and employment is considered a more or less uniform nature is observed.

In case of economic profile, it could be observed that where 42.00 per cent of the families are from low income strata (≤ 2250) 30.00 per cent belong to lower middle income (2251-3500) while 17.50 per cent belong to middle income (3501-5000). When 9.50 per cent belong to upper middle (5001-10,000) only 1.00 per cent are from high income strata (10,000 - 20,000). An examination of income distribution and expenditure pattern reveal more or less similar pattern. Major portion of income is

spent by the whole sample for food irrespective of income variation. 94.50 per cent of the families spent Rs. 100 - >1000 for food which is about 60.00 per cent of their total income. Next to food, more money is spent for children's education and 73.50 per cent of families spend Rs. 100- >1000 for children's education. Next priority is given for housing. It is observed that least priority is given for health care and entertainment and very few have kept aside an amount for saving. This finding is in concurrence with earlier findings reported by Sarvaekshana (1992) as an average Indian spent more portion of his income for food.

When housing and domestic conditions are analysed it is understood that majority of the sample (90.50 per cent) are residing in their own houses while rest 9.50 per cent resided either in rented houses or in quarters. When quality of infrastructure facilities were assessed most of the houses are well built and seem to have required facilities and conveniences in their houses like attached bathrooms, electricity, water and sanitation facilities and vehicle for conveyance. Besides, labour saving kitchen appliances, printed media like newspaper and magazines, television, tape recorder and radio are also found in majority of their houses. Among this, television forms the major leisure time entertainment for most of the families. In case of transport facilities, 21.00 per cent have two vehicles like bicycle and car in their homes and 3.00 have three vehicles like bicycle, car and jeep while 22.50 per cent have no transport facilities. All these point out that unlike the earlier decades, 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.

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 infections

resulting in malnutrition. In the present study, a good number (48.00 per cent) of households of the sample have attached latrines. When only 5.00 per cent from rural area depends on common well for drinking water 67.00 per cent of the families have their own well in their houses. About 10.00 per cent of families depend on water from municipalities, while 3.00 per cent of rural sample have water connections from corporation. In case of urban sample, 41.00 per cent of them depend on corporation for water facilities when only 20.00 per cent of them have their own wells at home 5.00 per cent depend on common well and municipality for their water requirements. Majority of the houses are electrified except a few who use kerosene lamp for lighting purpose.

5.1.2 Health and Nutritional Status of Adolescents

5.1.2.1 Health Status of the Adolescents

A perusal of the previous health history of the adolescents reveal that majority have birth weight within the range 2.5 to 3.0 kg which is considered as normal in Kerala children (Shenoy *et al*., 1999). Most of them are delivered in hospital. As per DHS in the year 1996-1997 of the total 4, 37, 123 deliveries in Kerala, 97.50 per cent were hospital based (Shenoy *et al*., 1999). Similarly all the adolescents in the present sample is delivered in hospital. It has been reported that all of the adolescents have taken their immunization in the right time during their childhood as per schedule and no incidence of serious health hazards or illness or injuries are reported by the parents except the preventive mild infectious diseases common in childhood. Except in the nutrition deficiency symptoms noted in the present sample, no conspicuous symptoms were identified previously in the children indicating more or less normal health status in previous years.

5.1.2.2 Nutritional Status of the Adolescents

The nutritional status of the respondents are evaluated from their anthropometric measurements and clinical assessment. According to

Beaton *et al*. (1990) anthropometry is useful because it provides strong and feasible predictors at individual level of subsequent ill health, functional impairment or mortality.

The present study reveals that height of urban boys ranged from 150-189 cm and 154-185 cm for rural boys. It is 144-168 cm and 142-173 cm for urban and rural girls respectively. Several studies have shown that growth pattern among well nourished Indian children for higher socio-economic group is comparable to Western reference standard such as that of NCHS. Besides, India being a vast country with varied culture and diet habits, the standard developed in one state may not be applicable in another state. So this NCHS standard and standard developed for affluent children is used generally for comparison (Ghosh, 1992). This is considered to be comparable with their counterparts of Asian origin and 50th percentile, the median value is termed as standard or 100 per cent of the expected for Indian children (Elizabeth, 2000). In the present study maximum per cent of boys come in 75th percentile and girls come in 50 percentile. NNMB (1994) had reported earlier that the height of females from slum areas of Thiruvananthapuram is found to be between 149.1 to 151.3 cm.

While considering the weight of urban and rural boys it is found that the weight ranged from 40-80 kg and 38-75 kg respectively and for girls it is 36-65 and 36-67 kg. When this is compared with NCHS standard, it is found that majority (93.00 per cent) are below NCHS standard in weight and when compared with IAP found that 36.00 per cent of them lies in 50th percentiles. When the level of malnutrition was assessed using Gomez classification, it is found that majority (63.00 per cent) comes in the normal range and only 33.50 per cent comes in the mild and 3.50 per cent in moderate level of malnutrition. The number of moderately malnourished adolescents are high in rural areas compared to urban area. Mild degree of malnutrition is seen maximum among rural girls compared

to other groups. A study done by Kumari and Singh (2003) too gives similar result where female adolescents were comparatively more malnourished than boys. The percentage of adolescents belonging to normal group is found to be more among rural boys when compared with rural girls. The present study is in line with the results given by Kumari and Singh (2003) that the percentage of adolescents belonging to normal group is more among males than females.

So it is really surprising to note that even though these adolescents have irregular meal pattern no one is severely malnourished when compared with national standards. But most of them are in the border line or moderate and mild level. The nibbling habits and high consumption of sweets and fried foods can be assumed as one of the reasons for the average height and weight.

Apart from height and weight other anthropometric measurements of subjects such as BMI and MUAC were also evaluated.

According to Royston and Lopez (1987) BMI is of value in distinguishing the nutritional state of different groups, monitoring the adequacy of food and in specifying the proportion of malnourished in a population. WHO (1995) revealed that undernutrition is used as an indicator of current nutritional status. In the present study BMI value of 38.50 per cent of the respondents falls between the standard 18.5 to 25 kg/m^2 implicating that their nutritional status is satisfactory. Experts from NIN (1999) confirm that BMI value between 18.6 and 25.0 can be considered as comparable with health for both male and female. Only 2.50 per cent in the study are overweight and rest belong to below normal category which ranges from mild to moderate and severe cases. When 28.00 per cent falls in the mild category 17.00 per cent are in moderate group and 14.00 per cent are severely underweight. This reveals that 59.00 per cent of the sample falls below normal standard.

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 5.00 per cent are underweight, 3.00 per cent are overweight and 1.50 per cent obese.

MUAC measurement helps to assess the amount of subcutaneous fat which in turn gives an indication of calorie reserves in the body of an individual (Malina *et al*., 1974). The mean value of MUAC showed that it is slightly higher than the standard value indicating good nourishment. The study done by Bhat *et al*. (1998) on Kashmir adolescents also is in line with present study as MUAC is comparable with the standard.

From the clinical examination it is seen that nutritional deficiency symptoms are not very uncommon in any of the groups studied eventhough 90.50 per cent comes in normal range as per shown in Eliz Health Path for Adolescent. Anaemia is the most common nutritional deficiency symptom noted. They ranged from mild to moderate level and is rather more among girls particularly the rural girls. Forty two per cent of the rural girls suffer from mild to moderate degrees of anaemia. According to Kellog's Nutrition Advisory Service (1997) the prevalence rate of anaemia among adolescent girls is very high in rural areas, 81.00 per cent than in urban areas (62.00 per cent). ICMR (2001) had reported that overall prevalence of anaemia among 4.34 per cent non-pregnant adolescent girls from 16 districts was 90.10 per cent. Shahbuddin (2000) had reported that according to International Nutritional Anaemia Consultative Group (1995) cut-off values, 94.00 per cent of boys and 98 per cent of girls are anaemic. The study points out that anaemia seems to be higher in rural areas than in urban areas. But, Rita *et al*. (2003) had revealed that among adolescent girls surveyed in the urban and rural area of Meerut the overall prevalence of anaemia was found to be 34.50 per

cent in rural area and 36.50 per cent in urban area. Mild symptoms of other nutritional deficiency symptoms like angular stomatitis, bleeding gum, thyroid enlargement, lack of lustre of hair could be noted among the adolescents studied. Apart from this, mottled enamel is also observed in most of the respondents mainly among the rural adolescents. A study done by Shahbuddin (2000) in Bangladesh had proved that 46.00 per cent of 906 adolescents suffer from angular stomatitis, 32.00 per cent had thyroid enlargement. Another study done in urban slum of Delhi also agrees with this present study as anaemia was reported in 55.50 per cent of subjects, goitre grade I in 28.30 per cent of subjects and dental cares in 37.20 per cent. Vitamin A deficiency was observed 2.30 per cent and 7.30 per cent of subjects had vitamin B deficiency (Kapoor and Mehra, 2003). The present study once again confirms that the inadequate and unbalanced diet with low intake of fruits and vegetables can lead to micronutrient deficiencies that may result in deficiency symptoms and poor work efficiency.

5.1.3 Dietary Habits and Food Consumption Pattern

Food habits of an individual are the characteristics repetitive act that he performs under the impetus of need to provide himself with nourishment and simultaneously to meet an assortment of social and emotional goals (Gift *et al*., 1972). Robinson (1970) had opined that dietary habit of an individual in general influences his or her nutritional status. In the present study it is found from the food habits that 98.00 per cent of the adolescents studied are non-vegetarians and the rest 2.00 per cent are Hindu Brahmins and are vegetarians. Similar result was obtained by Beatrice (1999) in her study undertaken in Thiruvananthapuram district where majority of adolescent sample were noted as non vegetarians. While evaluating the food habits of the subjects a few are reported to be very fussy or choosy in their food habits both by adolescents themselves and their parents. Moreover, majority (72.00 per cent) of them have the

habit of nibbling some food in between meals. Another observation of the respondents dietary habit is that though the three meal a day is followed in majority of the families in Kerala, most of the respondents *i.e.,* 67.00 per cent stated that they regularly skip one or two meals daily particularly breakfast. Lack of time due to tuition classes were the reasons reported by them. This study is in line with that of Khalil (2003) on the breakfast practices of adolescent girls 40.00 per cent of 217 girls under observation missed breakfast 40.00 per cent claimed that they do not feel appetite while 46.00 per cent are in a hurry for classes. Similar results are reported by Samuelson (2000). Doctors, dietitians and nutritionists have observed that starting a day with a heavy breakfast is not only good for health but also to improve the work efficiency of the individual. Here most of the adolescents are found to be leading a busy day with tight schedule and an irregular meal pattern with no breakfast. This could deprive the work efficiency. About 23.00 per cent of the respondents said that their packed lunches taken to school are shared by their peers. Another interesting observation is that a few refused to take packed lunches to school as they are reluctant and ashamed to carry their lunch and so instead of carrying the lunch they skip their meal and substitute this with bakery items like biscuits, cake, candies, chips and fast foods which give some calories and fat with little proteins. Soft drinks and spicy food items contribute only empty kcal. It is confirmed by many that soft drinks and snack items give only empty calories and no other nutrients (Sadana *et al.*, 1997). It is clear that these items satisfy their hunger for the time being. 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 one's daily nutrient needs (Srilakshmy, 2002). Substituting the lunch with one or two snacks will not meet the adolescents calorie need too. Ray and Athawali (2000) had reported that

snack items could not be accepted as nutritious as most of them provide only high fat and carbohydrates and no other nutrient. A concurrent result was observed by Virudhagiri (2002) in his study where the author reported that bakery items like biscuits which are low in calories, candies, chips and fast foods which are high in sugar and salt with little protein; soft drinks and spicy foods which contribute only empty kcal are usually consumed by the adolescents instead of taking regular meals. A few of the respondents reported that during tea time in the evening, they take meals and not tea and snacks which will compensate for lunch and meet their requirements. Some of them are in the habit of skipping dinner too. Devadas (1999) observed that meal skipping and eating irregular meals are common during adolescence and is especially prevalent during middle and late adolescents. This finding is also in confirmity with the studies reported by Saibaba (1986) and Devadas and Easwaran (1986). Thus the food habits of adolescents in the study were mainly characterised by irregular meal pattern as revealed earlier by Samuelson (2000). The author reported that irregular meal pattern (especially breakfast and dinner) were significantly more prevalent among girls than boys who enjoyed better quality food choice. Similar results are obtained here too. Many reported that they do not feel hungry so they do not take lunch or dinner or breakfast. This may be due to the nibbling habits prevalent in most of the adolescents or that their system has got used to the irregular meal pattern. This study is in line with Bhat and Wahray (2000) who reported that street foods were considered as important source of economical and nutrition food particularly by urban. A study done by Malathi (2002) reported that the busy adolescents often skip breakfast and have snacks and soft drinks for lunch and also have junk foods instead of taking dinner.

On assessing the frequency of use of various food items it is observed that cereals is consumed daily by the adolescents as cereal is the staple food of India and among this, rice is consumed daily by the adolescents which is the staple food of Keralites. In addition to this, nuts

and oil seeds, condiments and spices, fats and edible oil, sugar and jaggery etc. are the most perpetually used foods in the dietaries of all respondents. Similar results were obtained by Mony (1993) and Gayathri (2003) as these items are needed in small quantities daily for various culinary preparations popular in this region. A study done on dietary perception and practices in Senior Secondary Boys in Delhi schools also revealed the same that cereals, fats and oil and sugar were consumed daily by adolescents (Vibha and Sibal, 2003).

Next to cereals, milk, roots and tubers and fruits are found to be consumed almost daily by the adolescents. This is mainly seen among adolescent girls of rural area. Milk is taken daily as such or with tea or coffee which is usually substituted for their breakfast. This study agrees with earlier study reported by Kavitha (1999) that the milk and milk products are included in the daily dietaries of adolescents in Thiruvananthapuram district as they have the habit of drinking coffee or tea frequently. A study done in sub-urban Mumbai on food habits, nutritional intake and health of school girls also revealed that two third of students consumed milk or milk products regularly (Raje *et al*., 2003). In case of fruits, ripe tomatoes are included in the daily diet of almost everyone of the subjects but other fruits are less frequently consumed by them. A study reported by Hamulka *et al*. (2003) reveals that frequency of breakfast intake decreased at older school children. Breakfast, milk and milk products, vegetables and fruits intake was too low; intake of fats, sweets and beverages like coco-cola was too high among the adolescents studied. Roots and tubers were consumed less frequently by the adolescents. Similar results are given by Mony (1993) who reported that the consumption of roots and tubers by adolescents are rare. But both small and big onion are taken daily as these are included as seasoning in most of the preparations.

Pulses, vegetables, green leafy vegetables are included at alternate dietaries of adolescent. A study done in Bangladesh among urban adolescent girls revealed that next to cereals which dominate their diet, pulses and fish are most frequently used food items (Parveen and Khyrunnisa, 2003). As most of the adolescents skip breakfast as discussed earlier, the mothers compel them to take milk, egg and fruits mainly banana. So they either consume egg or banana with milk. This study is not in line with that of Khalil (2003) as only a very negligible percentage of adolescent girls had either milk, egg or fruits in their choices. Mothers who are educated, reported that most the adolescents are reluctant to consume vegetables as such and most of them are in the habit of picking and keeping aside the vegetables from the preparation or leave the vegetables as such in their plates without eating. Hence, the mothers who are very much aware of the importance of including greens and vegetables in their diet reported that they cut and mash or grind the vegetables and add to the gravies of different preparations so that the adolescents consume it without knowing. But a study done by Raje *et al.* (2003) on 500 school girls revealed that green leafy vegetables are consumed daily or in alternate days by 36 per cent of them. A study done by Kumari and Singh (2001) on secondary school children also reported that green leafy vegetables, other vegetables and fruits are inadequate in adolescent's diet.

In addition to this, consumption of meat and millet seems to be very rare among the adolescents studied.

Food preference is formed as a result of complex interaction of many factors in an individual's environment (Eggert, 1984). As revealed earlier in the studies of Robson *et al.* (1991) and Sadana *et al.* (1997) the present study also indicates that snack and sweets are highly preferred by adolescents. In addition, all the adolescents reported that they like equally the food prepared both in home and outside home. And among the food preparations 'puttu' is one item which is disliked by most of them as they

said it is very time consuming to eat. From the food preference, it is clear that adolescents preferred any one or two foods from each of the food groups given.

5.1.4 Knowledge and Attitude Towards Nutrition, Health and Food

Knowledge is a body of understood information possessed by an individual while attitude is what one perceives or how he behaves based on the knowledge. A person's knowledge on nutrition, health and food will certainly influence the food preference and food habits. Here in order to have a better understanding of the dietary profile of the adolescents, their knowledge and attitude levels on nutrition, health and food was assessed. The results indicate that though their knowledge in this area is not very high, they have considerable attitude in the areas studied. Nevertheless it is noted that the adolescents' knowledge regarding health and food is better than the knowledge on nutrition. Again sex wise difference is present among both rural and urban sample. This could be one of the reasons for their poor food habits.

A knowledge of health and nutrition is very important particularly for girls because when she becomes a mother in future poor health in adolescents can result in elevated levels of reproductive risks, low birth weight babies with increased risk of neuro genetic abnormalities and deficient IQ and poor school achievement. Here the level of knowledge in girls are better than boys in health and food aspect but in case of nutrition, knowledge of boys are far better than girls.

An earlier study done by Perron and Endrews (1985) points out that nutritional knowledge and attitude is positively connected so that the more the knowledge on nutrition, better or more positive is the attitude towards nutrition and vice versa. But contradictory results are obtained in this study. Majority of the adolescents studied show a positive attitude towards the three areas studied although the knowledge level is not very

good or below average. It is seen that those with very poor knowledge too have quite a positive and favourable attitude.

The adolescents reported that they gathered information regarding food, nutrition and health mainly from mothers and also from other sources. Kerala is a state renowned for high achievement in par with international level in many areas related to health and welfare due to increased level of mass literacy particularly female literacy and also the enlightened attitude towards female education and studies supported by public action. In the present study also majority of mothers have education up to pre degree level, better educated than fathers and are full time house wives who take special interest in child's education, food and health. Personal interview with mothers revealed that they have a good knowledge and awareness on food and nutrition. Nevertheless, they are highly concerned and indulge over their adolescent daughters' and sons' health and education. It seems that Russo *et al*. (1986) observed earlier education increases the awareness and attitude also increases. This could be one of the reasons for the positive attitude shown by the adolescents in these areas, even though their knowledge is not very remarkable.

Besides, adolescents reported that they gathered information from printed media *i.e.*, mainly from newspaper. Concurrent results were reported by Kohli (1986) that adolescents gathered information regarding food, nutrition and health from general reading and also from mass media besides parents who serve as a source of information.

In the present study it is apparent that even though the adolescents have a good knowledge and positive attitude towards food, nutrition and health and are aware about the ill effects of fast foods majority consume fast food and have irregular pattern of food intake. They are very much aware of the problems that can occur due to the consumption of fast foods. As mentioned earlier, this might be due to the lack of time for a proper meal or that in order to save time for other activities they are consuming

fast foods. Concurrent result was observed by Kumudini (2003) who reported that teenagers consume fast food probably because of its easy availability and it is less time consuming but at the same time tasty in accordance with the adolescent tastes.

5.1.5 Gender Specific Roles and Relations

Gender differences are created artificially partly through socialization, partly through positive and negative discrimination in family, religion, media, economic structure, laws and legal system, cultural beliefs and practices, education and health care (Bezbaruah, 2003). But in the present study it is apparent that no gender discrimination as such exist in the families and majority of them give due respect to each other because majority of the sample preferred both sexes equally. Though the adolescents do not feel oppressed or elevated just because of being a boy or girl, they feel that preference regarding birth order do exist as 21.00 per cent of adolescents reported that they felt loneliness when younger ones were born and felt that the younger ones enjoy many more favours being the youngest in the family.

5.1.6 Time Utilization and Energy Expenditure Pattern

Adolescents all over the world seem to lead a hectic life today without much time for rest. The fast changing life style, the hard work and continuous struggle accompanied by physical and mental pressure for achieving their academic and professional goals form the living pattern of today's adolescents. This has a profound influence on their health food habits and eating pattern. For a deeper probe in this area the time utilized and energy expended for daily activities by the present sample was studied. The major activities of the respondents of all the groups studied followed similar pattern irrespective of age, sex or regional difference. Their daily routine include mainly studying, going to school, then tuition classes, television watching and few minutes for eating besides the time for their personal abolutions and sleep. When these activities are

classified based on energy consumption it is observed that their main activities come under moderate activities which require fairly moderate energy expenditure only. About 9-10 hours a day is spend for moderate work, seven to eight hours for sleep, four to five hours for light activities and rest for sedentary activities except about 15-30 minutes for heavy activities by the majority of the sample. The leisure time is spend mainly for watching television or listening to music which comes under sedentary activities. When a very few boys roam about with friends in the evening a few girls particularly in rural area help in household activities during their leisure time. Concurrent observations were made by Dietz (1993) that leisure time lead by television viewing constitutes the principal source of inactivity for children and adolescents. It is observed that most of the adolescents here do not indulge in playing or any other exercises.

When the time utilization pattern of adolescents are assessed, it is observed that they start their day early with tuition / coaching classes and then to school and again coaching classes and reach home late. By evening they are very tired and so go to sleep early rather without dinner or either sit and watch television. Most of them have dinner while watching television. During their busy schedule as mentioned elsewhere, majority of them skip their breakfast and just consume a glass of milk or tea. When a few depend on pack lunches, others either skip lunch or depend on snacks and soft drinks. As Glanz *et al*. (1998) has pointed out that inorder to gain place among the peer groups they are ready to show off or follow their peers to the extend of leaving their traditional food habits and adopting Westernized food habits. Products like wafers, snacks and soft drinks were preferred by them. Majority of them take their meals in the evening while a few have tea and snacks in the evening too and then take a late meal for dinner. But all were very tired by the evening that majority of them go to bed very early without taking their dinner. It is evident that they do not have any social activity or social contact inside or outside home except their friends in school. Boys and girls both in urban

and rural areas have the common habit of munching something during free time or while watching television. This may be another reason for lack of appetite and skipping of meals or as Garby *et al.* (1990) had reported energy expenditure at rest and various degrees of physical activity changes with environmental changes.

5.2 SUBSAMPLE

5.2.1 Health and Nutritional Status

A general picture of the adolescents, their family background, their socio-demographic and economic features, dietary habits, nutritional status, knowledge and attitude towards nutrition, health and food and also their time and energy expenditure pattern are obtained from the study of the major sample. For a deeper probe into their dietary profile and related factors, as mentioned in earlier chapter, a subsample was selected from the major sample. The subsample consists of 40 adolescents with ten boys and girls within the age group 16-17 years each from urban and rural area. The family background of the sample reveal predominance of middle class or lower middle class small sized families with both parents having moderate education and mostly unemployed mothers. Results of the closer scrutiny of the dietary profile and the related factors done on this subsample are discussed here with empirical support.

Adolescents form a significant part of our population and the assessment of their nutritional status is relevant as healthy adolescent is a prerequisite to healthy adult life and healthy future generation. Moreover, being in final phase of growth in life provides a unique opportunity to compensate nutrient deprivation or growth retardation that may be viewed during early years of development. Although optimum care and guidance provided during their period could help them to develop to their optimum potential, life risks during the period is rather high. Nevertheless, poor food habits, hectic life style and neglected diet are known to be the predominant causes of adolescent health risks. The scientific appraisal

carried out here will throw light on the dietary profile related factors that affects the health of adolescents. Further, a probe into the nutritional status and health and dietary profile of the adolescents is relevant in this period. ICMR (1994) reported that in field studies to assess 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 concepts that an appropriate amount should reflect any morphological variation due to significant functional and physiological changes (Rao, 1996). Here as for the major sample parameters like height, weight, BMI, and MUAC 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 the 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 particularly the sample from the rural areas. In case of urban sample, in some of the areas studied the picture is not so gloomy while in other areas the condition is as bad. The sample shows deficit in anthropometrical measurements with poor haemoglobin level and possessing many of the nutritional deficiency symptoms and consume a diet inadequate in quantity and quality. Their knowledge in the areas of food, nutrition and health are rated as medium level knowledge. However, their attitude towards these areas are quite positive and right. Moreover, these above features seem to have a fairly significant relationship in many areas of their psychosocial adjustments.

The picture obtained when each variable is studied separately for both rural and urban boys to pinpoint exactly the area where more lacunae exist is discussed in detail.

It is obvious from the results that the adolescents on the whole are much below the NCHS standards in all the anthropometrical measurements studied and below the national standards in all measurements. Separate region and sex wise analyses envisaged for the sample show significant difference in all the areas. It is encouraging to know that boys as a whole and urban girls are taller than national standards while urban boys are much taller than the international standards though the urban sample as a whole is a shade better than rural sample both in the case of boys and girls. As referred earlier the body mass index measured as Wt/ht^2 is used as an index of nutritional status of the subjects. Those with BMI <18.5 is considered as energy deficient while those within 18.5 – 25.0 is considered as energy adequate and those with BMI >25.0 are classified as obese. Here it is apparent that except for urban girls who stand in the border line of adequacy, all the other groups are energy deficient. In case of MUAC except urban girls all denote deficit than the average standard. For all measurements the rural sample are far below the national and international average. The Indian adolescents are far below the international standards in their anthropometric measurements. A study done by Verma (2000) on rural children in the first six years of life in six regions of India revealed that on all the anthropometric measurements both boys and girls were deficient from the national average. Still another study by Kumari and Singh (2001) on SC children of 6-12 from Bihar also give similar result. All these studies point out that Indian children and adolescents particularly in the rural area are far below the standard in their anthropometric measurements. The present study also confirms this. Clear evidence without doubt have already established the fact that the deficit in anthropometrical measurements

starting from birth and continued throughout childhood and adolescence can have perspicuous repercussion in adulthood and in their progeny too.

As expected the result denotes clearly that difference do exist between the sexes and boys certainly have better anthropometric measurements than girls during this period. Further, urban girls are found to be better than rural girls in all measurements

When the level of malnutrition was classified using BMI, the whole sample comes either in mild or moderate levels of malnutrition. When classified as per Gomez classification 38.50 per cent of adolescents fall in normal range. Result of the studies conducted by Reddy *et al*. (1993) showed that upper middle class girls (16.00 per cent) had deficit in BMI indicating that the weight deficit is a major factor probably related to poor energy intake of the group of population. It is reported that among urban poor and rural girls this is mainly due to their getting lower priority for the food over the boys in the family. But in upper class the weight deficit is related to personal likes and dislikes and also conscious attempt on their part to maintain a low weight in the fear of becoming over weight.

Haemoglobin estimation is another indicator of an individual's health and nutritional status. Here it is observed that both the urban and rural sample have a haemoglobin level lower than the minimum levels recommended by WHO. Analysis envisaged separately for the groups revealed that it is not the boys, but the girls from both regions who are having a low haemoglobin level.

As haemoglobin is the career of oxygen in the body less concentration means that muscles and cells receive less oxygen. This in turn means that anaemic adolescents have less energy, tire more easily and are more susceptible to infection. Moreover, prolonged anaemia in girls can affect the safe motherhood in future too.

As in the present study many studies in India and in many other developing countries proved that anaemia is most common in all groups of adolescent girls to the extend of 20-25 per cent irrespective of social class. When anaemia is common in poor class due to the non availability of healthy foods because of poverty; in higher class it is due to wrong food habits (Srilakshmi, 2002).

As expected, the major nutritional deficiency symptom identified by the physician is anaemia. The prevalence figures indicate greater degree of anaemia among the adolescent girls. This is closely followed by angular stomatitis and bleeding gum which is seen only among rural sample. Thyroid enlargement could be noted both in urban and rural groups. Prevalence of goitre in the country after analysis of sample from 14 districts by ICMR (1989) recorded an overall goitre prevalence (21.00 per cent) and cretinism prevalence rate of 0.7 per cent. It is also reported that no state in India is free from iodine deficiency and many millions are considered to be at risk of IDD (Reddy *et al.*, 1993).

Except for prevalence of anaemia, urban boys are found to be slightly better than their counterparts in the other groups. Rural adolescents irrespective of sex differences are worse than their urban counter parts. The comprehensive data thus implies that the adolescents nutritional status as per anthropometric and clinical assessment is far below the International standard and in some areas below national standards too. And the rural sample is far worse than urban sample and in this girls are worse than boys. Prakash (1999) reported that anaemia is most widely prevalent deficiency symptom among rural child population. In addition to this Gawarikar *et al.* (2002) opined that during adolescent period of human growth due to growth spurt the risk of iron deficiency anaemia appears to be more for boys and girls and in girls this remain as such during their reproductive life.

5.2.2 Dietary Adequacy

Monitoring dietary intake pattern in adolescent is important in order to explore and prevent the onset of adult health problems too.

Food consumption is another important determinant of nutritional status. Information regarding food consumption pattern of the families and the daily dietary intake of the sub sample were assessed through one day weighment method. The adequacy of the different food groups and nutrients consumed were calculated and compared with the recommended dietary allowances (RDA) laid out by the ICMR.

The data revealed that majority of the sample are non vegetarians. Even though major portion of the family income is spent on food, the average dietary intake of the subjects studied as subsample are deficit in quantity and quality, *i.e.*, the diet do not meet the quantity of food from each group to be included daily in the adolescent diet as per the recommendation of ICMR. Further the nutrient content of the diet too are inadequate when compared with RDA.

The nutritional adequacy determined though qualitative and quantitative analysis gives a picturesque description of adolescent diets. It is quite clear that their diet is poor and inadequate both in quantity and quality content. It is far below the RDA given by ICMR (1989) on food intake. Even cereal which is consumed daily by the respondents is only upto 89.40 per cent of the RDA for the boys and 64.69 per cent for girls. When the consumption of fish and vegetables are better, the intake of greens and fruits are very low. Fat consumption is comparatively more but deficit than the standards.

Though cereal is consumed more than other foods it does not come any where near the RDA as can be seen from Table 38. Sex wise and region wise variation is seen in all the food groups though the difference is not statistically significant for all. It can be seen that the boys and

urban population have a better food intake when compared to rural population and girls. It is observed that boys consume whatever food they get and so they are said to have better food intake than rural.

The differentials in cereals, fruits, fats and oils are more obvious in boys and girls. In these food groups though not adequate the boys have comparatively better intake than girls. Nevertheless, the boys intake is comparatively closer to the RDA *i.e.*, 70-50 per cent. But for other food groups particularly green leafy vegetables and fruits, the consumption is very low. That could be the reason for the presence of nutritional deficiency symptoms and low hemoglobin level. Concurrent results are obtained in many researches which had revealed that low intake of green leafy vegetables and fruits in the diets of adolescents and school children. Eventhough pulse consumption is very low, majority being non-vegetarians the intake of other protein foods like meat, fish and milk and milk products is more than 70 per cent. This may be the reason for the normal anthropometrical measurements particularly for height in the case of boys. Nevertheless in the case of girls, though pulse consumption is a shade better than boys, the consumption of meat, fish, egg and milk and milk products are lower than boys. When the RDA of pulses is 70 to 50 g/day, the intake is below 20 g for all. This observation is in line with the observation made by Reddy *et al*. (1993) that the larger percentage of population consumes an inadequate level of pulses as compared to cereals and the percapita availability of the food stuff is low. It has been recommended that unless appropriate steps are taken to substantially augment the production of the pulses in the country, the quantity of our dietaries will further deteriorates. The highly deficient intake of cereals and fats which provide the energy required may be the reason for the low BMI which is assessed based on height and weight. The adequate intake of sugar may be one of sources which is providing the adolescents the energy for their day to day work. But it can be seen that even in the case of fat, when 90 per cent of RDA is met for boys, it is only 70 per cent for

girls. Another grave issue is the consumption of vegetables, fruits and green leafy vegetables particularly in girls. Though much below the recommended level, the vegetables meet about 50.00 per cent of the requirement and boys consumes about 70.00 per cent of fruits also. But in the consumption of green leafy vegetables, it is only 7.20 and 8.50 g for boys and girls respectively to the requirement of 100 g / day. This corresponds to barely seven to eight per cent of the need. And in the case of girls even fruit consumption is barely 20 per cent. Such a diet which is low in all the nutrients can definitely lead to deficiency in proximate principles as well as micronutrients which can have lifelong repercussions in their physical and mental stature and health. Moreover, as observed earlier the health of the future generation of the country as a whole will be affected.

The result of a study by Verma (2000) on different states of the country also revealed that diets of adolescent girls (15-18 years) were inadequate and lower than adult women inspite of higher needs in this age group.

The food guide pyramid is a pictorial representation of the dietary guidelines developed by Human Nutrition Information Service published by US Department of Agriculture (Plate 5). The diet is evaluated by comparing pyramid recommendation with the actual food intake. Fraser (1994) suggested that it is important to assess individual food and not just micronutrients dietary content alone because many food contain several biologically active compounds which may in the long term promote health benefits among individuals. When compared with the food guide pyramid, the results indicate that the whole sample failed to consume the recommended number of servings from each groups. And also the consumption of fats and sugar from the pyramid tip contribute more of the diet than any other group. The results of the present study is in line with

Beatrice (1999) that adolescents on whole preferred to have fried foods, sweets and nuts and oil seeds highly and not any food from other groups.

But it is apparent that the intake when compared to the pyramid tip is very close to the recommended level. Much lower and less adequate proportions are from the pyramid base, the cereals. The intake of all the other groups particularly for fruits and vegetable groups consumption is very low compared to the pyramid recommendations and it is recommended that the dark green and yellow vegetables should comprise one third of total vegetable servings. Here it is far below the requirement. As indicated the food intake is very inadequate and it is far below for rural groups and much worse for girls. The overall diet of the adolescents of the sample is not compatible with that recommended in food guide pyramid. Furthermore, when individual food group item was considered respondents did not comply with basic guidelines recommended to encourage healthy food choices. Proportions of consumption from all the food groups is well below minimum recommendations indicating inadequate diet across both sex and region. The mean intake particularly of females did not meet any of the basic recommendations. Similar results are observed by Brady *et al*. (2000) and Munoz *et al*. (1997) in studies done on African and American children where the diet was inadequate in all groups when compared with the pyramid. But females consumed a higher amount of fat while males consumption was more close to the recommendation for grains.

A diet which is quantitatively so inadequate in all groups, no doubt will be poor in quality too. As can be observed from Table 42 the diet is inadequate in all the proximate principles *i.e.,* all macronutrients and majority of the micronutrients except for thiamine, niacin and vitamin C. However, the analysis indicate that the consumption of fat is significantly higher than the RDA. When 70 per cent of energy and protein intake is met from macronutrients, only minimum level is met for the iron and

vitamin A. But for calcium the intake is close to the RDA, may be due to the comparatively high proportion of cereal foods and milk in the diet. Many previous studies indicated that income significantly improved the dietary quality. Eventhough the sample comprises mainly of lower to middle and high upper income group and major portion of the family income is spend on food, the inadequate quality prevailing in this study as suggested earlier may be due to the poor dietary habits and practices followed by the adolescents. This again confirms the energy and other nutrient deficits indicated in anthropometric and BMI assessment.

These results agree with the previous studies done in India and other countries that the adolescent diet throughout the world is inadequate in quantity and quality and is poor in most of the nutrients except in fat intake.

5.2.3 Dietary Profile Index and its Relationship with Variables Identified

It is widely accepted that adolescent nutrition is linked with the safe motherhood, reproductive child health and many of the health problems of their progenies. Hence researchers are becoming more aware of the necessity for monitoring and reforming their nutritional pattern. And it is proved that many factors determine the food intake and nutritional status of adolescents. Tracing the level and relationship of these indicators can help the researchers to significantly reduce or modify the causative factors. Here, a dietary profile index (DPI) was derived using selected characteristics from the information collected about the subsample and its association and relationship with identified variables were studied. Further, association with variables which can contribute to their dietary profile, the adolescent's knowledge and attitude towards nutrition, health and food, dietary habits, adjustments in psychosocial areas, selected socio-demographic variables, their own workload and time and energy utilization are studied.

The results obtained are very interesting. The nutritional deficiency symptoms as such do not show any significant relationship with their DPI, though the food intake do show some relationship. The consumption of pulses, vegetables, fat and milk show a highly significant relationship with the DPI. However, it is observed, that the adolescents intake in these foods are quite inadequate which indicates a poor dietary profile in turn.

When knowledge and attitude of the sample as a whole is evaluated the results indicated a fairly adequate attitude but a knowledge that is not so remarkable. Here when the relationship with DPI and attitude is studied, a statistical insignificant relationship is obtained. Nevertheless, a negative relationship is seen for both boys and girls in their attitude towards health. These suggest that their negative attitude in health may contribute to their dietary profile as such which again confirms the earlier observation that it is the wrong habits and practices of the adolescents which have more influence on their dietary profile than other factors. Similarly, when the knowledge of the respondents were correlated with DPI as expected, significant relationship is observed between the two particularly, the knowledge of boys on health and food. But in the case of girls the relationship is insignificant and negative. As observed earlier, it is not lack of knowledge, but improper attitude in girls that prompt them to take improper and inadequate diet.

A very interesting result is that though skipping of meals or fussiness in food consumption, as such do not have any significant relationship with DPI, the nibbling habits seems to have a very good influence on the DPI. As revealed by the majority of the groups, they all have the nibbling habit of taking some light food in between meals which may be one of the reasons for skipping meals or vice versa. Eventhough girls scored a better score than boys in their knowledge level in food and health, the association with DPI is significant and negative suggesting that their knowledge in this field has not influenced their DPI much. However,

for boys even with low score, significant association is seen indicating that the knowledge in this area can affect the dietary profile of boys. But on the whole the knowledge level on food, nutrition and health of this sample is not very promising but quite inadequate. This study is in line with Russo *et al*. (1986).

When the relationship of the adolescents psychosocial adjustment and DPI was determined surprisingly no significant relationship is seen particularly in achievement area, social relationship, self confidence and family relationship. However, the relationship is negative in all the areas for girls except in the area of physical adjustment and gender relationship. But for boys it is positive in all areas studied except in the gender and family relationship. This indicates the dietary profile of individuals and their psychosocial adjustments in life are closely related with each other either in positive or negative direction. Alaemo *et al*. (2001) in a study done on US children and teenagers found that negative academic and psycho-social outcomes are associated with family level food insufficiency.

As expected, lower is the gender discrimination in the family, better will be the dietary profile. However, the adolescents of the present study, as mentioned earlier, do not perceive that such a disparity exists in their families especially for food distribution. The preferential cultural access of males to all areas existing in other parts of the country is proved to be very rare in Kerala and which is considered as an important factor for 'Kerala model development' (Shenoy *et al.*, 1999).

Food consumption and nutritional status of population is proved to be very much influenced by their socio-demographic characteristic like age and sex profile, occupational profile, family background etc. The literacy status of the family along with family size and composition is known to be important dimensions in the management of home budget, food choices and health practices which in turn affect the health and

nutritional status of all the members of the family. Here, when characteristics like religion, caste, family size and consumption etc. were associated with DPI no statistically significant relationship is seen with parental education or occupation. The achievement in literacy for both males and females leading to increased awareness and to improved health and nutritional practices are proved by many as the backbone of 'Kerala model development'. So irrespective of educational, occupational and income variation, in most of the families of Kerala, better health and nutritional practices are followed. Nevertheless in this study, the sample is found to be highly homogenous in religion, caste, family size and composition. Moreover now-a-days most of the families in Kerala are small sized and nuclear and in this study also there is no exception. Hence these characteristics may not have any direct association in the food selection, distribution and consumption in families. The disparity if ever exists it may be due to the preferences and attitude seen typically in adolescence. The study by Arora (1991) revealed that the socio-economic level of the respondents such as social, economic, religious and family background in general have a very distinctive part to play in determining the attitude and food behaviour pattern of the individual.

It is obvious that though the DPI developed do not show statistically significant relationship with many of the selected variables, slight and varied association is seen with the majority of the variables. Hence interrelationship between the selected variables and each of the characteristic included for developing the index was done to understand where the relationship exist and in what direction is the relationship. As not much diversity is seen in the socio-demographic characteristics of the sample, these variables were not included.

When anthropometrical measurements were correlated, it is observed that the measurement in height, weight, MUAC and BMI are significantly related to the food intake particularly the major nutrients and their

consumption of cereals, pulses, fruits, vegetables and sugar. Another interesting indication is that the proved height and weight measurements in boys have a positive and significant relationship in the different domains studied under psychosocial adjustment. But for girls height and weight have shown significant but negative relationship with adjustments in social, personality and achievement areas, and also their self confidence. This agrees with earlier observations and previous findings that girls are very conscious about their physical appearance and that may be the reasons for their poor food intake when compared to boys. Jha (2002) has reported that most of the adolescents are convinced that they have to starve themselves to lose fat and it is hard to convince them that they need proper diet to get results. Food insufficient children and teenagers were more likely to have, psycho-social difficulties (Alaemo *et al*., 2001).

The results once again confirms that the haemoglobin level is related to their food consumption but increased energy consumption do not improve the haemoglobin level. But the attitude and knowledge in these areas particularly of boys have a close relation with their haemoglobin level. Same indications are obtained with DPI also, thus emphasizing that boy's knowledge and awareness have an influence on their food consumption and selection and also their health. But in girls, it can be assumed that it is not lack of awareness that reduce the intake of cereals, fat and other energy yielding foods but it is the importance they give to their physical appearance and also their misconceptions towards food and food intake.

Similarly, the food consumed and nutrient intake seem to have a vital influence on their psycho-social adjustments and it is deficient for boys and girls. Though DPI as a whole do not show statistically significant relationship with many of psychosocial adjustments; consumption of all the food groups seem to have a vital and significant

relationship with one or other areas of psychosocial adjustments. The consumption in turn is affected by their knowledge and attitude in these areas. Moreover, the intake of major nutrients like energy, fat and protein and micronutrients like calcium and carotene seems to have more relationship with many of the other variables included. As expected the food intake and nutrient intake is highly interrelated. It is evident from the intercorrelation that adjustment in the psychosocial areas and food consumption is very much related varying with each food and nutrient consumption. Thus the results of the intercorrelation indicate undoubtedly the relationship of food consumption, knowledge and attitude and dietary habits on the dietary profile and psychosocial adjustment of adolescents studied.

The magnitude of poverty is usually assessed based on the mean calorie intake and monthly percapita expenditure. Diet in the present sample even in households where adults consume adequate dietary energy or where per capita income is not below poverty line, more than 75.00 per cent of the adolescents have inadequate energy intake. Moreover, sex wise and region wise variation is seen in the respondents. Girls in general and rural sample is obviously have more inadequacy than boys and urban sample. When energy consumption is compared with their energy expenditure 75 per cent boys and 85.00 per cent girls do not get adequate energy based on the energy expenditure. When time utilization and workload of the adolescents were evaluated, it is understood that the majority of the sample irrespective of time, sex or regional variation indulge mostly in moderate activities and have only very little time for leisure time activities or for food intake. It is also apparent from the information collected that their time is spent on school, studies, tuition or extra coaching with very little time for other activities. Those who help in household activities or indulge in play or other exercise are almost nil except a few boys who find sometime in playing or roaming about with their friends. This again emphasis the fact that the adolescents in this

sample not only take food inadequate in quality and quantity, but they are also overburdened with their studies and academic work, that they do not get any time to take their meals properly or to indulge in any leisure time activities, play or other hobbies or rather no time even to meet their personal needs. This in turn is pertained to their nutritional status and psychosocial adjustment. This perspicuously prove that the dietary profile of adolescents are more influenced by their workload, time utilization pattern and food habits and practices than their socio-economic and demographic condition. Moreover, sex and region has a significant influence on the dietary profile.

Summary

6. SUMMARY

The study entitled "Determinants of dietary profile of higher secondary school children was undertaken with the objective to assess the dietary profile of Higher Secondary School children and to ascertain the influence of selected factors such as social and domestic environment, knowledge, attitude, preferences, gender specific adjustments and psychosocial profile.

The sample selected for the study comprises of 200 students with 100 boys and 100 girls selected from the XI standard of two boys' and girls' higher secondary schools of Venganoor and also higher secondary school of Kamaleswaram. A comprehensive analysis of socio economic and demographic features and the nutritional and health status of the children were carried out using nationally and internationally accepted result assessment methods to get a picturesque and exhaustive information of the local adolescent sample. Nevertheless, a probe into the dietary profile and related factors in adolescence, the most crucial period in the life span of an individual, can help to reduce the diet related issues which is very common during this period. A systematic and indepth appraisal to understand the dietary profile and related factors using standard tools and measures is done on a subsample of 40 students (20 males and 20 females) selected from major sample.

The major findings of the study are:

The sample as a whole form a homogenous group with most of the adolescents hailing from low to lower middle or middle income, nuclear families with one or two children. Both the parents have moderate education with mothers better educated than fathers though do not have any employment outside home. The major source of information for the respondents are from their own mothers, peers, newspaper, television and

radio. In addition to this they acquire knowledge from their textbooks and from teachers. Majority of them have own houses mostly with concrete roof, possessing the basic utility services like water, electricity and sanitary facilities. Most of the families have conveniences like refrigerator, modern kitchen appliances, television and vehicles for transportation. Major portion of the family income is spent on food, next is savings and on children's education and then for clothing and housing and least priority is given for health care and entertainment.

The dietary profile of the sample gives a gloomy picture. The nutritional status of the sample are poor and most of the adolescents are found to be much below the normal standard in all anthropometrical measurements except in case of height for boys. In most of the areas urban, rural and sex wise variation are seen. Rural sample and girls are observed as greater sufferers than the other groups. Most of the adolescents exhibited nutritional deficiency symptoms of one or other, mainly anaemia, thyroid enlargement, angular stomatitis, bleeding gum and lack of lustre of hair. All the adolescent girls have low haemoglobin level than minimum level by WHO but in case of boys the level is either normal or above.

Majority of the sample are found to be non-vegetarians. Their dietary assessment reveals a highly inadequate diet in quantity and quality. The intake of all the food groups are far below the recommended dietary allowance (RDA) except fats, oils and sugars which are close to RDA. The diet is deficient in almost all the major and minor nutrients except fat, thiamine, niacin and vitamin C. The sex wise and region wise variation is quite evident with girls and rural population having a poorer diet than others.

The evaluation of the energy balance and time utilization of the sample revealed the following. Majority of the boys and girls have a negative energy balance showing that their energy expenditure is more than intake. Also the energy intake is below the energy requirement

recommended for their age. Nevertheless, most of their activities are moderate in nature with very little heavy activities. In the time utilization, the adolescents are found to be very much loaded with their studies, homework and coaching classes. They rarely get time to have proper meals or to carry out their personal activities or to indulge in any recreation, play or hobbies. Their lack of time and heavy workload could be the reason for the poor dietary profile and psychosocial adjustment of the sample.

The knowledge and attitude in nutrition, health and food is assessed and found that though the majority have positive attitude their knowledge in these areas are not very encouraging. Their knowledge and attitude seems to have a direct influence on the dietary profile particularly in their food intake and indirectly in their anthropometrical measurements and clinical symptoms.

The dietary habits and preference of the sample studied are in par with the earlier researches done in the field. They prefer fast foods, soft drinks, snacks and sweets and do not like pulses, vegetable especially green leafy vegetables. Most of them skip the major meals and are in the habit of nibbling something in between. It also revealed that the nibbling habits have a direct and significant correlation with dietary profile. It can be assumed that, this has a steady influence on the dietary profile as can be observed from their poor nutritional and health status.

Unlike in earlier studies, the socio-economic and domestic backgrounds do not show any remarkable influence on their dietary profile.

But in the areas of psychosocial adjustments most of them have poor adjustment in some of the areas studied and the study reveals close relationship with dietary profile. It is seen that adolescents time is heavily loaded with academic work with no time for active play or recreation. Added to this are their poor dietary intake and wrong dietary habits and its implications on their health and nutritional status. It can be assured that

this can be the major cause of their poor academic achievements and poor adjustments in almost all areas studied. Sex wise and region wise variation is seen. A slight negative relationship exists for family relationship and gender with DPI in case of boys. But in case of girls a negative relationship exists in half of the areas studied with DPI, which include achievement, social relationships, self-confidence and family. But the present samples of adolescents do not perceive that gender disparity behaviour exist in their families.

On the whole the results reveal a depressing picture of adolescent having poor anthropometric measurements and standing far below the normal standards in their dietary profile. Their over work and over loaded time schedule give them absolutely no time to take proper meals which in turn affect their nutritional status. The poor knowledge and wrong food habits and skipping of major meals worsen the situation. Similarly most them are having problems in psychosocial adjustments, which in turn is related to their food intake and dietary profile. Rural adolescents and girls are found to be most affected than boys and urban population.

Therefore the results imply that food consumption pattern is poor among these adolescents and their workload is high. Also their weight is less when compared to their height and age but majority of them had normal BMI.

At present no conspicuous implications are seen in their health but if this state is continued it can have long-term irreversible repercussions in the physical and mental health and work efficiency of adolescents. Moreover, adolescent do not take proper food not due to lack of availability of food in the house but due to poor dietary habit and poor knowledge. Added to this is the tight work schedule with not time for recreation or active play. All this reduce not only the present work efficiency but can also can have long-term effect on physical and mental capacity as could be seen from their poor adjustments in most of the

psycho-social domain studied. Also anaemia seen particularly in girls can lead to poor reproductive child health and can affect the future generation.

The present study is confined to a small sample selected from one district only. Though socio-economic and demographic details did not seem to have much impact in this study generalisation cannot be made from this for other areas of the state.

Therefore, the results however objectively obtained may not hold good for adolescents from other districts. Hence, this study may be replicated using a wider sample selected from all over the state, so that possible difference if any due to socio-cultural variation can be understood. This will help the adolescent and all concerned to improve adolescents' dietary profile.

In present investigation the samples have more or less homogenous, socio-economic and demographic background and majority are from same religion and income group. Studies on wider sample giving due representation to variations in income and religion may give an insight into the variation in these areas and the impact on adolescent's dietary profile and health are needed. Such comparative further research in this area is highly recommended particularly between boys and girls and between different regions. Results suggest the need for further research in this field. The study serves as a catalyst of such major research in this field though it is not sufficient to make generalization. A larger study will keep further insight into causes of the increasing health and nutritional problems, diet related diseases and morbidity seen in adulthood.

The results obtained suggest the intervening role of socio demographic environment, knowledge, attitude, food habits, work load and psychosocial adjustments on the dietary profile particularly nutritional status and malnutrition level of adolescents. This prompts for further researches to improve the adolescent's knowledge in these areas and further measures to reduce their workload and tension. Intervention

programmes to improve the nutritional status of the adolescents are necessary to reduce the health risks of adolescents and their future children. Urgent measures to improve the food habits of adolescent girls are also recommended.

But the present study with all the limitations is expected to serve as a source of information for nutritionist, doctors, educationist, policy makers and other investigators to conduct both intensive and exhaustive researches in this field. Also it is hoped that a study may open avenues for further research and to take up many intervention programme or to modify existing programme in the new light. Also this will serve as a guide for adolescents to have an insight into their own dietary profile and to improve their consumption pattern, dietary habits and to plan their work and time schedule more effectively.

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* Original not seen

DETERMINANTS OF DIETARY PROFILE OF HIGHER SECONDARY SCHOOL CHILDREN

KRISHNA ROOPA

**Abstract of the
thesis submitted in partial fulfilment of the requirement
for the degree of**

Master of Science in Home Science
(Food Science and Nutrition)

**Faculty of Agriculture
Kerala Agricultural University, Thrissur**

2003

**Department of Home Science
COLLEGE OF AGRICULTURE
VELLAYANI, THIRUVANANTHAPURAM 695522**

8. ABSTRACT

The study entitled "Determinants of dietary profile of higher secondary school children" is proposed to assess the dietary profile of the higher secondary school children and to ascertain the influence of selected factors like socio economic and domestic environment, knowledge attitude, dietary habits, preference, work load, time utilization, their psychosocial adjustments and also their perceptions on gender specific discrimination.

The study was carried out on 100 boys and 100 girls studying XI standard selected from three higher secondary schools of urban and rural areas of Thiruvananthapuram educational district. The respondents belonged to the age group of 16-17 with the majority from Hindu OBC community and mainly first born from small sized nuclear families. Most of them hailed from either lower, middle or middle income families owning their own houses with tiled roofs and possessing the minimum necessities like water, electricity and sanitary facilities and also conveniences like labour saving kitchen appliances, refrigerator television and also vehicles for transportation.

The anthropometric measurements of the sample revealed them as below the NCHS standard in height, weight and MUAC with very poor BMI. All girls have low haemoglobin level while for boys it is normal. The majority of the adolescents possess nutritional deficiency symptoms like anaemia, angular stomatitis, thyroid enlargement, bleeding gum etc. Regarding their food intake, their food consumption is found to be inadequate in quantity and nutrient content. The assessment of their food preference and dietary habits indicated that they prefer mostly sweets, snacks and fast foods like adolescents all over the world and least preference are given for pulses and vegetables particularly leafy vegetables. Majority of them are in the habit of skipping all the main meals and thriving on nibbling snacks, savories or tit bits and soft drinks. Though they have a positive attitude towards nutrition, health and food,

their knowledge in these areas are not very good. Most of them live on negative energy balance with more energy expenditure than intake though they indulge mainly in moderate activities. But their time is loaded with academic activities like school, homework, coaching classes that they rarely get time for food, recreation or personal activities. In the areas of psychosocial adjustments also the results are not very positive but negative with them securing poor score mainly in areas of achievement, social, self-confidence and family relationships. But fortunately they do not perceive that gender discrimination exist in their family. When the association of various factors with the Dietary Profile Index developed was studied many factors like dietary habits, work load, psychosocial adjustments, knowledge and attitude towards nutrition, health and food are found to have profound and significant influence on one or other. Characteristics included under dietary profile are mainly nutritional status, health status and food consumption. Another interesting result is that almost in all the variables studied rural and urban variation and sex wise differences have a significant impact. Rural sample as well as girls from both regions are ranked as much below the national and international standards in BMI and anthropometric measurements with poor scores in most of the other areas studied particularly in their food consumption. The boys and urban sample though do not reach the standard profile are comparatively better.

This implies the need for more nutrition education to adolescents and their parents and also in initiating steps to improve the dietary profile of the adolescents and to reduce their workload. More research to have a systematic distribution of adolescent's time, giving enough time for food, work and recreation, is recommended. Special attention and intervention programmes with supplementary measures are needed to improve the quality of life, health and nutritional status of adolescent girls to guarantee safe motherhood and reduced health risks in adolescent girls the future mothers, and also to their children and thus to community and nation as a whole today and in future.

APPENDIX – I

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF AGRICULTURE, VELLAYANI
DEPARTMENT OF HOME SCIENCE

Name of the investigator :

INTERVIEW SCHEDULE TO ELICIT INFORMATION ON SOCIOECONOMIC AND DOMESTIC ENVIRONMENT FROM THE RESPONDENT

A1. PERSONAL AND SOCIOECONOMIC DETAILS

1.1 Name of the child :   Sex   :   M/F
1.2 Address : Home :   School :   Class
                                           :
                                           Division   :
                                           Name of school   :
                                           Place of school   :
1.3 Date of birth :   1.4 Age : ….. Years ……… Months

1.5 Religion : Hindu/Christian/Muslim   1.6 Caste : Forward/SC/ST/OBC

1.7 Community :

1.8 Place of residence : Rural/Urban/Suburban   1.9 Native place :

1.10 Mother tongue of the child :

A2. FAMILY DETAILS
2.1 Family type : Nuclear/Joint/Extended

2.2 Family size : | 1-2 | 3-4 | 5-6 | 7-8 |

2.3 No. of siblings : | 1 | 2 | 3 | 4 | 5 | 6 |

2.4 Ordinal position : First / Middle / Last

2.5 Order of birth | 1st | 2nd | 3rd | 4th | 5th |

B. HEALTH AND NUTRITIONAL ASSESSMENT
B1. Birth history
1.1 Birth weight (kg) …………   1.2 Birth length (cm)………….
1.3 Type of delivery – Normal/Caesarian/Forceps/Vaccum
1.4 Birth term – Normal/premature/post mature

B.2. Health Assessment

2.1 General health : Normal/Underweight/Obese/Handicapped/Invalid/Specify if any other

2.2 Immunisation taken

Vaccine	Yes/No	Age
HBV BCG OPV DPT Measles vaccine MMR Hepatitis		

2.3 Record of illness' the child had :

Disease	Age	Duration	Complication	Treatment	Any after effects
Measles Mumps Diarrhoea Dysentery Jaundice Worm infestation Serious illness if any Accidents Operations					

C. FAMILY DETAILS

C.1 Head of the family :

C.2 Composition of family

Sl. No	Name	Relation to the child	Age	Sex	Qualification	Occupation		Monthly income	Health status		
						Main	Subsidiary		Normal Y/N	Invalid Y/N	Handicapped Y/N

D. ECONOMIC DETAILS

D.1 Total monthly income of the family :

D.2 Monthly expenditure pattern of the respondent's family

Item	Average expenditure / month			
	Below 100/-	Between 100 – 500/-	Between 500 – 1000/-	Between 1000/- and above
Food Clothing Housing Travelling Education Entertaining Health care Saving Miscellaneous				

E. DOMESTIC ENVIRONMENT
Infrastructure facilities
[Put (✓) at appropriate place]
E.1 Type of house

      I   II   III   IV

House	Roof	Wall	Floor
Own	Thatched	Mud wall	Concrete
Rented	Tiled	Brick wall	Tiled
Quarters	Concrete	Stone wall	Mosaic
Any other	Sheet	Any other	Any other
Specify	Any other Specify	Specify	Specify

E.2 Necessities available

Water	Light
Common well	Electricity
Own well	Solar
Municipality	Gobar gas
Corporation	Kerosene
Common pipe	Any other
Any other specify	specify

E.3 Latrines, drainage and waste disposal

Latrine present or not	Number of latrine	Bedroom attached latrines Y/N	Have latrines but no drainage Y/N	Have latrines as well as drainage Y/N	Waste disposal
					Municipality Own pith Common pith None Any other, specify

E.4 Facilities possessed

	Electrical appliance	Transport facilities	Printed media	Kitchen appliance
Convenience available in home	Television Radio Tape recorder VCR/VCP Home theatre Air conditioner	Cycle Motor cycle Car Jeep Tempo	Newspaper Magazine Children publication Books	Refrigerator Gas stove Oven Mixy Grinder Cooker

4.1 Do you have house maid : Yes/No. If yes : Full time/part time / none

4.2 How do you spend most of your leisure time, rank according to priority ?   :   Watching TV / Watching movies / listening to music/day dreaming/ computer game/hobby / reading/ telephoning

F. GENDER SPECIFIC ROLES AND RELATIONS IN FAMILY

1.	Who helps more in household work ?	B/G
2.	Whom do you prefer as your youngster ?	B/G
3.	Does your elder siblings take care of you like your parent ?	Y/N
4.	Did you feel unwanted when the younger child was born ?	Y/N
5.	Whom do you like to become ?	B/G
6.	Do you think your parents prefer your elder/younger siblings than you?	Y/N
7.	Who does the housework in your house ?	B/G/both
8.	Who gets the special food in your family ?	B/G
9.	Are you always asked to give up everything for the youngest child ?	Y/N
10.	Who is the decision maker in you family ?	M/F/C
11.	If a choice is given who'll be given priority in your family for higher studies ?	B/G/both
12.	Do you think that boys are given more freedom in your family than girls ?	Y/N
13.	Who is more responsible in controlling the family finance ?	M/F/both
14.	Who is more intelligent ?	B/G
15.	To whom does your parents give special care ?	B/G

B – Boy, G – Girl, C – Child, F – Father, M – Mother, Y – Yes, N - No

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF AGRICULTURE, VELLAYANI
DEPARTMENT OF HOME SCIENCE

Name of the investigator :

SCHEDULE TO ASSESS ANTHROPOMETRIC, BIOCHEMICAL &
CLINICAL ASSESSMENT OF THE RESPONDENT

I. Name of the child   Sex : M / F
Address :

Home	School : Class : Division : Name of school : Place of school :

Date of birth :   Age : --------Years ----------- Months

II A ANTHROPOMETRIC MEASUREMENT

Height (cm) Weight (kg) Body mass Index MUAC	

B. BIOCHEMICAL ESTIMATION

Haemoglobin

C. CLINICAL SYMPTOMS

Symptoms	Severe	Moderate	Mild	Nil	Remarks

1. Hair
   a) Lack lusture
   b) Dispigmentation
   c) Thinness & sparseness
   d) Flag sign
   e) Easy pluckability
2. Face
   a) Moon face
   b) Emaciated
   c) Oedema
3. Lips
   a) Angular stomatitis
   b) Chelosis
4. Eyes
   a) Bitots spot
   b) Conjunctival xerosis
   c) Keratomalacia					

5. Tongue
   a) Oedema
   b) Scarlet & raw tongue
   c) Magenta tongue
   d) Atrophic papillae
6. Teeth
   a) Mottled enamel
7. Gums
   a) Spongy bleeding
8. Glands
   a) Thyroid enlargement
   b) Parotid enlargement
9. Skins
   a) Sclerosis
   b) Pellagrous dermatitis
   c) Grazy pavement
       dermatitis
   d) Scrotal & vulval
       dermatitis
10. General
   a) Anaemia
   b) Beading of ribs
   c) Enlargement of spleen
   d) Enlargement of liver					

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF AGRICULTURE, VELLAYANI
DEPARTMENT OF HOME SCIENCE

Name of the investigator :

INTERVIEW SCHEDULE TO ELICIT INFORMATION ON
DIETARY HABITS AND FOOD CONSUMPTION PATTERN

Name of the child :   Sex – M / F
Address :

HOME	SCHOOL :	Class :
		Division :
		Name of school :
		Place of school :

Date of Birth :   Age : --------- Year ------------ Month

A. FOOD HABITS

1. Vegetarian / Non vegetarian
2. Are you a good eater   ?   :   Yes / No
3. Are you very fussy in eating   ?   :   Yes / No
4. Do you have the habit of nibbling ?   :   Yes / No
5. Are you very choosy in your food ?   :   Yes / No
6. What is your opinion on dieting ?   :   Good / Bad
7. Do you skip any meal ?   :   Yes / No
  a) If yes, which meal?   :   Breakfast / Lunch /
                                        Evening tea /Supper

  b) Why?   :

8. Which meal do you believe that
   must be consumed in greater amount ?   :   Breakfast / Lunch /
                                        Evening tea/ Supper
  a) Why?   :
9. Which food do you dislike most ?   :
            Specify

10. What do you prefer?   :   Home food / Eating
                                      outside/ Both

B. DAILY DIETARY PATTERN OF THE RESPONDENT

Meals	Menu	Quantity (g)	Ingredients	Time
Early morning				
Breakfast				
Mid morning				
Lunch				
Tea				
Dinner				
Bed time				

APPENDIX – III Continued
C. Food use frequency & food preference of respondent

Food group items	Quantity	Daily	Biweekly	Weekly	Fortnightly	Monthly	Occasionally	Rarely	Never	Highly preferred	Just liked	Indifferent	Disliked	Why like/dislike
Cereals														
Rice														
Rice flakes														
Puffed rice														
Wheat														
Maida														
Atta														
Suji														
Vermicelli														
Ragi														
Barley														
Oats														
Pulses														
Bengal gram														
Bengalgram dhal														
Green gram														
Greengram dhal														
Redgram dhal														
Blackgram dhal														
Horse gram														
Cow pea														
Green peas														
Soya bean														
Leafy vegetable														
Amaranthus-red														
Amaranthus-green														
Colocasia leaves														
Curry leaves														
Drumstick leaves														
Spinach														
Celery														
Agathi leaves														
Chekkurmanis														
Cabbage														
Roots & Tubers														
Arrow root														
Beetroot														
Carrot														
Colocasia														
Onion small														
Onion big														
Radish														

Appendix – III Continued

Food group items	Quantity	Daily	Biweekly	Weekly	Fortnightly	Monthly	Occasionally	Rarely	Never	Highly preferred	Just liked	Indifferent	Disliked	Why like/dislike
Sweet potato														
Potato														
Tapioca														
Yam														
Any other														
Specify….														
Other vegetables														
Ash gourd														
Bittergourd														
Beans														
Cauliflower														
Cucumber														
Drumstick														
Jack, tender														
Ladies finger														
Mango green														
Onion stalk														
Papaya														
Plantain flower														
Plantain green														
Pumpkin														
Snakegourd														
Nuts & oil seeds														
Arecanut														
Cashew nut														
Coconut														
Gingelly seed														
Ground nut														
Mustard seed														
Condiments & spices														
Asafoetida														
Cardamom														
Chillies														
Cloves														
Coriander seed														
Ginger														
Garlic														
Pepper														
Nutmeg														
Tamarind pulp														
Turmeric														

Appendix – III Continued

Food group items	Quantity	Daily	Biweekly	Weekly	Fortnightly	Monthly	Occasionally	Rarely	Never	Highly preferred	Just liked	Indifferent	Disliked	Why like/dislike
Fruits														
Amla														
Apple														
Banana														
Cherries, red														
Dates														
Grapes														
Jack fruit														
Jambu fruit														
Lemon														
Mosambi / Lime sweet														
Orange														
Papaya														
Pine apple														
Plum														
Pomegranate														
Sapota														
Tomato ripe														
Water melon														
Fish & other seafood														
Sardine														
Oil sardine														
Mackeral														
Pomfret, black														
Lobster														
Prawn														
Singhi														
Crab														
Ray														
Meat and poultry														
Beef														
Chicken														
Duck														
Pork														
Liver														
Egg, duck														
Egg, hen														
Mutton														

Appendix – III Continued

Food group items	Quantity	Daily	Biweekly	Weekly	Fortnightly	Monthly	Occasionally	Rarely	Never	Highly preferred	Just liked	Indifferent	Disliked	Why like/dislike
Milk & milk products														
Milk, buffalo														
Milk, cow														
Milk goats														
Curd														
Butter milk														
Skimmed milk														
Skimmed milk Powder														
Whole milk Powder														
Fats & edible oil														
Butter														
Ghee														
Oil														
Vanaspati														
Sugar														
Sugar cane														
Honey														
Jaggery														
Food preparation														
Main dishes														
Bread														
Idili														
Dosai														
Chappathi														
Puri														
Puttu														
Uppuma														
Pathiri														
Cornflakes														
Porotta														
Nan														
Pulav														
Fried rice														
Biriyani														
Plain rice														
If any other, specify														
Snacks														
Burger														
Biscuit														
Cake														
Halwa														

Food group items	Quantity	Daily	Biweekly	Weekly	Fortnightly	Monthly	Occasionally	Rarely	Never	Highly preferred	Just liked	Indifferent	Disliked	Why like/dislike
Jilabi														
Ladoo														
Mysore pak														
Chips														
Pakoda														
Murukku														
Mixture														
Peda														
Vada														
Puffs														
Bonda														
Groundnut cake														
Gingelly ladoo														
If any other, specify														
Desserts														
Custards														
Fruit salad														
Pudding														
Ice cream														
Beverages														
Complan														
Bournvita														
Horlicks														
Boost														
Cococola														
Sprite														
Juices														
Coffee														
Tea														
Coconut water														
If any other, specify														

D. Major sources of information on food, nutrition and health (Mark 1, 2, 3 according to priority)

Mother		Teacher		Television	
Father		Books		Radio	
Grandmother		Magazine		Film	
Grandfather		Newspaper		Advertisement	
Sibling		Computer		Any other specify	

KERALA AGRICULTURAL UNIVERSITY
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DEPARTMENT OF HOME SCIENCE

Name of the investigator :

INTERVIEW SCHEDULE TO ELICIT INFORMATION FROM THE PARENT REGARDING DIETARY HABITS AND FOOD CONSUMPTION PATTERN OF CHILD

Name of the child :   Sex- M / F

Address :

Home	School
	Class
	Division
	Name of the school
	Place of the school

Date of birth :   Age: ---year -----Month

A. FOOD HABITS OF RESPONDENT

1. Is he/she a good eater ?

   Yes/ No

   If no, specify the problem :

2. Is he/ she very fussy in her eating habits ?

   Yes / No

3. Is he / she very choosy about her food ?

   Yes/ No

4. Specify which food does he / she dislike most ?

5. Which meal does he / she prefer most ?

   Breakfast / Lunch/ Evening tea/ Supper/ in between meals

   Why ?

6. General opinion about your child's food habits :

   Excellent / Good / Average/ Poor/ Very poor

7. Which food does he/ she prefer ?

Home food/ Eating outside

8. Does he/ she have nibbling habit ?

Yes/ No

What ?

When ?

B. DIETARY DETAILS OF A DAY

Meals	Menu	Ingredients	Wt. of raw ingredients used (g)	Wt. of total cooked food (g)	Amount of cooked food consumed by respondent	Raw equivalent used by respondent (g)	Wt. of food waste
Early morning							
Breakfast							
Lunch							
Tea							
Dinner							
Any other specify							

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF AGRICULTURE, VELLAYANI
DEPARTMENT OF HOME SCIENCE

Name of the investigator :

NUTRITION KNOWLEDGE INVENTORY

KRISHNA ROOPA
DR. S. SYAMAKUMARI

A few statement are given below. Kindly go through each statement carefully and mark according to your opinion. Read each statement carefully and for right answers make a (✓) mark against 'yes' and for wrong answer put (✓) mark against 'no'. Give honest answers which will be kept confidential and will be used for research purpose.

Name of the student		Sex: M/F
Address	Home	School
Date of birth: ......years........months		Age:

Sl. No.		YES	NO
1	Liver is an iron rich food		
2	Animal foods have no carbohydrate		
3	Burning feet syndrome is due to Vitamin B complex deficiency		
4	Metallin yellow colour in food damage the reproductive organ		
5	Taking raw fruits and vegetables will cause indigestion		
6	Adolescent must sleep for at least 9 hours to be healthy		
7	Better to take colas and synthetic drinks than unboiled water		
8	It is not necessary to take bath daily		
9	Adolescent girls life is really difficult		
10	Parboiled rice is more nutritious than raw rice		
11	Green leafy vegetables are rich sources of Vitamin K		
12	Fats are not stored in the body		
13	Deficiency of Vitamin K can cause haemorrhage		

Sl. No.		YES	NO
14	A product without the manufacturing & expiry date should not be purchased		
15	Daily taking of eggs can cause pimples		
16	Pneumonia is a disease that affects the lungs		
17	Energy which do not get exhausted is called renewable energy		
18	Washing and changing undergarments daily is not as important as taking bath		
19	Boys are never obese		
20	Vitamin B is lost in wet cooking		
21	Milk is an excellent source of iron		
22	1 gm of fat yield 9 calories		
23	Pellagra is known as 3D's disease		
24	The symbol FPO is given to fruits & vegetable products		
25	Eating clay helps in the normal development of foetus		
26	Diabetes occur due to excess of insulin		
27	Vitamin tablets or tonics are must for an adolescent		
28	Wearing slippers with very high heals can give one backaches		
29	Adolescent girls need more nutritious diet		
30	Colas and soft drinks are prepared from fruits		
31	Ragi is considered as poor man's milk		
32	Vitamin D promotes absorption of calcium from small intestine		
33	Excess of iodine leads to goiter		
34	Food colour not packed in sealed container/ packs should not be purchased		
35	Drinking too much water make one fat		
36	Reproductive Child Health (RCH) aims at improving the health of every women to produce healthy babies		
37	Eating 2 heavy meals a day is better than eating 4 small meals		
38	Regular pedicure is essential to prevent health problem of feet		
39	Adolescent girls are very fussy in their food habits		
40	Cooking rice in boiled water is better than cooking in cold water		
41	Sunflower oil is a polyunsaturated fatty acid		
42	Vitamin D is lost on exposure to sunlight		
43	Excess of iodine results in cretinism		
44	Using aginomotto is not at all harmful to health		
45	It is better to take cola's or synthetic drink than unboiled water		

APPENDIX – V Continued

Sl. No.		YES	NO
46	Maternal mortality rate is the actual number of death of women / 10,000 live birth		
47	Taking a very light dinner helps to reduce obesity better than skipping any other		
48	Clean short nails are healthier than long beautiful nails		
49	As adolescent are healthy they can afford to skip one or two meals		
50	A mixed food of pulses and cereals will improve the protein quality of a diet		
51	In animals the vitamin A is found in the form of β-carotene		
52	Vitamin E is required for normal reproduction of man		
53	Bleeding gum is due to deficiency of Vitamin C		
54	Adulteration in food should be reported immediately		
55	Frequent foods are better than two or three full meals		
56	Every child below 5 years are immunized with 6 doses of OPV under pulse polio immunization programme		
57	An adolescent is too busy to take proper food daily		
58	Very tight shoes can cause blisters of the feet		
59	Living on soft drinks can give the adolescent boys enough energy		
60	Bakery products can very well meet the dietary needs of an adolescent		

APPENDIX – VI

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF AGRICULTURE, VELLAYANI
DEPARTMENT OF HOME SCIENCE

Name of the investigator :

ATTITUDE INVENTORY

<div align="right">KRISHNA ROOPA
Dr. S. SYAMAKUMARI</div>

A few statement are given below and you are requested to mark your opinion against each statement. Mark the degree to which you agree/disagree with each statement. Five choices namely ;

[Strongly agree/agree/doubtful/disagree/strongly disagree] are given for each statement.

Read each statement carefully and make a (✓) mark against the answer which you think in most applicable to you in any one of the column. Only one option can be marked for each statement. Give honest answers which will be kept confidential and will be used for research purpose.

Name of the respondent		Sex : M/F
Address	Home	School
Date of birth : Months	Age : ……… Years ……….	

Sl. No.		SA	A	D	D.A	SDA
1	Butter milk is rich in Vitamin A					
2	A person can become a blind due to lack of Vitamin A					
3	It is good to add colour to make food attractive					
4	Adolescent boys should take more snacks to get energy					
5	Vitamin D should be given to children for proper growth of bones and teeth					

APPENDIX – VI Continued

Sl. No.		SA	A	D	D.A	SDA
6	Red colour in beetroot helps in production of blood					
7	Only a healthy adolescent can grow to be a healthy adult					
8	Frequent consumption of food is better than three heavy meals					
9	Washing the face regularly with soap and clean water can prevent pimples					
10	Cooking vegetables in excess water is not good					
11	Orange is more nutritious than gooseberry					
12	Girls grow earlier than boys					
13	We need minerals to supply energy to our body					
14	Drumstick leaves are very rich in beta carotene					
15	Every non adulterated food prepared and sold in very busy street can harm your health					
16	Consumption of too much sweets can lead to acne					
17	Colas can suppress the appetite					
18	Clean and healthy skin make you more beautiful					
19	Boiled foods are more nutritious than fried foods					
20	Boiled rice water is rich in sodium & calcium salts and complex vitamins					
21	Vitamin A is necessary for healthy skin					
22	Vitamin deficiency can cause skin disease					
23	Synthetic drinks do not contain fresh fruit juices					
24	Eating papaya during pregnancy results in abortion					
25	Adolescent should over eat to meet the growing needs					
26	A regular diet low in fat and carbohydrate along with regular exercise is better than skipping meals altogether					
27	Chewing gum should be used regularly to keep your gum and cheek bones healthy					
28	Dehydration in diarrhoea can be prevented by taking boiled water with sugar and salt					
29	Consumption of iron rich food prevents anaemia in adolescent girl					
30	Banana stem has only fibres and no other nutrients					
31	Daily eating of papaya is not good for girls					
32	Micro nutrients is not essential for health					
33	Excess of Vitamin A can cause health problems					
34	One should never buy a product in which there is no proper label					
35	Avoid water when you have diarrhoea					

SA – Strongly Agree, A – Agree, D – Doubtful, DA – Disagree, SDA – Strongly Disagree

Sl. No.		SA	A	D	D.A	SDA
36	Healthy person has to be mentally healthy too					
37	Skipping breakfast does no harm to adolescents health					
38	Cigarette smoking after meals help to digest your food properly					
39	Cutting vegetables into small pieces cause more nutrient loss					
40	Egg contain plenty of fat					
41	Adolescent boys require more food than girls					
42	Taking raw sprouted pulses regularly helps to meet the Vitamin C					
43	Vitamin B taken in excess will be excreted from body					
44	Ice cream is a common vehicle for incidence and outbreaks of food poisoning & food borne disease					
45	Salads in the diet of an adolescent can prevent pimples					
46	Regular late nights doesn't harm adolescents health					
47	Taking a very light dinner helps to reduce obesity					
48	Smell of perspiration in adolescence can be got rid of better by regular baths than using perfumes alone					
49	Tapioca and fish combination diet prevent goiter					
50	Nutritious food after 18 yrs does not help girls to grow					
51	Calcium is very essential for an adolescent to grow in height					
52	Vitamin B complex deficiency can cause anaemia					
53	A label should contain list & quantity of ingredient and manufacture & expiry label					
54	It is not practical for a busy adolescent to take balanced diet daily					
55	Nibbling foods during T.V. viewing can make you obese					
56	Deficiency of riboflavin leads to beri–beri					
57	Adolescent should take care to use only washed clothes to keep healthy					
58	Cooking in covered vessels reduces loss of Vitamin C					
59	Maintaining correct posture is very essential for proper growth of an adolescent					
60	Taking regular iron rich food can turn your complexion dark					

SA – Strongly Agree, A – Agree, D – Doubtful, DA – Disagree, SDA – Strongly Disagree

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF AGRICULTURE, VELLAYANI
DEPARTMENT OF HOME SCIENCE

Name of the investigator :

SCHEDULE TO COLLECT INFORMATION ON THE
RESPONDENTS TIME EXPENDITURE PATTERN

Name of the child :   Sex – M / F
Address:

Home	School

Date of birth :   Age : ------- Year ---------
Month

No.	Activity	Time	
		From	To (hours/ minutes)
1	Wake up		
	Sleep		

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF AGRICULTURE, VELLAYANI
DEPARTMENT OF HOME SCIENCE

Name of the investigator :

PSYCHO SOCIAL PROFILE ASSESSMENT INVENTORY

KRISHNA ROOPA
DR. S. SYAMAKUMARI

Given below are series of statements. Kindly go through each statement carefully and mark the degree to which you agree/disagree with each statement. 5 choices namely

Strongly agree/Agree/Doubtful/ Disagree/Strongly disagree are given for each statement.

Read each statement carefully and make a (✓) mark against the answer which you think is most applicable to you in any one of the column. Only one option can be marked for each statement. There are no right or wrong answers. Give honest answers which will be kept confidential and will be used for research purpose.

Name of the student   Sex – M / F
Address : Home   School
                                        Class   :
                                        Division   :
                                        Name of school   :
                                        Place of school   :

Date of Birth: Age: ------- Years---------Months

1	I am physically very strong					
2	I wish my house were bigger					
3	My physique enables me to run fast					
4	I am too small for my age					
5	I always dress neatly					
6	No body likes me as I am a boy/ girl					
7	I do not feel active and fresh when I get up in the morning					
8	I possess lot of valuable things					
9	I often worry about my health					
10	I have a very pleasing personality					
11	I wish I could wear expensive clothes					
12	I am full of vigour and energy					

A		Strongly Agree	Agree	Doubtful	Disagree	Strongly Disagree
13	I am not beautiful					
14	My house does not have necessary conveniences					
15	I never feel sick					
16	I do not get sufficient time for recreation					
17	I am over conscious about my physical appearance					
18	I am a healthy person					
19	I wish I were rich					
20	I am capable of doing very hard jobs					

B

1	I never worry over probable misfortunes that could happen					
2	I cannot tolerate people criticizing or teasing me.					
3	I never run away from problems					
4	Tension makes me eat a lot					
5	I am a very happy person					
6	I spend much of my time day dreaming					
7	I skip my meals when I am angry					
8	I do not feel uneasy in situations which insists strict time schedules and rigid behaviour standards					
9	I am a failure in every thing I do					
10	I never get discouraged quickly					
11	I often feel like committing suicide					
12	I am quite capable of expressing my views freely					
13	I loose my appetite when I am worried					
14	I never evade school work which are difficult					
15	I cannot concentrate on any one thing					
16	I never keep awake at night worrying about things					
17	My life is a burden to me					
18	I can easily take firm decision					
19	I find it a strain thinking about the work					
20	I am very satisfied in my life					

C

1	I solve my problems easily					
2	I am more intelligent than most children of my age					
3	I am fed up of studying					
4	I like to discover something for the benefit of the future generation					
5	I am unable to win prizes in debate and quiz					
6	I try to get victory in every activity					
7	I am not systematic in my work					

		Strongly Agree	Agree	Doubtful	Disagree	Strongly Disagree
8	I am respected by all for being a bright student					
9	I feel that our curriculum is unnecessarily heavy					
10	If I try little more I could certainly get better marks					
11	I try with more enthusiasm whenever I fail					
12	I am very confident of my abilities					
13	I achieve little for the effort I put in					
14	Others like me because of my great ideas					
15	I am proud of my answers					
16	I have very poor memory					
17	I am sure I can secure job whenever I want					
18	I am too lazy to work even to get good marks					
19	I will accept only a vocation which is useful to the community					
20	My activities are always recognized by others					

D

1	I believe that pride goes before a fall					
2	I believe that drinking alcohol is not so bad					
3	I am ready to accept people quite knowing that they are not perfect					
4	I feel that one should be firm in matters which are considered as right					
5	I like gambling on small bets					
6	I can never bear my guilty feeling if I cheat in the examination					
7	I never keep sincerity in all my actions					
8	I believe that noble actions are better ways to success than mere faith in God					
9	Saying lies to protect oneself is not bad					
10	I believe that one should never betray one's friends even to save oneself					
11	I never try to be punctual and regular in my activities					
12	One should be willing to express ones feeling in any place					
13	I try to procure whatever I want without bothering about the means					
14	It does not matter to insult other if the situation demands					
15	One should never exploit the short comings of others					
16	One should always be faithful to one's parents					
17	I try to correct myself whenever I make mistakes					
18	I keep perfect truth in all my actions without considering the result of it					
19	I believe that hard work pays in the end, for a student					
20	When you want to get something you need not consider others					

APPENDIX – VIII Continued

E

		Strongly Agree	Agree	Doubtful	Disagree	Strongly Disagree
1	I do things as neatly as other people					
2	My teachers behave as if I am the worst child in the class					
3	I have plenty of friends of my age					
4	My friends consider me as an unhappy person					
5	My friends entrust me their problems with full confidence					
6	I feel better when I am alone					
7	I am considered as very smart by my friends					
8	My teachers downgrade me					
9	I am very often the life of party / group					
10	My friends adjust with life more than I am					
11	I am a popular person					
12	I feel inferior before others					
13	My suggestions are always welcomed by my friends					
14	Others find fault with me without any reason					
15	I feel that I do not have anyone in this world					
16	I feel it easy to make new acquaintance					
17	I am a problem to all					
18	Others misunderstand me quite often					
19	People are always nasty towards me					
20	Other children behave pleasantly to me					

F

1	In an emergency, I certainly can defend my self well against any physical attack					
2	Others look down upon me					
3	I can manage any problematic situation					
4	I am not very confident whether I could do things properly					
5	I take the initiative in getting my friends together					
6	I am proud of my physical ability					
7	I am fully aware about what I may or may not do					
8	I get discouraged in failure					
9	I can relieve myself quickly from my physical and mental tensions					
10	I often think that I could not do things which others can do easily					
11	I do not have clear cut ideas about my future career					
12	I am ready to change my views if I am wrong					
13	Life is a strain for me for most of the time					
14	I am very proud of my own abilities					
15	I do not possess the mental courage to face every situation					

APPENDIX – VIII Continued

		Strongly Agree	Agree	Doubtful	Disagree	Strongly Disagree
16	I can take the lead whenever necessary					
17	I help my parents to take confident decision					
18	I can overcome all the obstacles in achieving my goal					
19	One of my good qualities is that I like others					
20	If I had my life to live over again I would still choose to be myself					

G

1	I am very much loved in my family					
2	I feel hesitant to take my friends home					
3	I am treated as equal by my parents					
4	My parents are too old fashioned in their ideas					
5	Reasonable requests made by me are never refused at home					
6	I feel I could get more peace from any where than in my family					
7	I am not scared to approach my parents when I am in trouble					
8	My suggestions are never welcomed at home					
9	I feel my family is inferior than my friends family					
10	My presence is very much enjoyed at home					
11	My parents never understand me and my problems					
12	I never quarrel with my parents					
13	I am never opposed at home in finding my own ways in doing things					
14	My parents are satisfied with everything I do					
15	My parents are too busy to find sometime to spend with us					
16	I wish my parents stop quarreling with each other					
17	My parents expect me to study all the time					
18	I am always given the choice to select the food I like					
19	I wish my parents do not nag me so much					
20	My parents do not take any interest in my affairs					

H

1	Girls are permitted to play with boys					
2	Boys are not allowed to do any household work in my house					
3	Girls and boys are equally intelligent					
4	My mother believes that girls shouldn't participate like boys in games which require heavy physical strain					
5	Boys are not given any preference in their food choices in my home.					

APPENDIX – VIII Continued

		Strongly Agree	Agree	Doubtful	Disagree	Strongly Disagree
6	Grown up girls wearing jeans and shirts are opposed in my family					
7	All children are equal to my parent irrespective of ordinal position					
8	Boys are not allowed to grow long hair in my family					
9	All at home think that girls too should be given equal freedom like boys.					
10	Eldest child is given more freedom than other siblings					
11	I feel girls have more problems than boys					
12	My parents do not mind on what kind of dresses I should wear as boy/ girl					
13	Youngest are given all privileges					
14	My brothers are not given any privileges than my sisters or me.					
15	Middle child is neglected in my family					
16	Boys and girls are equally preferred in my family					
17	I wish it is better to be a boy in my family to get more love and affection.					
18	Eldest child is given priority in important family decisions.					
19	Independence in girls are never encouraged in our society					
20	Girls are given special food in my family in certain periods.					

APPENDIX – IX

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF AGRICULTURE, VELLAYANI
DEPARTMENT OF HOME SCIENCE

Name of the investigator :

DIETARY PROFILE INDEX

	URBAN (20)		RURAL (20)
1	6.78	1	8.722
2	9.219	2	8.346
3	10.13	3	8.951
4	9.951	4	9.34
5	10.031	5	8.829
6	9.691	6	9.673
7	9.185	7	9.486
8	8.621	8	9.554
9	9.857	9	9.129
10	9.396	10	9.049
11	9.883	11	9.806
12	9.826	12	10.678
13	10.458	13	9.212
14	10.547	14	10.284
15	10.643	15	9.662
16	10.058	16	8.892
17	9.531	17	9.028
18	10.422	18	10.164
19	9.349	19	9.764
20	10.336	20	9.772

APPENDIX - X Intercorrelation of different variables (subsample)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1	1.00																															
2	0.13	1.00																														
3	0.19	0.65**	1.00																													
4	0.10	-0.34*	0.32*	1.00																												
5	0.32*	0.30	0.14	-0.11	1.00																											
6	0.37*	0.29	0.30	-0.10	-0.31*	1.00																										
7	0.14	0.40**	0.52**	0.11	0.17	0.45**	1.00																									
8	-0.009	0.13	0.21	0.17	-0.005	0.12	0.51**	1.00																								
9	0.12	0.14	0.01	-0.19	0.10	0.55**	0.21	0.03	1.00																							
10	0.04	0.07	-0.01	-0.15	0.09	0.39**	0.45**	0.08	0.54**	1.00																						
11	-0.04	-0.12	-0.12	-0.05	0.02	-0.07	-0.15	0.01	0.15	-0.01	1.00																					
12	-0.11	-0.01	0.004	-0.01	-0.03	-0.07	-0.17	0.08	-0.21	-0.20	0.008	1.00																				
13	-0.20	-0.06	-0.21	-0.12	-0.08	-0.003	-0.06	0.02	0.077	0.12	-0.11	0.07	1.00																			
14	-0.21	-0.17	-0.14	-0.03	-0.12	-0.22	-0.25	-0.12	0.06	-0.04	0.26	0.23	0.41	1.00																		
15	-0.23	-0.31*	-0.35*	-0.08	-0.08	-0.18	-0.36*	-0.08	0.01	0.002	0.29	0.32*	0.40	0.54	1.00																	
16	-0.12	0.17	-0.08	-0.28	0.14	-0.09	-0.04	0.04	0.09	0.16	0.17	0.31*	0.60**	0.48**	0.48**	1.00																
17	-0.03	-0.18	-0.21	-0.13	-0.33*	-0.07	-0.21	-0.02	0.05	0.07	0.02	0.08	0.45**	0.54**	0.47**	0.24	1.00															
18	-0.08	0.28	0.32*	0.09	0.11	-0.08	0.004	0.21	-0.04	-0.16	0.001	0.16	-0.00	0.05	-0.09	0.09	0.07	1.00														
19	-0.05	-0.29	-0.20	0.29	-0.18	0.01	-0.10	0.23	0.14	0.006	0.36*	0.06	-0.06	-0.07	0.08	-0.08	-0.02	0.15	1.00													
20	-0.11	-0.08	-0.19	0.04	-0.13	-0.18	-0.12	0.21	-0.09	-0.07	0.31*	-0.09	-0.03	0.29	0.18	0.01	0.12	0.06	0.38*	1.00												
21	-0.16	-0.14	-0.04	0.15	0.01	0.01	-0.02	0.02	0.14	0.08	0.28	-0.16	0.17	0.37*	0.12	0.07	0.10	-0.20	-0.00	0.29	1.00											
22	-0.10	0.11	0.18	0.19	0.03	-0.20	-0.14	-0.11	-0.16	-0.07	0.20	-0.04	-0.05	0.05	-0.14	-0.11	0.12	0.06	0.02	0.06	0.29	1.00										
23	-0.25	-0.14	-0.09	0.25	-0.09	-0.26	-0.34*	0.04	-0.18	-0.21	0.03	0.21	0.13	0.12	0.04	-0.003	0.01	0.25	0.25	0.24	0.39*	0.50**	1.00									
24	-0.13	-0.13	-0.12	0.18	-0.11	-0.07	-0.19	0.14	0.07	0.10	0.37*	0.21	0.09	0.40**	0.26	0.05	0.19	0.08	0.21	0.38*	0.39*	0.17	0.38*	1.00								
25	0.17	0.44**	0.35*	-0.17	0.21	0.27	0.53**	0.03	0.14	0.32*	-0.07	-0.004	-0.05	-0.25	-0.35*	0.05	-0.00	-0.07	-0.21	-0.22	-0.04	0.17	-0.14	-0.17	1.00							
26	-0.008	0.02	0.20	0.17	0.13	0.30	0.31*	0.12	0.11	0.13	-0.03	-0.02	-0.15	-0.09	-0.13	-0.38*	-0.17	0.05	0.10	-0.05	0.03	-0.04	-0.01	0.05	0.08	1.00						
27	0.24	-0.18	-0.22	-0.07	0.10	0.19	0.10	0.04	0.47**	0.57**	0.35*	-0.23	-0.18	-0.09	0.15	-0.08	-0.01	-0.33*	0.20	0.04	0.32*	-0.16	-0.05	0.28	0.05	0.11	1.00					
28	-0.02	0.003	0.27	0.32*	0.11	0.27	0.29	0.13	0.08	0.27	0.02	0.13	-0.07	-0.26	-0.09	0.12	-0.17	0.08	0.14	-0.17	0.17	0.15	0.11	-0.15	0.31*	0.12	0.05	1.00				
29	0.01	0.25	0.15	-0.03	0.23	0.08	0.39*	0.20	0.12	0.37*	-0.44**	-0.04	0.29	0.04	-0.15	0.30	0.09	0.12	-0.19	-0.06	0.05	-0.04	-0.06	-0.20	0.16	-0.13	-0.09	0.26	1.00			
30	0.31*	0.17	0.15	0.29	0.14	0.13	0.26	0.29	0.11	0.16	-0.24	-0.19	0.03	-0.29	-0.13	-0.005	0.007	0.15	0.05	-0.02	0.03	0.14	0.10	0.06	0.07	0.13	0.08	0.29	0.31*	1.00		
31	-0.04	0.32*	0.43**	0.27	0.11	0.13	0.38*	0.61**	-0.03	-0.11	-0.09	-0.01	0.03	-0.14	-0.27	0.09	-0.21	0.32	0.06	0.05	0.04	-0.09	0.02	-0.03	-0.10	0.05	-0.22	0.21	0.33*	0.33*	1.00	
32	0.31*	0.25	0.36*	0.01	-0.07	0.40**	0.27	0.11	0.30	0.24	0.03	-0.38*	-0.11	-0.24	-0.26	-0.19	-0.07	0.22	-0.02	0.12	-0.19	-0.01	-0.18	-0.10	0.02	0.06	0.08	-0.06	0.09	0.11	0.08	1.00

1 Age	11 Physical	21 Attitude - Food	31 Fats and oils
2 Height	12 Personality	22 Knowledge on nutrition	32 Sugar
3 Weight	13 Achievement	23 Knowledge on health	
4 BMI	14 Moral	24 Knowledge on food	
5 Haemoglobin	15 Social	25 Cereals	
6 Protein	16 Self confidence	26 Pulses	
7 Energy	17 Family	27 Green leafy vegetables	
8 Fat	18 Gender	28 Other vegetables	
9 Calcium	19 Attitude - Nutrition	29 Fruits	
10 Carotene	20 Attitude - Health	30 Milk	

* Significant at 5 % level
**Significant at 1 % level

APPENDIX - XI Intercorrelation of different variables (Boys)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1	1.00																															
2	0.26	1.00																														
3	0.44**	0.27	1.00																													
4	0.34*	-0.11	0.63**	1.00																												
5	0.35*	0.08	-0.06	0.11	1.00																											
6	-0.01	-0.02	0.31	0.11	-0.21	1.00																										
7	0.12	-0.25	0.27	0.38*	-0.33*	0.55**	1.00																									
8	0.03	-0.09	0.11	0.33*	-0.12	0.01	0.44**	1.00																								
9	0.15	0.14	-0.06	-0.21	0.13	0.73**	0.19	-0.11	1.00																							
10	-0.13	-0.35*	-0.17	-0.03	-0.18	0.55**	0.56**	0.06	0.56**	1.00																						
11	-0.01	-0.01	-0.10	-0.19	0.08	0.19	-0.10	-0.008	0.32*	-0.002	1.00																					
12	-0.11	0.34*	0.25	-0.06	-0.02	-0.11	-0.26	0.11	-0.24	-0.34*	0.21	1.00																				
13	-0.39*	0.06	-0.16	-0.05	-0.04	0.02	0.27	0.37*	0.005	0.26	-0.28	0.10	1.00																			
14	-0.10	0.04	-0.24	-0.42**	0.18	-0.09	-0.14	-0.15	0.21	0.22	0.37*	0.14	0.32*	1.00																		
15	-0.34*	-0.10	-0.18	-0.21	0.14	-0.11	-0.21	0.14	0.03	0.11	0.29	0.24	0.31*	0.68**	1.00																	
16	-0.25	0.06	-0.34*	-0.35*	0.11	0.02	0.03	0.23	0.21	0.25	0.24	0.18	0.58**	0.55**	0.63**	1.00																
17	0.03	-0.15	-0.13	-0.20	-0.16	-0.15	0.08	0.23	0.007	0.29	-0.09	0.19	0.37*	0.28	0.26	0.39*	1.00															
18	0.11	-0.03	0.05	0.21	0.08	-0.33	-0.29	0.20	-0.36*	-0.49**	-0.06	0.44**	-0.33*	-0.40**	-0.09	-0.37*	0.02	1.00														
19	0.09	0.06	-0.13	0.12	0.03	0.21	0.14	0.35*	0.32*	0.10	0.24	-0.11	-0.12	-0.40**	-0.25	-0.18	-0.26	0.28	1.00													
20	-0.00	-0.03	-0.44**	-0.13	0.10	-0.25	-0.22	0.32*	0.03	0.04	0.36*	-0.15	-0.07	0.20	0.23	0.13	-0.11	-0.002	0.44**	1.00												
21	-0.03	-0.14	-0.03	0.15	0.52**	0.20	0.03	-0.10	0.30	0.21	0.29	-0.23	0.12	0.33*	0.18	0.20	-0.22	-0.50**	-0.22	0.06	1.00											
22	-0.005	0.19	0.16	0.22	-0.07	-0.02	-0.13	-0.05	-0.002	0.006	0.11	0.22	-0.19	-0.16	-0.25	-0.31*	0.03	0.06	-0.04	-0.02	0.28	1.00										
23	-0.09	0.27	0.06	0.29	0.23	-0.20	-0.29	0.14	-0.08	-0.16	0.05	0.30	0.02	-0.15	-0.07	-0.20	-0.16	0.21	0.24	0.22	0.28	0.78**	1.00									
24	-0.03	0.13	-0.008	0.22	0.34*	-0.01	-0.01	0.21	0.007	0.06	0.49**	0.29	0.03	0.28	0.30	0.10	-0.18	0.05	0.21	0.49**	0.39*	0.30	0.49**	1.00								
25	0.06	0.04	0.03	-0.12	-0.06	0.20	0.35*	0.006	0.14	0.27	0.07	0.14	0.11	-0.15	-0.34*	0.12	0.36*	-0.23	0.02	-0.35*	0.06	0.32*	0.09	-0.004	1.00							
26	-0.04	-0.28	0.18	0.29	0.15	0.16	0.18	-0.08	0.09	0.26	0.04	-0.26	-0.005	-0.02	-0.04	-0.46**	-0.04	-0.03	0.14	-0.10	0.29	0.15	0.15	0.25	0.03	1.00						
27	0.15	-0.31*	-0.14	0.008	0.22	0.35*	0.23	-0.10	0.54**	0.56**	0.56**	-0.48**	-0.20	0.29	0.17	0.07	-0.07	-0.46**	0.27	0.33	0.53**	0.007	0.07	0.34*	0.11	0.46**	1.00					
28	0.12	-0.34*	0.25	0.42**	0.17	0.47**	0.33*	0.15	0.32*	0.42**	0.06	-0.06	-0.007	-0.31	-0.13	0.10	0.14	-0.09	0.10	-0.24	0.39*	0.21	0.08	-0.02	0.37*	0.20	0.33*	1.00				
29	0.05	-0.39*	-0.18	0.24	0.001	0.07	0.37*	0.32*	0.06	0.45**	-0.46**	-0.20	0.35*	-0.12	-0.06	0.20	0.22	0.01	0.12	0.009	-0.01	-0.20	-0.10	-0.27	-0.05	-0.14	-0.04	0.44**	1.00			
30	0.40**	-0.009	0.19	0.71**	0.21	-0.07	0.22	0.30	-0.06	0.10	-0.34**	-0.30	-0.06	-0.47**	-0.25	-0.19	0.02	0.16	0.16	0.04	0.15	0.35*	0.35*	0.13	0.01	0.11	0.05	0.43**	0.38*	1.00		
31	0.002	-0.07	0.27	0.58**	-0.02	0.08	0.16	0.48**	-0.15	-0.24	-0.13	-0.08	0.14	-0.44**	-0.13	0.03	-0.26	0.18	0.27	0.06	-0.05	-0.17	0.07	-0.10	-0.33*	-0.22	-0.27	0.25	0.29	0.35*	1.00	
32	0.21	-0.03	0.41**	0.25	-0.42**	0.45**	0.28	0.30	0.26	0.24	0.23	-0.02	-0.37*	-0.14	0.03	-0.25	-0.13	0.09	0.33*	0.24	-0.20	0.05	-0.08	0.04	-0.28	0.09	0.26	0.16	0.06	0.07	0.13	1.00

1 Age	11 Physical	21 Attitude - Food	31 Fats and oils	* Significant at 5 % level
2 Height	12 Personality	22 Knowledge on nutrition	32 Sugar	**Significant at 1 % level
3 Weight	13 Achievement	23 Knowledge on health		
4 BMI	14 Moral	24 Knowledge on food		
5 Haemoglobin	15 Social	25 Cereals		
6 Protein	16 Self confidence	26 Pulses		
7 Energy	17 Family	27 Green leafy vegetables		
8 Fat	18 Gender	28 Other vegetables		
9 Calcium	19 Attitude - Nutrition	29 Fruits		
10 Carotene	20 Attitude - Health	30 Milk		

APPENDIX - XII Intercorrelation of different variables (Girls)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1	1.00																															
2	-0.38*	1.00																														
3	-0.32*	-0.10	1.00																													
4	-0.09	0.22	0.75	1.00																												
5	0.27	-0.28	-0.12	0.09	1.00																											
6	-0.00	0.28	0.11	-0.11	-0.63**	1.00																										
7	-0.00	0.46**	0.56**	0.40**	0.19	0.23	1.00																									
8	-0.12	0.34*	0.29	0.09	-0.01	0.20	0.70**	1.00																								
9	0.04	0.22	0.07	-0.14	0.05	0.41**	0.26	0.25	1.00																							
10	0.34*	-0.21	-0.18	-0.06	0.12	0.11	-0.10	0.08	0.52**	1.00																						
11	-0.03	-0.11	-0.04	0.06	0.11	-0.33*	-0.15	0.08	-0.14	0.08	1.00																					
12	-0.11	-0.32*	-0.20	0.03	-0.04	-0.04	-0.13	0.07	-0.19	-0.07	-0.22	1.00																				
13	0.05	-0.03	-0.23	-0.36*	-0.06	0.01	-0.44	-0.34*	0.18	-0.01	0.08	0.05	1.00																			
14	-0.26	0.13	0.16	0.10	-0.09	-0.21	-0.06	-0.03	-0.01	-0.22	0.13	0.29	0.47**	1.00																		
15	-0.02	-0.34*	-0.36*	-0.21	-0.02	-0.14	-0.41**	-0.31*	0.01	0.00	0.26	0.41**	0.47**	0.39**	1.00																	
16	-0.08	-0.18	-0.14	-0.04	0.00	-0.30	-0.48**	-0.19	-0.05	-0.10	0.19	0.41**	0.69**	0.60**	0.53**	1.00																
17	-0.04	0.16	-0.10	-0.34*	-0.31*	0.07	-0.35*	-0.21	0.14	-0.001	0.10	0.02	0.50**	0.64**	0.57**	0.27	1.00															
18	-0.34*	0.47**	0.45**	0.20	0.02	-0.03	0.09	0.20	0.21	0.02	0.11	0.01	0.23	0.37*	-0.02	0.30	0.16	1.00														
19	-0.18	-0.06	0.10	0.25	-0.09	0.03	-0.06	0.18	-0.09	0.13	0.57**	0.26	-0.07	0.01	0.32*	0.22	0.004	0.21	1.00													
20	-0.22	0.16	0.21	0.15	-0.20	-0.06	0.19	0.11	-0.25	-0.19	0.21	-0.05	-0.02	0.32*	0.08	-0.02	0.27	0.15	0.24	1.00												
21	-0.28	0.22	0.16	-0.004	-0.13	-0.04	0.12	0.22	-0.03	0.02	0.22	-0.12	0.19	0.36*	-0.02	0.05	0.29	0.06	0.13	0.51**	1.00											
22	-0.27	0.24	0.27	0.19	0.14	-0.42**	-0.20	-0.20	-0.44**	-0.28	0.38*	-0.31*	0.10	0.28	-0.02	0.10	0.22	0.06	0.16	0.17	0.33*	1.00										
23	-0.41**	0.13	0.07	-0.06	-0.07	-0.19	-0.16	-0.005	-0.30	-0.10	-0.09	0.15	0.20	0.21	0.01	0.34	0.02	0.43**	0.05	0.20	0.44**	0.18	1.00									
24	-0.21	0.12	-0.01	-0.14	-0.28	-0.01	-0.24	0.12	0.25	0.47**	0.08	0.15	0.12	0.48**	0.13	0.14	0.48**	0.21	0.02	0.16	0.33*	-0.03	0.11	1.00								
25	0.25	0.19	0.47**	0.56**	0.08	0.16	0.56**	-0.07	0.09	0.003	-0.34*	-0.26	-0.32*	-0.19	-0.22	-0.48**	-0.20	-0.19	-0.29	0.19	0.02	-0.16	-0.22	-0.26	1.00							
26	0.02	0.28	0.24	0.10	0.13	0.40**	0.57**	0.33*	0.13	-0.05	-0.13	0.13	-0.26	-0.13	-0.20	-0.36	-0.25	0.10	0.08	-0.006	-0.20	-0.26	-0.16	-0.16	0.22	1.00						
27	0.37*	-0.29	-0.34	-0.23	0.09	0.10	0.00	0.20	0.42**	0.77**	0.11	-0.07	-0.17	-0.36*	0.13	-0.19	0.00	-0.26	0.14	-0.21	0.14	-0.36*	-0.05	0.23	0.03	-0.14	1.00					
28	-0.37*	-0.12	0.19	0.46**	-0.04	-0.001	0.07	0.07	-0.36*	-0.21	0.01	0.36*	-0.14	-0.16	0.04	0.08	-0.44**	0.20	0.42**	-0.02	-0.05	0.05	0.30	-0.31*	-0.00	0.03	-0.25	1.00				
29	-0.27	0.22	0.17	-0.005	0.14	-0.13	0.00	-0.06	0.19	-0.10	-0.40**	0.12	0.36*	0.50**	-0.07	0.27	0.22	0.10	-0.44**	-0.05	0.39	0.23	0.30	0.16	0.02	-0.19	-0.16	-0.20	1.00			
30	-0.04	-0.03	-0.28	-0.44**	-0.12	0.42**	0.07	0.26	0.65**	0.16	0.15	-0.07	0.33*	0.03	0.26	0.19	0.14	0.10	0.11	-0.07	-0.07	-0.47**	-0.21	0.12	-0.28	0.21	0.20	-0.24	-0.16	1.00		
31	-0.25	0.57**	0.49**	0.15	-0.00	0.05	0.60**	0.81**	0.12	-0.10	0.05	0.05	-0.05	0.27	-0.35*	0.01	-0.08	0.42**	0.00	0.13	0.33*	0.03	0.18	0.27	-0.09	0.36*	-0.18	0.03	0.19	0.13	1.00	
32	0.38*	0.34*	0.22	-0.03	-0.07	0.32*	0.13	-0.09	0.34*	0.17	-0.14	-0.63**	0.12	-0.23	-0.44**	-0.25	0.02	0.25	-0.27	0.08	-0.13	-0.08	-0.17	0.18	0.29	0.04	-0.02	-0.00	0.08	-0.07	-0.03	1.00

1 Age	11 Physical	21 Attitude - Food	31 Fats and oils	* Significant at 5 % level
2 Height	12 Personality	22 Knowledge on nutrition	32 Sugar	**Significant at 1 % level
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