

***NUTRITIONAL ADEQUACY OF DIETS
IN SELECTED HOSTEL MESSSES***

By

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THESIS

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1999

Dedicated to
My Parents
&
My Brothers

DECLARATION

I hereby declare that this thesis entitled “**Nutritional adequacy of diets in selected hostel messes**” is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title, of any other University or Society.


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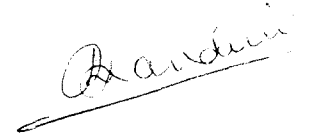
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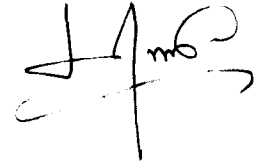
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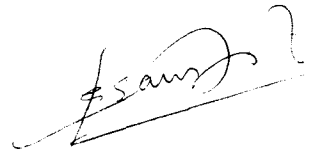


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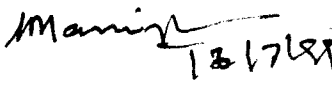


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INTRODUCTION

INTRODUCTION

Nutritional care of students residing in hostels are more important as they live away from home and may suffer from emotional problems. Besides majority of college students falls in the category of adolescence and adolescence is the period of rapid growth with increase in nutritional requirement.

Studies conducted in several hostels in India revealed that diets consumed by the college students were inadequate in calories, protein, vitamins and minerals. They failed to meet the accepted standards of nutritional requirements as proposed by the Nutrition Advisory Committee of India.

Nutritional requirements of the adolescents have received only scanty attention. Very few studies have been conducted on the energy intake and expenditure of adolescent college girls. They indicated that there are wide individual variations in the physical activity of the adolescents. Adolescence is a period of nutritional stress, consequently the energy balance during that period is important.

Hostlers are reported to have greater energy needs as compared to the day scholars. Studies on diet of hostels attached to different educational

institutions all over the country found that nutritionally deficient, imbalanced and improperly planned. Several other workers also reported as hostel diets being deficient in important nutrients.

Information regarding the adequacy of diets served in hostels are at present scanty and hence the experiment is attempted.

The objective of the study are :-

1. To assess the food habits, food consumption pattern and nutrient intakes of the selected inmates
2. To assess the health profile of the selected inmates
3. To find out the association between adequacy of diets and health profile of inmates and to
4. Assess the nutritional status index of inmates.



REVIEW OF
LITERATURE

REVIEW OF LITERATURE

The available literature of the study entitled “Nutritional adequacy of diets in selected hostel messes” were pursued and reviewed under the following headings.

- 2.1. Dietary habits
- 2.2. Food preference
- 2.3. Food consumption
- 2.4. Dietary requirements
- 2.5. Nutritional requirements and
- 2.6. Nutritional status

2.1. Dietary habits

Suitor and Hunter (1990) opined that adolescence is a transition stage in the life cycle linking childhood to adulthood. According to Marshall and Tanner (1986) in the past, the word ‘adolescence’ was used synonymously with puberty and more recently it has become a common practice to use ‘adolescence’ to refer to the physiological changes associated with puberty.

Food habits of an individual are the characteristic repetitive acts that he performs under the impetus of the need to provide himself with nourishment and simultaneously to meet and assortment of social and emotional goals (Gift *et al.*, 1972). Mahan and Rees (1984) observed that adolescent's food habits are reflective of many and diverse influence such as the family, peers and their own physico social development. Wilson *et al.* (1971) and Rao (1985) were of the opinion that teenage period is the time when they exercise full authority in matter of what they will and will not eat. Burton (1978) reported that eating habits were one of the greatest obstacles to the establishment of optimal diets among the majority of persons. Parental attitudes and social factors are the predictors of adolescents food preference and dietary complexities.

Ikeda *et al.* (1983) defined that adolescents had fairly correct knowledge of their food intake which was controlled mainly by their desire to keep in a better physical condition. Kardjati *et al.* (1983) found that female adolescents were found to consume the same type of food irrespective of their physiological state. Worth (1983) stated that there was very little difference in the nutritive value of food selected by adolescents. The rich adolescents were found to include more fruits and vegetables than the poor. A diet survey was conducted by Sarupriya *et al.* (1988) among adolescents in Rajasthan found that they followed two meals a day with main food item as chappathi made from maize flour along with green pulse preparation for lunch and dinner. Philippe *et al.*

(1988) surveyed 225 adolescent girls in France and found that 45 per cent of them skipped breakfast. Lack of time, dieting and not feeling well were the reasons reported by them for the skipping of breakfast. Bellisle *et al.* (1997) suggested that increasing eating frequency is associated with body weight and fat deposition.

Hurban (1977) reported that 'snack' pattern is common among adolescents and they receive a significant proportion of their daily energy intake from snacks, the types of food selected for these eating occasions can determine the overall nutritional quality of the adolescent's diet. The type of food selected and the subsequent impact on the nutritional quality of the diet may be related to when and where the 'snack' occasion occurs. Hansen and Wyse (1980) reported that the nutrients which 'snacks' contributed in the lowest amounts were folate, vitamin D, Zn, ^{and} Fe providing 8, 9, 10 and 11 per cent of the Recommended Dietary Allowance (RDA) respectively and falling below the recommended density of these nutrients. Truswell and Darton-Hill (1981) stated that there is a tendency to equate snacking with snack foods which may have a poor nutritional profile. Bundy *et al.* (1982) revealed that snacks provided several dietary components particularly energy, vitamin B₆, Fe and Mg to adolescent boys and girls.

McCoy and Kenny (1984) calculated average daily nutrient intake provided by 'meals' and 'snacks' for 1224 girls participating in a dietary

survey and opined 'snacks' as all food including liquid and found that 9 per cent consumed one or more snacks as pre-breakfast, 56 per cent between breakfast and lunch, 9 per cent between lunch and evening meal and 80 per cent following the evening meal. In a study of adolescents by McCoy *et al.* (1986) 'snack' provided 23 per cent of energy, 14 per cent of protein, 27 per cent of carbohydrate, 22 per cent of fat and 15 per cent of cholesterol. These snacks on average provided 15-20 per cent of the mineral intakes and 13-17 per cent of the vitamin intakes. 'Snacks' contributed greatly to the intake of riboflavin, vitamin C and thiamine provided 52, 43 and 39 per cent of the R.D.A. respectively.

Pearce *et al.* (1987) reported that 15 per cent of the adolescent girls viewed snack as eating for fun while 14 per cent viewed snack eating as eating out of control. Garcia *et al.* (1990) reported that Mexican children ate upto thirteen times daily and consumed as much as 45 per cent of their energy as 'snacks'. Robson *et al.* (1991) studied the 'snacking habits' of 1015 randomly selected adolescents and found that the majority of 'snacks' (defined as foods consumed between 'meals') was derived from cakes, puddings and biscuits. In addition to contributing significant proportions of energy as sugar 'snacks' also contributed significant amounts of other important nutrients. Rugg-Gunn *et al.* (1993) observed that confectionary contributed 30 per cent of non-milk extrinsic sugars, although the contribution of 'snacks' as a whole was not reported.

2.2. Food preference

According to Eggert (1984) food preferences are formed as a result of the complex interaction of many factors in an individual's environment. These preferences play a critical role in influencing food choices and consumption. Bull (1988) reported that adolescents' food preferences and food selection were influenced by social or external pressures.

Carlisle (1980) stated that vegetables had a low acceptance among adolescents. They accepted raw vegetables, more readily than cooked ones and sweet tasting vegetables over bland or bitter ones. Gnweeki *et al.* (1981) found that raw vegetables, salad items, especially tomato and carrot were popular among adolescents. Krishnakumari (1983) found that the intake of fruits and greens by the adolescents were negligible.

Kardjati *et al.* (1983) remarked that the traditional menu consumed by the adolescents mainly consisted of rice, pulses, non-leafy vegetables and some visible fats. Sato *et al.* (1984) opined that adolescents preferred meat. Price (1984) suggested that intake of milk among adolescents was very low and that of confectionery was high. Desserts were also found to be highly appreciated. Chavance and Durmer (1982) stated that consumption of beverages of adolescents were seven litres. Hirai *et al.* (1989) estimated the mean number of food items taken by the adolescent were 19 and no difference was noted in the number of food items taken in different days of the week. According to Mony, *et al.* (1993) adolescents

in the age group 16-18 years were found to prefer cereal based preparations. The author also reported that frying was the most favourable method of cooking for adolescents and they preferred sweet preparation more than other preparations.

2.3. Food consumption pattern

Kaur and Mann (1990) studied the food consumption pattern of some of the men's hostels and found that one hostel had a canteen open throughout the day and another allowed students to cook some items in their rooms especially tea, coffee and breakfast items like egg, bread and porridge thus supplementing their hostel diets. Khanguonkar *et al.* (1990) found that the main source of β -carotene in the diet of adolescent was cereals accounting for 47.9 per cent of the total β -carotene intake.

Devadas *et al.* (1976) stated that the intake of cereals, green leafy vegetables, roots and tubers and other vegetables by the adolescents were reported to be below the recommended allowances. A diet survey conducted by Krishna Kumari (1983) in eleven women's hostels revealed that the cereal intake was consistently lower in the women's hostel while in the men's hostels, it was adequate as compared to the ICMR recommended allowances. Pulse intake was more than adequate in all the hostels. Again, the women's hostel, except one, consumed low amount of roots and tubers as compared to the men's. The intake of greens and fruits were negligible. There was wide variation in the intake of vegetables

among them, ranging from 0 to 20 per cent per person per day. The fat intake was fairly adequate, with one hostel below the RDA and the sugar intake was less than the RDA in the nine hostels. Renu, S. (1993) reported that mean food intakes of adolescent boys were higher than adolescent girls with regard to all food except milk.

2.4. Dietary requirements

A survey of diets in residential hostels in India conducted by Rao (1967) observed that about 70 per cent provided less than 10 g milk and milk products and their energy intake was less than recommended allowance. In many institutions breakfast was not served and their vitamin A and riboflavin intake were inadequate. Mony, P. (1993) reported that actual food intake of the adolescents in the age group of 16-18 years indicated that the intake of cereals and fish were met above the R.D.A. Foods, belonging to all the other food group were found to met insufficiently.

King *et al.* (1972) reported that teenage pregnant girls consumed more food than non-pregnant girls and their diets were found to be inadequate and the most poorly supplied nutrients were calcium, iron, vitamin 'A' and energy. Rao *et al.* (1976) studied the nutrients uptake of 1000 rural school children between 10 to 17 years and observed that except vitamin 'A' and calorie in one school, all the other school children received diet with supplying all the nutrients more than their RDA. Iron

intake of 110 Scandinavian teenage girls were studied by Elsborg and Rusenquiste (1979) and revealed that the intake of iron ranged from 6 to 28 mg daily, mean intake being 14.9 mg/day. Only 17 per cent of the girls had iron intake above the RDA where it was less than 10 mg in 10 per cent of the girls surveyed.

Survey conducted by National Nutrition Monitoring Bureau (NNMB, 1980) reported that girls in the 13-16 years age group consumed much less than boys, meeting only two thirds of their recommended intake while 16-18 years old appeared to consume slightly better levels, eventhough they were still below the requirements. A study on the nutritional status on privileged adolescent Gujarati boys (10 to 18 years) revealed that their diet and nutrient intake were more than adequate. (Das and Capoor, 1981). According to Anuradha (1981) intake of pulses and leafy vegetables in the age group of 13 to 15 and 16 to 18 years were grossly deficient. Guzman *et al.* (1981) collected information on dietary pattern and daily food intake of 1535 adolescents in Luzon and reported that only 13.7 per cent of the children ate food meeting the RDA for energy, protein and niacin. The intake of calcium, vitamin A, thiamine, riboflavin and ascorbic acid were below 70 per cent of RDA.

Banerjee and Saha (1982) conducted a study on 14 Chinese school boys aged 12-14 years coming from affluent homes and resident in Singapore for the determination of energy cost, pulmonary ventilation

and oxygen consumption at rest and during some common physical activities. The energy cost in these Chinese children were found to be significantly higher, but the energy cost per kilogram body weight per hour was found to be significantly lower than in the Indian children. Pulmonary ventilation in litres per minute was significantly higher in Chinese school boys during all physical activities except lying at rest, sitting and running. Oxygen consumption in litres per minute was also significantly higher during all activities except lying at rest and sitting.

A study of food and nutrient intake of 185 rural adolescent boys and girls of Andhra Pradesh was carried out by Pushpamma *et al.* (1982) revealed that the requirement of vitamin C and vitamin 'A' were found to be most inadequately met. Only 40 to 50 per cent of requirement of calcium, thiamine and riboflavin were met while the requirements of calories, protein and niacin were met upto 80 to 85 per cent. The intake of iron was just sufficient in boys but only 52 per cent of RDA was met in girls. Selz *et al.* (1983) studied the nutrient intake of white children of 6 to 19 years age group and reported that the energy intake of the boys aged 15 to 19 years was almost 3250 kcal/day while that of girls it was 2200 kcal/day. Nutrient intakes of black and white girls in southern U.S.A. were analysed by Kenny *et al.* (1986). It was observed that black girls obtained more vitamin A from vegetables and more thiamine from meat than did white girls. As income increased consumption of starches and eggs were found to be decrease^d and that of fruits increased.

2.5. Nutritional requirements

Bindhu *et al.* (1979) observed that carbohydrate intake was found to be more or less same in rural and urban college students of age 15-20 years. But urban adolescents were found to consume significantly higher amounts of protein, fat and calories than rural counter part. Singh and Sindhu (1980) reported the deficient energy intake and surplus protein intake in the diets of adolescents of Himachal Pradesh.

Chavance and Durmer (1982) opined that out of the 1535 adolescents surveyed, only 13.7 per cent of the children ate meals which completely meet and RDA. Energy, protein and niacin intakes exceeded 90 per cent of RDA. They had also reported that the iron intake of the most of the boys were found to be 90 per cent or more of the RDA. while in the case of girls, it was below 70 per cent of the RDA. Bundy *et al.* (1982) reported that thiamine and riboflavin intakes were generally low in adolescents.

Barbera *et al.* (1983) carried out a duplicate diet meal study with a group of university students living in a hostel, in order to estimate the intake of Zn, Cd, Co, Cu, Fe, Mn, Ni and Pb. The estimated intake values from the contents of breakfast, lunch, dinner and drinks were compared with the values of the provisional tolerable daily intake in the case of Cd and Pb, R.D.A. of Co, Fe and Zn and Estimated Safe and Adequate Dietetic Daily Intake (ESADDI) of Cu and Mn. Neither excessive intake of Pb

and Cd nor deficiencies in Zn, Co, Fe, Mn or Ni were observed but Cu intake was lower than the ESADDI.

Chandana and Bhat (1984) found that intakes of energy, vitamin C, calcium and zinc of adolescents were below than the recommended where as phosphorus, thiamine, riboflavin and carotene intakes were adequate. The authors also reported that the intake of vitamin C and calcium and zinc were below the recommended allowances, where as phosphorus, thiamine, riboflavin and carotene intake were inadequate. Lamberg *et al.* (1984) observed that the dietary vitamin D intake increased with increasing age of adolescents. The main dietary sources of vitamin D were vitamin enriched margarine, fish, fish products and eggs.

Reiter *et al.* (1989) reported the intake of folate and vitamin B₁₂ of black female adolescents were meeting less than 2/3 of RDA. Survey conducted by National Monitoring Bureau (1989) among tribals had revealed that adolescent tribal boys in all the status consumed diet deficient in all the nutrients except iron. It was further revealed that the girls had better calories consumption than boys eventhough the mean intake was less than RDA. Salor *et al.* (1990) observed the iron status among adolescents in Spain and found that most of the subjects studied had a total iron intake lower than the recommended dietary intake.

According to Kathleen and Julienne (1994) only 15 per cent had iron intake < 70 per cent of the RDA and mean iron intake was 120 per

cent of the RDA. More girls had low iron intake than boys (20 per cent vs 9 per cent). Similarly non school going adolescents had lower mean iron intake than the school going ones (106 per cent of the RDA vs 124 per cent).

Qmra *et al.* (1990) had studied variation of the growth due to socio-economic status and dietary intake of healthy normal girls between the ages of 5 to 16 years and concluded that higher percentages of girls from low socio economic status (91.2 per cent) consumed inadequate calories than those girls from upper socio-economic status. A study was conducted among 20 girls residing in University girls hostels of Punjab by Kaur and Mann (1990). The diets were analysed for energy, protein, fat and crude fibre. The protein content of daily diets ranged between 41 to 83 g. The protein content of non-vegetarian diets was higher than the vegetarian diets.

In a study conducted by Asha and Suryakanta (1992) among girls (18-21 years) staying in backward class girls hostel of Amaravathy city, Maharashtra revealed that the mean food intake was marginally adequate. B-complex, vitamin 'C' and Fe deficiency (18 per cent, 6 per cent, 4 per cent) were observed in 37 per cent subjects. Hb levels were between 12-15 g/100 ml blood and rest 867 per cent had Hb level between 6-11 g/100 ml of blood. Martorell *et al.* (1994) indicated that overall energy and protein intakes were adequate between 70 and 100 per cent of recommended allowances. Adequacy of intake relative to recommended

level did not differ significantly by sex. Self assessed food security, however, appeared less adequate than dietary intakes. In a study conducted by Walker *et al.* (1994) among Jamaican adolescents, 33 per cent reported going to bed hungry atleast once a week.

Kathleen and Julienne (1994) found that more adolescents from the rural and periurban areas had low energy intake compared to those in the urban areas (43 per cent rural, 32 per cent periurban and 15 per cent urban). Socio economic status was worse among those adolescents with low energy intake than among those with adequate intake. The authors also pointed out that only 12 per cent had protein intake < 70 per cent of the RDA. Adolescents from the rural and periurban areas had low protein intake compared to those in the urban areas.

Seventy eight per cent of adolescents had intake < 70 per cent of RDA while average intake was 60 per cent of the R.D.A. More boys had low vitamin 'A' intake than girls (87 per cent vs 73 per cent), similarly boys had lower mean vitamin 'A' than girls (50 per cent of RDA vs 64 per cent) (National Nutrition Monitoring Bureau, 1989).

Kathleen and Julienne (1994) stated that there was no difference in the portion of urban, periurban and rural adolescents with low vitamin A intakes, however, mean vitamin 'A' intake was lower among rural and periurban adolescents compared to urban areas (44 per cent of RDA rural, 47 per cent periurban, 68 per cent urban). Food and Agriculture

Organisation (1995) studied twenty two healthy Nigerian adolescent girls aged 11-17 years residing in a hostel over five consecutive days in order to assess their energy intake, energy cost of specific activities and body composition. The study revealed low energy intake of the participants.

Barker (1998) suggested that milk not only helps in augmenting body's calcium content which is an important factor for bone fortification, but also supplied several other minerals like phosphorus, magnesium and zinc required in lesser quantities for bone fortification. Survey conducted by centre for Human Consumption (1998) reported that milk strengthens the lower portion of the body, especially the legs and the pelvic region. The presence of a protein in milk stimulates formation of bones, bones forming cells, collagen and bone plates which are the basis of strong bones.

2.6. Nutritional status

Sarupriya and Mathew (1988) studied the nutritional status of adolescent boys and girls and reported that only 40 per cent had normal body weight and 90 per cent of the subjects had one or other variable signs of deficiency disease. Asha and Suryakanta (1992) reported that the weight for height of subjects were less than the standard values. Ten per cent subjects were under weight. Mony, P. (1993) studied 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 the Indian standards. Kurz and Johnson (1994) reported stunting during adolescents in developing countries. Bouis *et al.* (1994) stated that stunting was found to be highly prevalent in studies of International Centre ^{for} Research ^{on} Women (ICRW) Nutrition of Adolescent girls Research Programme : 65 per cent of rural Philippines, 62 per cent Mexico, 57 per cent in rural Guatemala, 50 per cent Ecuador, 47 per cent in Nepal, 43 per cent in urban Philippines, 41 per cent in Benin, 32 per cent in India and 27 per cent in urban Guatemala.

According to WHO (1995) stunting in adolescence is considered as an indicator of past under nutrition and is a cumulative indicator of nutritional status. The study also revealed that under nutrition is used as an indicator of current nutritional status and is defined as a body mass index that is less than 5th percentile of the NCHS / WHO reference data.

According to McCoy and Kenny (1984) adolescence is a critical period in the development of disease. Krishnamachari *et al.* (1974) in Andhra Pradesh revealed that the prevalence of nutritional deficiency was higher among girls of 6 to 15 years and anaemia was observed in 59.9 per cent of the girls. Two billion people suffer from anaemia largely due to iron deficiency (WHO, 1991).

According to International Nutritional Anaemia Consultative Group (INACG) (1985) about 33 per cent of the Cameroonian adolescents were anaemic, when anaemia is defined according to standard haemoglobin

cut off values. The mean haemoglobin is 12.5 g/dl (+/- 1.58 standard deviation). Barbin and Barbin (1992) reported that adolescents themselves, both boys and girls, may develop iron deficiency anaemia because of rapid growth and the start of menstruation.

Theopilus (1974) in a study conducted among adolescent girls of 10 to 20 years at Madras found a slight decrease in haemoglobin concentration with increasing age. Lee (1978) observed that the mean haemoglobin levels for males were higher than that for girls though the values for males were below acceptable range. According to Wiener *et al.* (1980) mean haemoglobin level of adolescents were lowest even though they were consuming the diet containing high amount of cellulose. Rani (1982) observed that the mean haemoglobin level of female adolescents aged 12 to 15 years was 9.48 g/100 ml and 89 per cent of the girls surveyed had anaemia. The observation of National Institute of Nutrition (NIN-1988-89) on adolescent girls of rural and urban slums had indicated that 10 to 20 per cent of the girls had poor haemoglobin levels.

Gupta and Saxena (1977), Taneja *et al.* (1978) and Rao (1983) reported that occurrence of vitamin 'A' deficiency anaemia and vitamin B complex deficiency among the adolescents. The authors also stated that the incidence of nutritional deficiency diseases were high in vegetarians than non-vegetarian adolescents. Occurrence of vitamin 'A' and B-complex deficiencies were reported among adolescent boys and girls between the ages of 12 to 21 in a report published by NNMB (1984).

However they had pointed about the occurrence of angular stomatitis among the adolescents of Kerala.

Taneja and Sandal (1978) found that dental disease was maximum in 15-17 years of age groups. A report published by National Nutrition Monitoring Bureau (1984) had revealed the high incidence of dental carfies among the adolescents in Kerala. Chopdar and Mishra (1981) stated that adolescents suffer from vitamin deficiency, anaemia and other infection like gastro intestinal and upper respiratory infections. Clinical examination of the adolescents in the age group 16-18 years revealed that anaemia, pigmentation of skin, dental caries were the most common clinical manifestation in both boys and girls as reported by Mony, P. (1993).

From the pertinent investigations it follows that the daily food allowances for young swimmers of the sporting type boarding school of Alma-Ata fully cover their needs for major nutrients such as protein, fats, carbohydrate and conform to the amount of energy expended by them (Zhumabaeva *et al.*, 1976). Blum and Robert (1991) reported that bigger potential problems are considered to be in adolescent reproductive health, a negative implication of early sexual activity on the risks of early child bearing and sexually transmitted disease, including HIV infection. Senderowitz (1995) revealed that adolescence is an important time to study pre pregnancy iron status because many girls around the world would have had their first child by age 19 and a great many more slightly

thereafter. According to Senderowitz (1995) adolescence is typically characterized as a healthy time, with low prevalence of infection and chronic disease.

Kramer (1987) observed that adolescence is an important time for gain in weight as well as height. Both muscle and fat increase with girls gaining relatively more fat and boys relatively more muscle. Gupta (1989) had studied the health status of rural school children of either sex between the age group of 5 to 17 years and had revealed that only 19 per cent girls had weight equal to 80 per cent of Harward standard and 71.7 per cent of girls had weight between 61 to 80 per cent of Harward standard. The mean height of these children was 90 to 94 per cent of Harward standard.

Leelaraman (1990) found that large per cent of rural poor and urban girls had weight deficit by 75 per cent and height deficit by 75 per cent of NCHS standard as compared to upper middle income where only 20 per cent deficiency existed. Nedberg (1990) conducted several studies and demonstrated inferior anthropometric status and higher mortality among girls than among boys in South Asia. The data showed that anthropometric status of females of suburban African were better than that of males. In a study by Nutrition Foundation of India at Jabalpur (1990) found that malnutrition was higher in rural and urban girls than in boys with deficit in height, weight and mid arm circumference. Cronk (1990) pointed that triceps skin fold thickness, a measure of body fat on

the upper arm, often has a similar distribution of BMI and is used to compared to BMI, the distributions of triceps and BMI were some what different, indicating that the Cameroonian adolescents were leaner than the NCHS adolescents with comparable BMI. This may reflect differences in fat patterning in which black have smaller triceps skin fold thickness, or it may reflect that Cameroonian adolescents are more active than their NCHS counter parts.



MATERIALS AND
METHODS

MATERIALS AND METHODS

A study was undertaken to assess the “Nutritional adequacy of diets in selected hostel messes” and to ascertain the impact of diets on the health profile of the selected inmates.

Selection of hostel mess

Large sample

Three hostel messes were selected viz. (1) a hostel mess run by Government (on contract basis) - Medical College Ladies Hostel, (2) a hostel mess run by private organization (management) - Zenana Mission Ladies Hostel and (3) a hostel mess run by the inmates - Agriculture College Ladies Hostel based on the following criteria. ie., inmates of the hostels should be women and there should be minimum 100 inmates in a hostel. Food expenditure pattern, food preference, per capita availability of food and per capita availability of nutrients among the inmates of the hostels were collected.

Sub sample for indepth study

Selection of sample

A sub sample of thirty students were selected for indepth study (10

from each hostel). The inmates were selected based on their willingness to participate, in the age group of 16 to 18 years and should be stayed in the hostel for a minimum period of six months.

Indepth investigations such as actual food intake, scoring food use frequency, different food combinations, energy expenditure for different activities, anthropometric measurements, clinical assessment and biochemical investigations were ascertained among the sub samples.

A. Tools selected for data collection

Interview method was used for the collection of data. Bass *et al.* (1979) reported that interview method is most suitable since it proceeds systematically and records the collected information quickly.

Diet survey method was also used for the collection of data. Swaminathan (1985) reported that diet surveys constitute an essential part of any complete study of nutritional status of individuals or group, providing essential information on nutrient level, sources of nutrients, food habits and attitudes.

The survey was conducted by the investigator, through visits, interview, personal enquiry and also by observation.

The questionnaire used for the dietary survey was developed in such a way to collect information regarding the food expenditure pattern of the

mess, eating pattern of the inmates, frequency of using different food stuffs, food preparations commonly used and their preference, meal frequency and food combinations, nibbling habits, type of food they take from outside and the frequency of taking beverages. The questionnaire structured for the survey was pretested and is presented in Appendix I.

Schedule required for finding out the preference of inmates was also formulated. The preference of the respondents were rated on a four point scale viz.

4. extremely preferred
3. preferred
2. less preferred
1. not at all preferred

The schedule used for the survey was pretested and presented in Appendix II.

The methods used for the diet survey are

a) Food list method

This method is used to collect information on the food consumption pattern of hostel inmates for a particular period of time. The quantities of various foods consumed by the inmates during the period of survey were entered in the food list sheet.

b) Weighment of raw food and weighment of cooked food

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 day weighment method would be as efficient a tool as that of seven days. Tilve (1977) reported that individual intake can be obtained accurately by actual weighing of food items consumed. Actual food intake was assessed among 30 inmates i.e., 10 selected students from each hostel. A three day weighment method was done for assessing the actual food intake of raw foods. The schedule structured is presented in Appendix III. All the raw foods taken for cooking were weighed. The food consumed by the inmates and its remaining after eating were also weighed and recorded to find out the exact amount of foods consumed by them (Appendix IV) (Plate 1).

The nutritive value of the food consumed was calculated by the help of food consumption tables and this value was compared with Recommended Dietary Allowances (R.D.A.) of ICMR (1989).

Nutritional status of the selected inmates were assessed through taking anthropometric, clinical and biochemical investigations.

b) Assessment of anthropometric measurements

Anthropometry has been accepted as an important tool for the assessment of nutritional status. Weissell (1982) reported that

Plate 1. Weighment of cooked foods



anthropometric data which are being used increasingly in estimating nutritional status. According to Vijayaraghavan (1987) weight for age, weight for height, height for age and arm circumference singly or in combination were extensively used for determining nutritional status. Weight for age and height for age was regarded as a reliable measurement in assessing growth. In this study height and weight of the subjects were taken as suggested by Jelliffie (1966).

Methods used for anthropometry

Height

The height of the inmates were measured using anthropometer. The inmates were made to stand on a flat floor with feet together and with head, shoulder, buttocks and heels touching the wall. The head was held comfortably erect with the lower broader of the orbit in the same horizontal plane as the external auditory meatus. The arms were hanged at the sides in a natural manner. A wooden block was used as head piece which was gently lowered crushing the hair and making contact with the top of the head. The measurements were taken up to the nearest 0.1 cm by taking care of the influencing factors like foot wear and hairdo.

Weight

The weight was measured using a weighing machine before eating. Inmates were weighed wearing very light clothing, without shoes. The inmates were made to stand on the centre of the weighing machine balance

without touching anything else. Care was taken to use the balance on a firm mounted surface and it was checked before use. The measurement was taken to an accuracy of 0.1 kg.

Mid-upper arm circumference

Mid-upper arm circumference was measured to the nearest 0.1 cm with a flexible non stretchable tape by placing gently but firmly round the limb to avoid compression of the soft tissues. The left arm was measured while hanging, at its mid point i.e., between the tip of the elbow (olecranon) and the top of the shoulder (acromial process) (Plate 2).

Waist and hip

Waist and hip were measured by means of a narrow, flexible, non stretchable tape to the nearest 0.1 cm.

Triceps skinfold thickness

Triceps skinfold thickness was measured with a Harpenden Calipers on the upper left hand. The skinfold measured consist of a double layer of skin and subcutaneous fat. A fold of skin and subcutaneous fat between the thumb and forefinger was used as the mid point mark. Care was taken not to include underlying muscle. The calipers were applied over the fat fold at the mid point mark and measurements were taken to nearest 10 mm in two to three second. Three measurements were taken and the results averaged (Plate 3).

Plate 2. Measurement of Mid-upper arm circumference



Plate 3. Measurement of Triceps skinfull thickness



Plate 4. Haemoglobin estimation



Body Mass Index

Body Mass Index (BMI) - has been shown to be a good indicator of nutritional status and functional status (Nutrition News, 1990). The BMI was worked out and the inmates were classified into various groups.

e) Clinical examination

According to Swaminathan (1985) clinical examination is the most essential part of all nutritional surveys as we get direct information on signs and symptoms of dietary deficiencies prevalent among the students. The various clinical deficiency signs were observed using a structured schedule with the help of a qualified physician (Appendix V).

d) Biochemical investigation

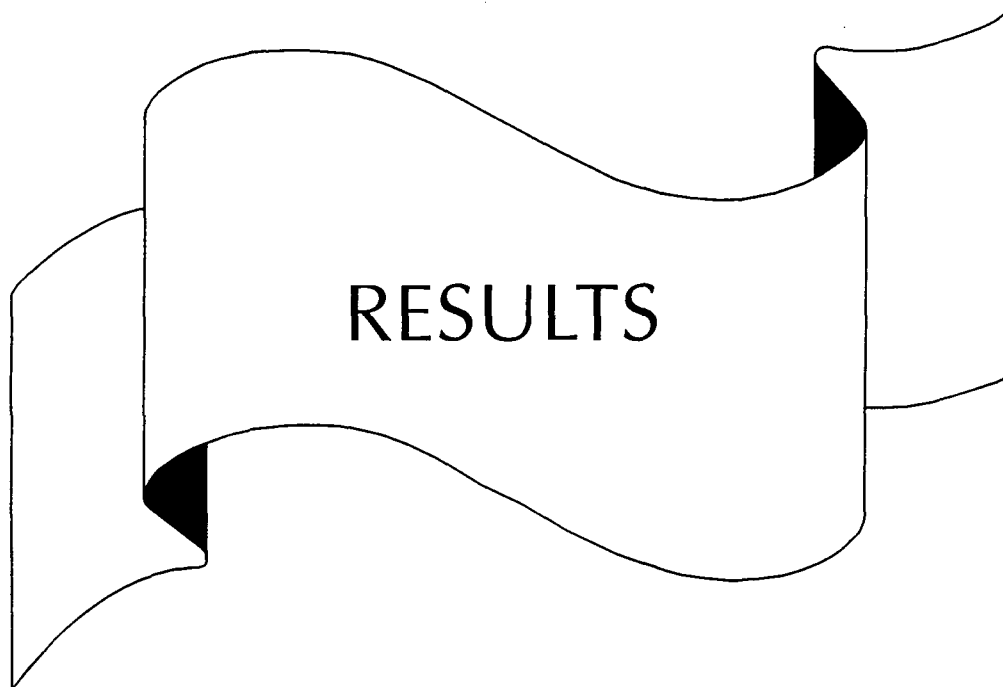
Haemoglobin estimation of the selected inmates were conducted by the cyanmethaemoglobin method (Plate 4).

Monitoring energy expenditure pattern

The energy expenditure pattern of the inmates were calculated by using prediction equation suggested by IMCR (1989).

Statistical analysis

Statistical analysis such as standard deviation, correlation analysis and nutritional status index were carried out.



RESULTS

RESULTS

A study was conducted to assess the “Nutritional adequacy of diets in selected hostel messes”. The data collected from large sample (100 and above) and sub sample (30) were analysed and the results are presented under the following heads.

Large Sample

- 4.1. Food expenditure pattern of inmates
- 4.2. Food preference of inmates
- 4.3. Percapita availability of foods
- 4.4. Percapita availability of nutrients from the diets

Subsample

- 4.5. Personal characteristics of the selected inmates
- 4.6. Dietary habits of the selected inmates
- 4.7. Energy intake and energy expenditure of selected inmates
- 4.8. Nutritional status of selected inmates

4.9. Association between adequacy of diets and health profile of inmates

4.10. Nutritional status index of selected inmates

4.1. Food expenditure pattern of inmates

The food expenditure pattern of the three selected hostel messes were collected and presented in Table 1 and Fig. 1. The data indicated that the expenditure pattern of various food items varied in the three hostel messes.

Table 1. Food expenditure pattern of inmates

Food stuffs	MCLH (Rupees)	Per cent	AGCLH (Rupees)	Per cent	ZMLH (Rupees)	Per cent
Cereals	9688.33	(13.8)	8356.60	(12.90)	5008.60	(13.9)
Pulses	4051.60	(5.8)	3691.30	(5.7)	1383.30	(3.8)
Green leafy vegetables	643.30	(0.9)	556.60	(0.85)	286.30	(0.8)
Other vegetables (Roots and tubers)	7795.30	(11.00)	7612.60	(11.8)	3833.30	(10.6)
Fruits	2553.30	(3.6)	1929.30	(3.0)	1068.30	(3.0)
Milk and & products	6376.00	(9.05)	5205.60	(8.0)	4060.30	(11.2)
Meat, poultry & fish	11354.00	(16.1)	10002.30	(15.4)	6073.30	(16.8)
Fats and oils	4596.60	(6.5)	4800.00	(7.4)	2850.00	(7.9)
Sugar and jaggery	2876.00	(4.08)	3239.00	(5.0)	1751.60	(4.8)
Spices	1934.30	(2.7)	1725.00	(2.7)	1481.60	(4.1)
Bakery foods	74190.00	(20.5)	9746.60	(15.0)	3210.30	(8.9)
Miscellaneous	4380.00	(6.2)	7886.60	(12.2)	6138.00	(14.2)
Total	70438.73	(100)	64751.5	(100)	37144.9	(100)

MCLH - Medical College Ladies Hostel
 AMLH - Zenana Mission Ladies Hostel

AGCLH - Agriculture College Ladies Hostel
 Figures in parenthesis indicates percentage

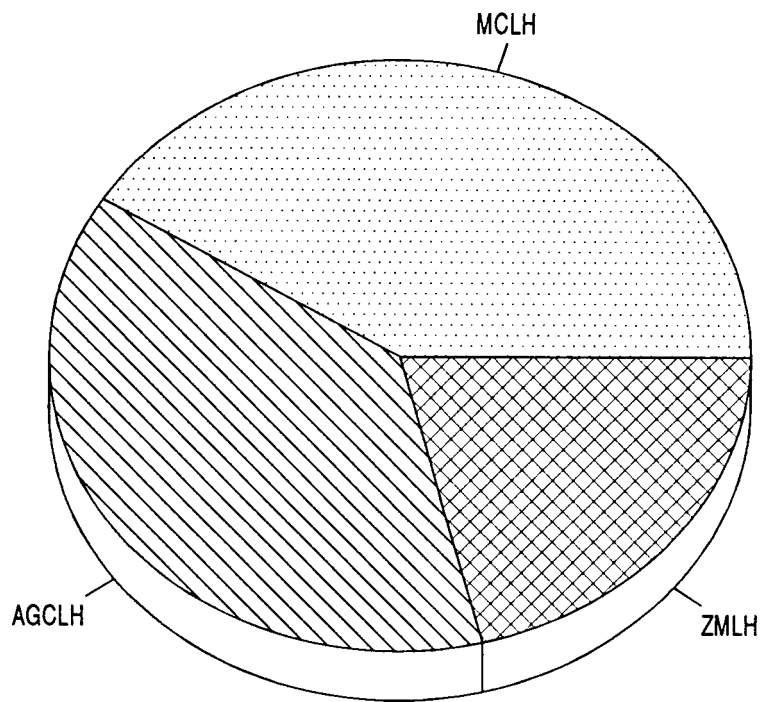


Fig. 1. Food expenditure pattern of inmates

The expenditure pattern for the various food items were assessed and it was found that Medical College Ladies Hostel (MCLH) had spent a maximum of Rs. 9688.00 for cereals compared to Agriculture College Ladies Hostel (AGCLH) (8356.6) and Zenana Mission Ladies Hostel (ZMLH) (5008.6). In the case of pulses and green leafy vegetables a maximum expenditure of Rs. 4051.6 and Rs. 643.3 respectively were observed in MCLH. At the same time for other vegetables and roots and tubers it was found that MCLH spent a maximum of Rs. 7795.3 when compared to the other two hostels. The expenditure on animal foods like milk and milk products, meat, poultry and fish were found to be highest in MCLH (Rs. 6376 and Rs 11354 respectively). The expenditure for fruits was found to be highest in MCLH (Rs. 2553.3) whereas the expenditure for sugar and jaggery and fat and oils were found to be highest in AGCLH (Rs. 3239 and Rs 4800 respectively). In the case of spices it was found to be highest in MCLH (Rs. 1934.3). The maximum money incurred for bakery items was found to be more in MCLH (Rs. 14190). Whereas it was only Rs. 9746.6 in AGCLH and comparatively less in ZMLH (Rs. 3210.3). Money spent on miscellaneous item was found to be Rs. 7886.6, Rs. 5138 and Rs. 4380 in AGCLH, ZMLH and MCLH respectively.

The average expenditure per month and per day was also worked out. The inmates in the Agriculture College Ladies Hostel were following dividing system and the average expenditure per day was found to be Rs. 18.85 and per month (January, 1998) it was Rs. 584.35. But in the case

of inmates in MCLH and ZMLH the mess fee is of fixed rate and it was Rs. 550 and 500 respectively.

4.2. Food preference of inmates

Preference of inmates for various food articles commonly used for culinary purpose were assessed using a point preference rating scale and formulae for food preference given in Appendix VI.

The food preference of inmates was assessed and presented in Table 2.

The table revealed that 43.3 per cent inmates in AGCLH were extremely preferred cereals when compared with inmates in other two hostels. Pulses were extremely preferred by 27.5 per cent inmates in AGCLH. At the same time 41.8 per cent inmates in ZMLH were extremely preferred vegetables when compared with other two hostels. However, 70 per cent inmates in MCLH extremely preferred green leafy vegetables and 36.7 per cent inmates in MCLH extremely preferred root and tubers. But in the case of fruits, 70 per cent inmates in AGCLH extremely preferred fruits when compared with inmates in other two hostels. At the same time 88.2 per cent inmates in AGCLH extremely preferred animal products. In the case of nuts and oil seeds, 83.3 per cent inmates in MCLH, 73.3 per cent inmates in AGCLH and 80 per cent inmates in ZMLH were extremely preferred nuts and oil seeds. Eighty per cent inmates in MCLH, 82.4 per cent inmates in AGCLH and 77.2 per cent in

Table 2. Preference of the inmates for various food stuffs (in percentage)

	Extremely preferred food stuffs			Preferred food stuffs			Less preferred food stuffs			Not at all preferred foods		
	MCLH	AGCLH	ZMLH	MCLH	AGCLH	ZMLH	MCLH	AGCLH	ZMLH	MCLH	AGCLH	ZMLH
Cereals	26.7	43.3	35	53.3	46.7	36.7	20	30	40	20	–	20
Pulses	20	27.5	25	54	66	64	20	20	20	10	–	20
Vegetables	30.8	35	41.8	54.4	46.6	49.4	20.8	30	18.3	15	11.25	20
Green leafy vegetables	70	56	50	40	42.5	37.5	30	13.3	23.3	15	10	15
Roots and tubers	36.7	29.1	25.6	45	49.2	44.6	24.4	34.4	30	35	12.9	17.1
Fruits	61.4	70	62.7	48.3	48.2	46.7	25.7	22.5	20	15	10	16.7
Animal products	78.2	88.2	72.7	30	25	46	24	13.3	37.5	10	–	–
Nuts and oil seeds	83.3	73.3	80	40	75	40	20	30	30	10	–	10
Sweet preparations	80	82.4	77.2	40	42.2	37.3	25	20	22.5	–	–	–
Other foods stuffs	87	88	90	30	33.3	20	16	16.7	20	50	30	50

MCLH - Medical College Ladies Hostel

AGCLH - Agricultural College Ladies Hostel

ZMLH - Zenana Mission Ladies Hostel

Table 3. Highly preferred foods among the inmates in the selected hostels
(score above 79.83)

Food articles	MCLH	AGCLH	ZMLH
	Preference score	Preference score	Preference score
Rice	85	87	—
Wheat	80	90	—
Peas	—	—	82.5
Redgram	82.5	80	82.5
Tapioca	—	80	80
Potato	87.5	90	85
Yam	—	—	80
Carrot	87.5	82.5	—
Beetroot	90	82.5	—
Small onion	87.5	—	—
Big onion	82.5	92.5	82.5
Ladies finger	85	—	82.5
Cucumber	95	90	92.5
Brinjal	82.5	87.5	82.5
Bittergourd	80	85	82.5
Snakegourd	—	—	82.5
Plantain	—	85	87.5
Beans	85	80	82.5
Pumpkin	87.5	—	—
Dolichos beans	—	80	—
Amaranthus	90.7	90	—
Drumstick leaves	100	100	100
Cabbage	87.5	82.5	—
Coriander leaves	86	—	—
Cows milk	100	100	100
Buffalo milk	—	82.5	95
Curd	100	100	100
Butter milk	85	95	—
Butter	92.5	100	87.3

Contd...

Table 3 (Contd...)

Food articles	MCLH	AGCLH	ZMLH
	Preference score	Preference score	Preference score
Hen's egg	100	100	100
Duck's egg	—	87.5	—
Fish	100	100	100
Beef	100	100	100
Chicken	100	100	100
Mutton	80	90	82.5
Banana	85	90	—
Tomato	—	87.5	80
Gooseberry	87.5	90	—
Jackfruit	—	87.5	82.5
Mango	100	100	100
Guava	100	100	100
Orange	100	100	100
Apple	80	80	—
Papaya	—	—	85
Pineapple	100	100	87.5
Sapota	82.5	87.5	85
Anona	—	100	90
Rose apple	100	87.5	100
Stargooseberry	90	100	100
Watermelon	100	100	100
Groundnut	80	—	—
Coconut	100	100	100
Cashewnut	100	100	100
Biscuit (salt)	—	82.5	82.5
Biscuit (sweet)	100	87.5	95
Bread (white)	85	80	82.5
Cake	100	100	100
Honey	90	95	92.5

Contd...

Table 3 (Contd...)

Food articles	MCLH	AGCLH	ZMLH
	Preference score	Preference score	Preference score
Sugar	—	87.5	90
Jaggery	—	82.5	—
Pappad	87.5	100	95
Sago mixture	82.5	90	97.5
Banana chips	100	100	100
Potato chips	100	100	100
Jack chips	100	100	100
Puffs	100	100	100
Onion vada	90	—	80
Bengalgram dhal vada	92.5	—	82.5
Blackgram dhal vada	100	100	100
Banana fry	100	100	100
Ladu	92.5	100	87.5
Jilebi	100	100	100
Peda	—	100	—
Ice cream	100	100	100
Pepsi	100	100	100
Limca	100	90	—
Coco cola	100	—	90
Merinda	100	100	100
Citra	100	100	100
Lime juice	87.5	92.5	82.5
Fruit juice	100	92.5	100
Watermelon juice	100	100	100
Five star	100	100	100
Sip-up	95	100	92.5
Jam	90	95	85
Perk	100	100	100
Fruit salad	100	100	100
Dilkush	85	100	95

Table 4. Medium preferred foods among the inmates in the selected hostels (scores between 61.83 and 79.83)

Food articles	MCLH	AGCLH	ZMLH
	Preference score	Preference score	Preference score
Rice	—	—	77.5
Wheat	—	—	77.5
Peas	72.5	77.5	—
Greengram	72.5	77.5	77.5
Horsegram	67.5	77.5	—
Ladies finger	—	77.5	—
Plantain	75	—	—
Pumpkin	—	77.5	77.5
Ivygourd	75	77.5	65
Bread fruit	77.5	—	—
Amaranthus	—	—	77.5
Buffalo milk	77.5	—	—
Butter milk	-	—	77.5
Duck's egg	75	—	75
Gooseberry	—	—	75
Jack fruit	75	—	—
Anona	77.5	—	—
Groundnut	—	—	75
Gingelly	—	75	—
Sugar	75	—	—
Ragi	—	72.5	—
Bengalgram	65	67.5	72.5
Tapioca	67.5	—	—

Table 4. (Contd...)

Food articles	MCLH	AGCLH	ZMLH
	Preference score	Preference score	Preference score
Yam	—	65	—
Colocasia	62.5	70	—
Carrot	—	—	67.5
Raddish	—	—	62.5
Coleus	—	65	—
Diascorea	—	70	—
Small onion	—	—	72.5
Lesser yam	—	—	72.5
Ash gourd	72.5	70	70
Snake gourd	70	70	—
Dolichos beans	65	—	—
Bread fruit	—	65	70
Papaya	65	62.5	—
Plantain flower	—	—	65
Plantain stem	70	62.5	70
Peas	67.5	—	62.5
Curry leaves	—	—	65
Apple	—	—	65
Palm fruit	—	70	—
Groundnut	—	72.5	—
Jaggery	72.5	—	67.5
Jack fruit seed	—	65	—
Bengalgram dhal vada	—	72.5	—
Onion vada	—	70	—
Coco cola	—	70	—

Table 5. Less preferred foods among the inmates in the selected hostels (Scores below 61.83)

Food articles	MCLH	AGCLH	ZMLH
	Preference score	Preference score	Preference score
Ragi	60	—	47
Horsegram	—	—	60
Yam	60	—	—
Colacasia	—	—	52.8
Sweet potato	57.5	57.5	57.5
Coleus	52.5	—	52.5
Diascorea	—	—	52.5
Small onion	—	55	—
Papaya	—	—	57.5
Plantain flower	57.5	55	—
Curry leaves	57.5	44.5	—
Tomato	58.2	—	—
Ayani	57.5	60	—
Plum fruit	—	—	60
Gingelly	57.5	—	60
Raddish	45	45	—
Bread fruit	—	—	30
Goats milk	25	10	30
Banana	—	—	42
Palm fruit	49	—	48.2
Biscuit (salt)	47.5	—	—
Jack fruit seed	45	—	37.5
Peda	—	—	50
Limca	—	—	50

4.3. Percapita availability of foods

Percapita availability of foods in the three hostel messes were worked out for the month of January (1998) and is presented in Table 6 and Fig. 2. Percapita of cereals (567 g) in MCLH were higher than that of other two hostels such as AGCLH and ZMLH (448 g and 389 g respectively). In the case of pulses, maximum percapita was found in MCLH (149 g) and minimum percapita (94 g) in ZMLH. While green leafy vegetables and other vegetables (root and tubers), it was found that the percapita of MCLH was 90 g and 282 g respectively and was comparatively higher than with other two hostels. But in the case of fruits + milk per capita was higher in AGCLH (103 g) and that of milk and milk products (241 g). In the case of sugar and jaggery, fats and oils, the highest percapita was found in MCLH (25 g and 24 g) when compared with other two hostels.

4.4. Percapita availability of nutrients from the diets

The per capita availability of nutrients for the inmates in the selected hostels were calculated and the details are presented in Table 7 and Fig. 3. Percapita availability of protein (103 g), energy (2810 kcal), calcium (764 mg), retinol (1238 ug), thiamine (2.15 mg), niacin (28 mg) and vitamin c (172.7 mg) were found to be higher in MCLH when compared with other two hostels. Whereas the percapita availability of riboflavin (2.62 mg) was higher in AGCLH. The percapita availability of iron was found to be below RDA in the three hostels.

Table 6. Percapita availability of foods

Food items	MCLH	AGCLH	ZMLH
Cereals (g)	567	448	389
Pulses (g)	149	120	94
Green leafy vegetables (g)	90	86	75
Other vegetables (root & tubers) (g)	282	199	155
Fruits (g)	96	103	80
Milk (g)	241	159	161
Fish, egg and meat (g)	129	119	102
Sugars and Jaggery (g)	25	18	16
Fats & oils (g)	24	20	21

MCLH - Medical College Ladies Hostel

AGCLH - Agriculture College Ladies Hostel

AMLH - Zenana Mission Ladies Hostel

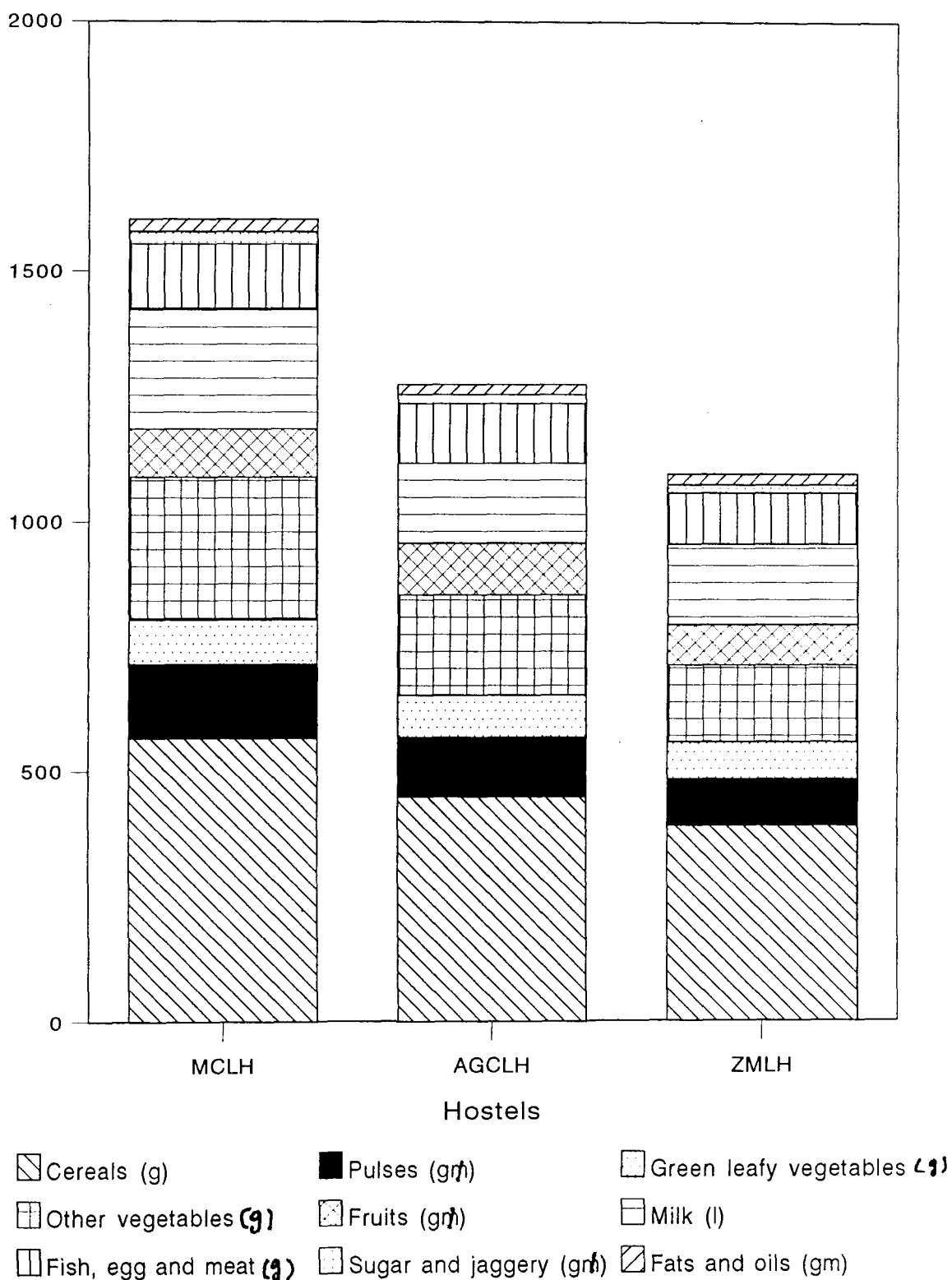


Fig. 2. Percapita availability of food

Table 7. Percapita availability of nutrients from the diets

Nutrients	RDA	Percapita availability of nutrients		
		MCLH	AGCLH	ZMLH
Protein (g)	65	103	86.24	98.2
Energy (kcal)	2050	2810	2324.9	1807.1
Calcium (mg)	500	764	683.34	484.3
Iron (mg)	50	36	43.023	37.95
Retinol (g)	600	1238.9	776.61	693.81
Thiamine (mg)	1	2.157	1.624	1.45
Riboflavin (μ g)	1.2	1.25	2.62	1.60
Niacin (mg)	14	28.09	23.98	26.43
Vitamin C (mg)	40	172.7	118.6	131.25

MCLH - Medical College Ladies Hostel

AGCLH - Agriculture College Ladies Hostel

AMLH - Zenana Mission Ladies Hostel

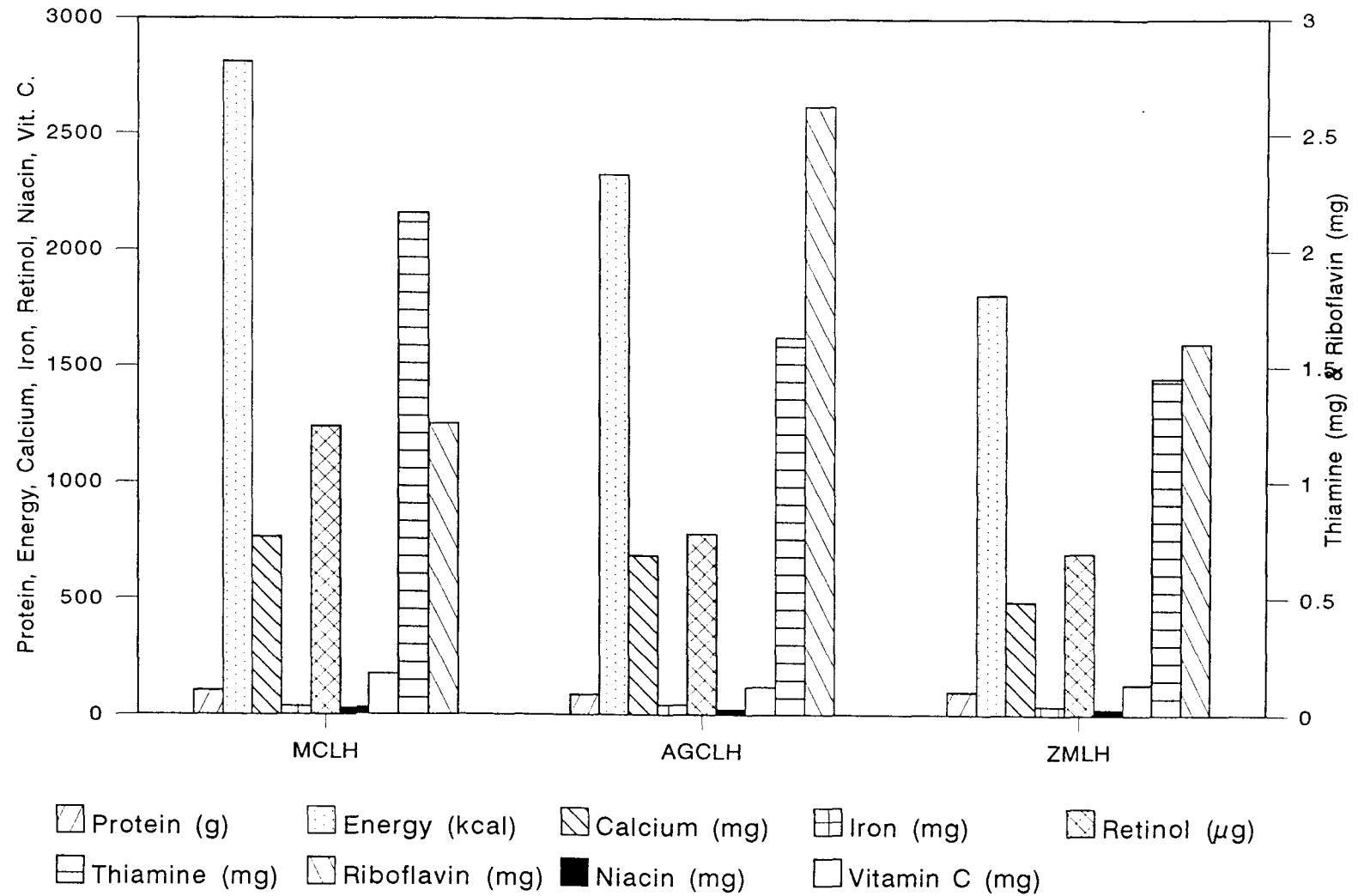


Fig. 3. Per capita availability of nutrients among the inmates in the hostels

Subsample

A subsample of thirty inmates (10 from each hostel) were selected for indepth study.

4.5. Personal characteristics of the selected inmates

Personal characteristics of the inmates with reference to reading habits, exposure to different mass media, leisure time activities, hobbies and participation in different organization, were assessed and details are presented in Table 8, 9, 10 and 11.

Table 8 depicted the habits of inmates in the three hostels. Habits of listening to radio and television programmes among the inmates in the hostels were surveyed, in the selected hostels like MCLH, AGCLH and ZMLH.

The Table revealed that 30 per cent of inmates in MCLH, 60 per cent inmates in AGCLH and 30 per cent inmates in ZMLH were found to view the television programme daily. Twenty per cent inmates in MCLH, 20 per cent inmates in AGCLH and 30 per cent inmates in ZMLH were occasional viewers of television programme. However 50 per cent inmates in MCLH, 20 per cent inmates in AGCLH and 40 per cent inmates in ZMLH were not in the habit of viewing television programme.

Table 8. Habits of listening to radio / television programme among the selected inmates

	Viewing Television						Listening to Radio					
	MCLH		AGCLH		ZMLH		MCLH		AGCLH		ZMLH	
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
Never	5	50	2	20	4	40	7	70	5	50	7	70
Daily	3	30	6	60	3	30	2	20	4	40	1	10
Occasionally	2	20	2	20	3	30	1	10	1	10	2	20
Total	10	100	10	100	10	100	10	100	10	100	10	100

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Twenty per cent inmates in MCLH, 40 per cent inmates in AGCLH and 10 per cent inmates in ZMLH were found to listen the radio programme daily. While 10 per cent inmates in MCLH, 10 per cent inmates in AGCLH and 20 per cent inmates ZMLH were occasional listeners of the radio programme. However 70 per cent inmates in MCLH, 50 per cent in AGCLH and 70 per cent inmates in ZMLH did not like to listen radio programme.

Table 9 revealed that cent per cent inmates in MCLH, 100 per cent inmates in AGCLH and 80 per cent inmates in ZMLH were in the habit of reading newspaper daily. Whereas twenty per cent inmates in ZMLH were occasional readers.

Habits of reading weeklies and magazines were observed by 50 per cent inmates in MCLH, 60 per cent inmates in AGCLH and 40 per cent inmates ZMLH. Twenty per cent inmates in MCLH, 40 per cent inmates in AGCLH and 20 per cent inmates in ZMLH were the occasional readers of the magazines and weeklies. Thirty per cent inmates in MCLH and 40 per cent inmates in ZMLH were not in the habit of reading weeklies and magazines.

Details of leisure time activities of inmates are presented in Table 10 and Fig. 4. It was observed that 20 per cent inmates in MCLH, 10 per cent inmates in AGCLH and 10 per cent inmates in ZMLH spend their time in cycling. Ten per cent inmates in MCLH, 10 per cent inmates

Table 9. Reading habits of selected inmates

	Reading News papers						Reading weeklies / magazines					
	MCLH		AGCLH		ZMLH		MCLH		AGCLH		ZMLH	
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
Never	1	—	—	—	—	—	3	30	—	—	4	40
Daily	10	100	10	100	8	80	5	50	6	60	4	40
Occasionally	—	—	—	—	2	20	2	20	4	40	2	20
Total	10	100	10	100	10	100	10	100	10	100	10	100

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 ZMLH - Zenana Mission Ladies Hostel

Table 10. Leisure time activities of selected inmates

Activities	MCLH		AGCLH		ZMLH	
	No.	Per cent	No.	Per cent	No.	Per cent
Cycling	2	20	1	10	1	10
Gossiping	1	10	1	10	1	10
Sleeping	2	20	1	10	5	50
Singing	1	10	1	10	2	20
Sports and games	4	40	6	60	1	10
Total	10	100	10	100	10	100

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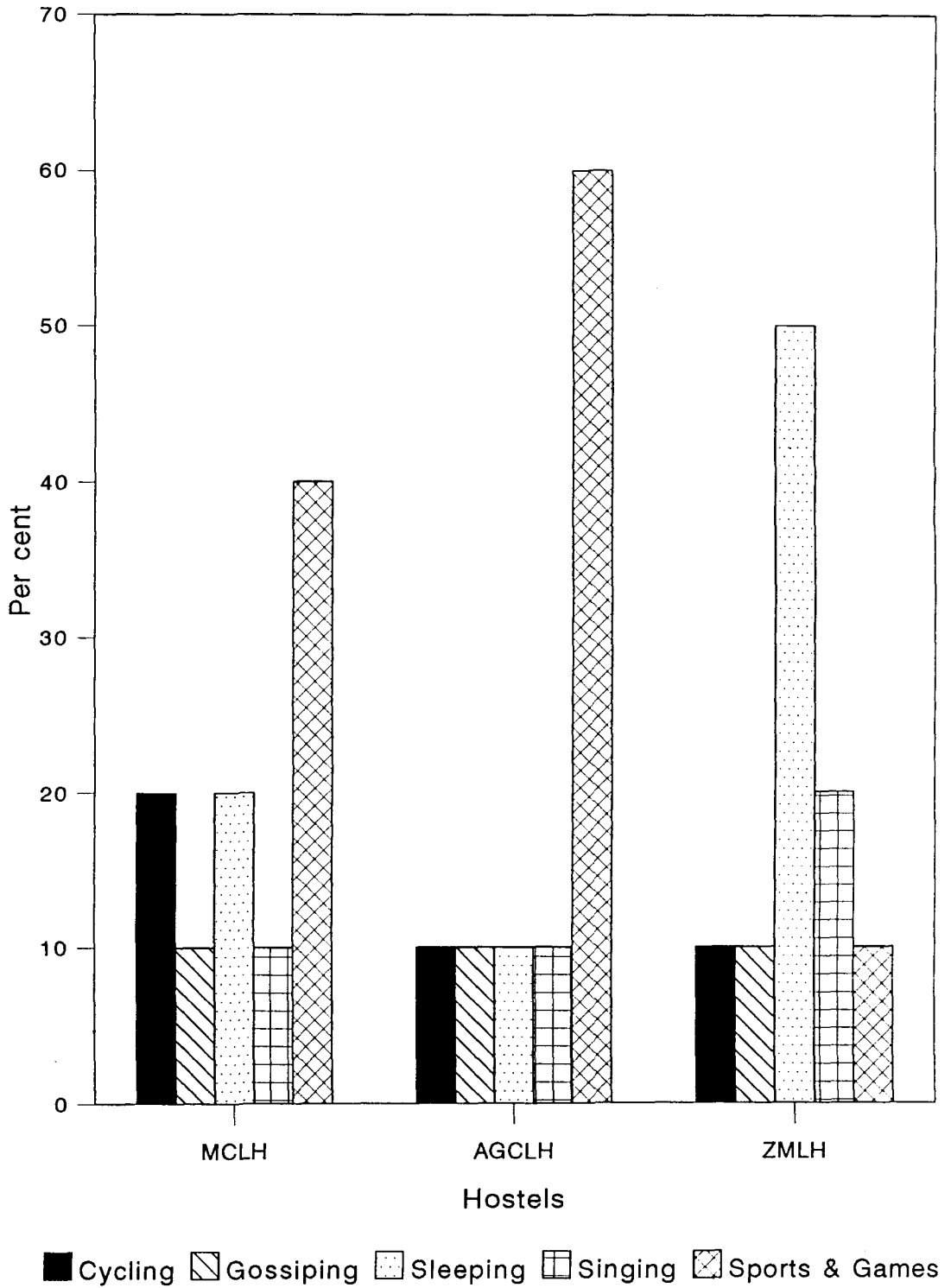


Fig. 4. Leisure time activities of selected inmates

in AGCLH and 10 per cent inmates in ZMLH enjoyed gossiping during their leisure time. Twenty per cent inmates in MCLH, 10 per cent inmates in AGCLH and 50 per cent inmates in ZMLH spend their time in sleeping. Ten per cent inmates in MCLH, 10 per cent inmates in AGCLH and 20 per cent inmates in ZMLH enjoyed singing during their leisure times. While 40 per cent inmates in MCLH, 60 per cent inmates in AGCLH and 10 per cent inmates in ZMLH spend their time in sports and games.

The participation of inmates in various organization are presented in Table 11 and Fig. 5. Fifty per cent inmates in MCLH, 10 per cent inmates in AGCLH and 30 per cent inmates in ZMLH had membership in youth clubs. Thirty per cent and 20 per cent inmates in AGCLH had membership in camera and forestry club respectively. However 30 per cent inmates in MCLH and 40 per cent inmates in AGCLH had their membership in college unions. At the same time 20 per cent inmates in MCLH and 70 per cent inmates ZMLH were not having membership in any of the organizations.

4.6. Dietary habits of the selected inmates

Dietary habits of the inmates were ascertained through the frequency use of various foods, preference of inmates for beverages, nibbling habits of inmates, preference of inmates for cooking methods

Table 11. Participation of inmates in various organizations

Organisations	MCLH		AGCLH		ZMLH	
	No.	Per cent	No.	Per cent	No.	Per cent
Youth club	5	50	1	10	3	30
Camera club	—	—	3	30	—	—
Forestry club	—	—	2	20	—	—
Politics	3	30	4	40	—	—
Nil	2	20	—	—	7	70
Total	10	100	10	100	10	100

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 ZMLH - Zenana Mission Ladies Hostel

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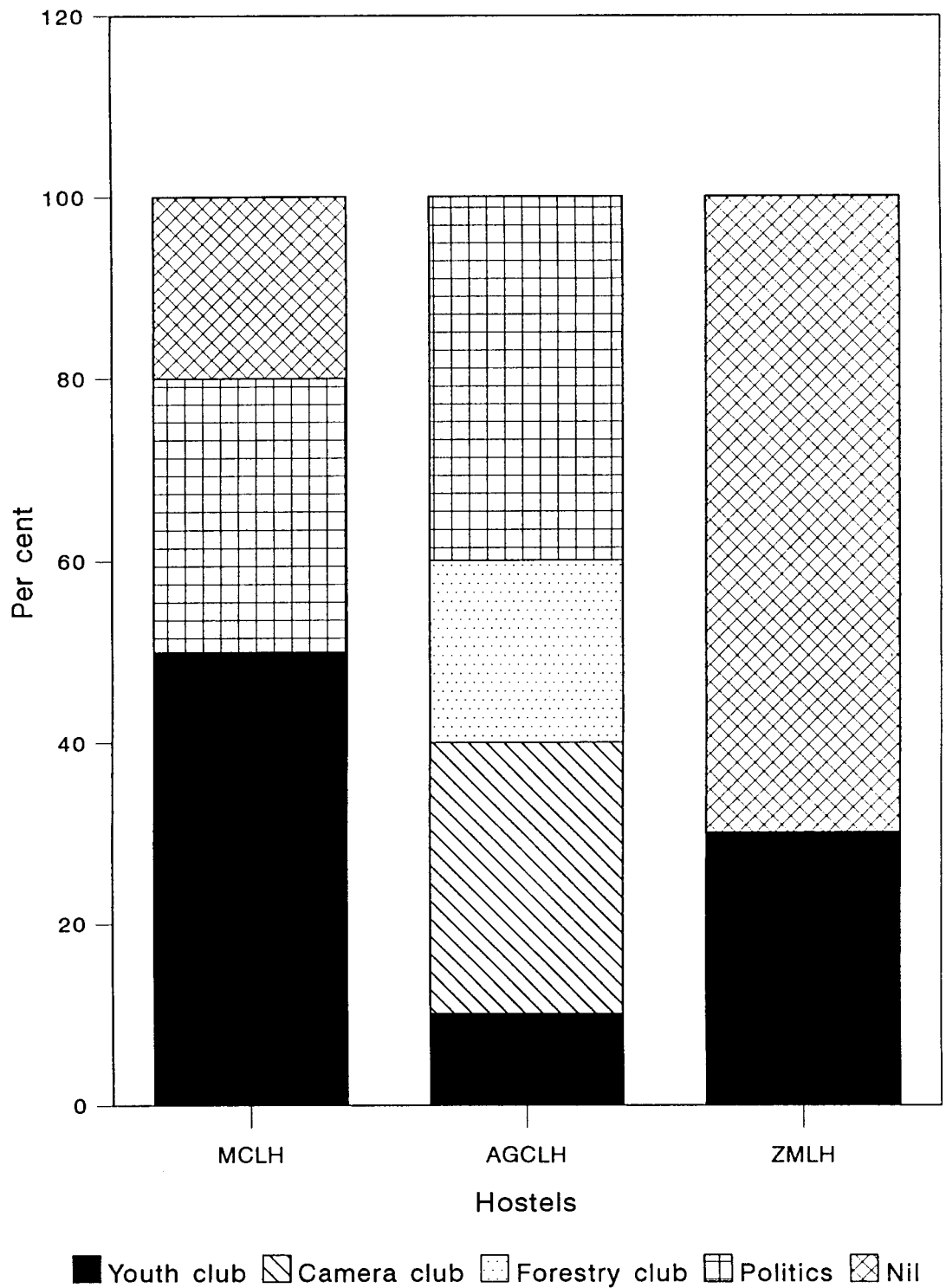


Fig. 5. Participation of inmates in various organizations

and type of preparation and preference of inmates for various food combinations. The actual food intake and nutrient intake of the inmates were also worked out.

Table 12 revealed the preference of inmates for beverages. Seventy per cent inmates in MCLH, 80 per cent inmates in AGCLH and 50 per cent inmates in ZMLH preferred tea while 30 per cent inmates in MCLH, 20 per cent inmates in AGCLH and 50 per cent inmates in ZMLH preferred coffee.

Table 13 gives the details of nibbling habit of inmates in the three hostels. Eighty per cent inmates in MCLH, 80 per cent inmates in AGCLH and 60 per cent inmates in ZMLH were found to be in the habit of eating in between the meals, whereas the nibbling habit was absent in 20 per cent inmates in MCLH, 20 per cent inmates in AGCLH and 40 per cent inmates in ZMLH.

Cent per cent of inmates in the three hostels preferred to eat sweets or fried items in between meals.

Table 14 revealed the preference of inmates for cooking methods and type of preparations.

Majority of inmates preferred deep fried foods. Sixty per cent inmates in MCLH and 70 per cent inmates in AGCLH and 50 per cent inmates in ZMLH preferred deep fried foods. Whereas 40 per cent

Table 12. Preference of selected inmates for beverages

Beverages	MCLH		AGCLH		ZMLH	
	No.	Per cent	No.	Per cent	No.	Per cent
Tea	7	70	8	80	5	50
Coffee	3	30	2	20	5	50
Total	10	100	10	100	10	100

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Table 13. Nibbling habits of inmates

Particulars	MCLH		AGCLH		ZMLH	
	No.	Per cent	No.	Per cent	No.	Per cent
a. Nibbling habit						
Yes	8	80	8	80	6	60
No	2	20	2	20	4	40
Total	10	100	10	100	10	100
b. Type of foods taken in between meals						
Coffee/Tea	—	—	—	—	—	—
Sweet or fried items	10	100	10	100	10	100
Total	10	100	10	100	10	100

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Table 14. Preference of inmates for cooking methods and type of preparation

Particulars	M.C.L.H.		A.G.C.L.H.		Z.M.L.H.	
	No.	Per cent	No.	Per cent	No.	Per cent
a. Cooking methods						
1. Deep fried foods	6	60	7	70	5	50
2. Shallow fried foods	—	—	1	10	1	10
3. Steaming	4	40	2	20	2	20
4. Boiling	—	—	—	—	2	20
Total	10	100	10	100	10	100
b. Type of preparation						
1. Sweet preparation	7	70	8	80	6	60
2. All types	3	30	2	20	4	40
Total	10	100	10	100	10	100

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inmates in MCLH, 20 per cent inmates in AGCLH and 20 per cent inmates in ZMLH preferred steamed foods and 10 per cent inmates in AGCLH and 10 per cent inmates in ZMLH preferred shallow fried foods. However 20 per cent inmates in ZMLH preferred boiled foods.

Majority of inmates liked sweet preparations. Seventy per cent inmates in MCLH, 80 per cent inmates in AGCLH and 60 per cent inmates in ZMLH preferred sweet preparations. While 30 per cent inmates in MCLH, 20 per cent inmates in AGCLH and 40 per cent inmates in ZMLH preferred all types of preparations.

Table 15 highlighted the various food combinations of inmates in the three hostels. Cereal preparations such as *dosa*, *idiyappam*, *idli*, *chappathy* and *uppuma* along with vegetable curry and tea were the commonly used items for breakfast among cent per cent of inmates in the three hostel. Cereal with fish and vegetable was found to be the commonly consumed item for lunch. Thirty per cent inmates in two hostels such as MCLH and AGCLH and 50 per cent inmates in ZMLH consumed cereals with fish and vegetable combination for lunch. Cereals with meat, curd and vegetable were consumed by 50 per cent inmates in MCLH, 60 per cent inmates in AGCLH and 40 per cent inmates in ZMLH for lunch. Cereal and fish preparation for lunch was consumed by 20 per cent inmates in MCLH.

Tea with roots and tubers were found to be consumed for the evening tea by 20 per cent inmates in MCLH, 10 per cent inmates in

Table 15. Preference of inmates for various food combinations

	Breakfast				Lunch				Evening Tea				Dinner			
	MCLH	AGCLH	ZMLH	TOTAL	MCLH	AGCLH	ZMLH	TOTAL	MCLH	AGCLH	ZMLH	TOTAL	MCLH	AGCLH	ZMLH	TOTAL
Black coffee + cereals	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tea + cereals	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cereal + fish	-	-	-	-	20 (2)	10 (1)	10 (1)	4	-	-	-	-	-	-	-	-
Cereal + veg	100 (10)	100 (10)	100 (10)	30	-	-	-	-	-	-	-	-	-	-	-	-
Cereal + fish + veg	-	-	-	-	30 (3)	30 (3)	50 (5)	11	-	-	-	-	50 (5)	80 (8)	60 (6)	19
Tea + root + tuber	-	-	-	-	-	-	-	-	20 (2)	10 (1)	20 (2)	5	-	-	-	-
Tea + tuber	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tea + banana	-	-	-	-	-	-	-	-	80 (8)	90 (9)	80 (8)	25	-	-	-	-
Kanji + chutney	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cereals + meat + cereal + veg	-	-	-	-	50 (5)	60 (6)	40 (4)	15	-	-	-	-	50 (5)	20 (2)	40 (4)	11

Numbers in parenthesis indicate inmates
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AGCLH and 20 per cent inmates in ZMLH, while 80 per cent inmates in MCLH, 90 per cent inmates in AGCLH and 80 per cent inmates in ZMLH consumed tea along with banana fry during evening tea.

Cereals with fish and vegetable combinations were used for dinner by 50 per cent inmates in MCLH, 80 per cent inmates in AGCLH and 60 per cent inmates in ZMLH. At the same time cereal with meat, curd, and vegetable combinations were preferred by 50 per cent inmates in MCLH, 20 per cent inmates in AGCLH and 40 per cent inmates in ZMLH during dinner.

Frequency use of various foods among the inmates

Frequency use of various food items among the inmates in the hostels were assessed using a point preference rating scale and the details are presented in Table 16.

The major food articles included in the daily dietaries of the inmates were cereals, roots and tubers, milk, fats and oils, sugar and jaggery and spices. Cent per cent inmates in MCLH included cereals, fats and oils, sugar and jaggery and spices in their diets. While cent per cent inmates in AGCLH included cereals, roots and tubers, fats and oils, sugar and jaggery and spices in their diets. However cent per cent inmates in ZMLH included cereals, milk, fats and oils, sugar and jaggery and spices in their diets.

Table 16. Frequency use of various foods among the inmates

Food items	Daily						Thrice in a week						Twice in a week							
	MCLH		AGCLH		ZMLH		MCLH		AGCLH		ZMLH		MCLH		AGCLH		ZMLH			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
Cereals	10	100	10	100	10	100	—	—	—	—	—	—	—	—	—	—	—	—	—	
Pulses	2	20	2	20	1	10	4	40	3	30	2	20	4	40	3	30	4	40	4	40
Vegetables	3	30	4	40	2	20	4	40	6	60	3	30	—	—	3	30	—	—	—	—
Roots and tubers	5	50	10	100	4	40	5	50	—	—	6	60	—	—	—	—	—	—	—	—
Fruits	—	—	—	—	—	—	2	20	3	30	2	20	—	—	—	—	—	—	—	—
Milk	4	40	3	30	10	100	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Fish	—	—	—	—	—	—	60	60	10	100	4	40	—	—	—	—	—	—	—	—
Fats and oils	10	100	10	100	10	100	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sugar and jaggery	10	100	10	100	10	100	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Spices	10	100	10	100	10	100	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Contd...

Table 16. (Contd....)

Food items	Once in a week						Occasionally						Never						
	MCLH		AGCLH		ZMLH		MCLH		AGCLH		ZMLH		MCLH		AGCLH		ZMLH		
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Pulses	—	—	2	20	3	30	—	—	—	—	—	—	—	—	—	—	—	—	—
Green leafy vegetables	10	100	10	100	10	100	—	—	—	—	—	—	—	—	—	—	—	—	—
Fruits	4	40	3	30	4	40	4	40	4	40	3	30	—	—	—	—	—	—	—
Milk	—	—	—	—	—	—	6	60	7	70	—	—	—	—	—	—	—	—	—
Fish	4	40	—	—	6	60	—	—	—	—	—	—	—	—	—	—	—	—	—
Meat	10	100	10	100	10	100	—	—	—	—	—	—	—	—	—	—	—	—	—
Egg	5	50	10	100	5	50	5	50	—	—	5	50	—	—	—	—	—	—	—

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 AGCLH - Agriculture College Ladies Hostel
 ZMLH - Zenana Mission Ladies Hostel

Pulses were found to be used thrice in a week by 40 per cent inmates in MCLH, 30 per cent inmates in AGCLH and 20 per cent inmates in ZMLH. Forty per cent inmates in MCLH, 60 per cent inmates in AGCLH and 50 per cent inmates in ZMLH included vegetables thrice in a week in their diets. Consumption of roots and tubers thrice in a week was observed in 50 per cent inmates in MCLH and 60 per cent inmates in ZMLH. Sixty per cent inmates in MCLH, cent per cent inmates in AGCLH and 40 per cent inmates in ZMLH were observed to consume fish thrice in a week in their diets.

Forty per cent inmates in MCLH, 30 per cent inmates in AGCLH and 40 per cent inmates in ZMLH included pulses twice in a week in their diets. Thirty per cent inmates in MCLH and ZMLH consumed vegetables twice in a week.

All the inmates in the three hostels included green leafy vegetables only once in a week in their diets. At the same time meat was used once in a week by the inmates in the three hostels. Egg was consumed once in a week by fifty per cent inmates in MCLH and cent per cent inmates in AGCLH and ZMLH.

It can be seen that, fruits were consumed occasionally by 40 per cent inmates in MCLH and AGCLH. At the same time inmates in ZMLH observed to consume fruits occasionally. Sixty per cent inmates in MCLH and 70 per cent inmates in AGCLH included milk occasionally. While

cent per cent inmates in ZMLH included milk daily in their diets. Fifty per cent inmates in MCLH and AGCLH consumed egg occasionally.

Based on the frequency use of different food groups in the daily dietaries, food use frequency scores were calculated as suggested by Reaburn *et al.* (1979) (Table 17 and Appendix VI).

Maximum scores of food use frequency obtained by the inmates in the three hostels revealed that cereals, green leafy vegetables, roots and tubers, fruits, meat, fats and oils, sugar and jaggery and spices obtained maximum scores when compared with other foods.

Based on the scores obtained by the inmates, the frequency use of food groups were classified into two groups and the details are given in Table 18.

Cereals, pulses, vegetables, roots and tubers fruits, milk, fish, meat, fats and oils, sugar and jaggery and spices were the most frequently used food items by inmates in MCLH. While cereals, pulses, vegetables, green leafy vegetables, roots and tubers, fish, meat, egg, fat and oils, sugar and jaggery and spices were the more frequently used food items by inmates in AGCLH. On the other hand, cereals, pulses, vegetables, greenleafy vegetables, roots and tubers, fruits, milk, meat, fats and oil, sugar and jaggery and spices were the most frequently used food items by the inmates in ZMLH. At the same time fruits and milk were

Table 17. Food use frequency score obtained by the inmates

Food items	Food use frequency scores		
	MCLH	AGCLH	ZMLH
Cereals	100	100	100
Pulses	76	70	62
Vegetables	80	88	78
Green leafy vegetables	100	100	100
Root and tubers	100	100	88
Fruits	56	44	100
Milk	52	44	100
Fish	64	100	56
Meat	100	100	100
Egg	30	100	30
Fats and oils	100	100	100
Sugar and jaggery	100	100	100
Spices	100	100	100

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Table 18. Frequency of use of different food groups among the inmates

Most frequently used foods (scores above 50)			Less frequently used foods (scores below 50)		
MCLH	AGCLH	ZMLH	MCLH	AGCLH	ZMLH
Cereals	Cereals	Cereals	Egg	Fruits	Egg
Pulses	Pulses	Pulses		Milk	
Vegetables	Vegetables	Vegetables			
Green leafy vegetables	Green leafy vegetables	Green leafy vegetables			
Root and tubers	Root and tubers	Root and tubers			
Fruits		Fruits			
Milk		Milk			
Fish	Fish	Fish			
Meat	Meat	Meat			
	Egg				
Fats and oils	Fats and oils	Fats and oils			
Sugar and jaggery	Sugar and jaggery	Sugar and jaggery			
Spices	Spices	Spices			

medium frequently used food among the inmates in AGCLH while egg was the medium frequently used food among the inmates in MCLH and ZMLH.

Actual food intake of selected inmates

Food intake of selected inmates in the three hostels were assessed by three day weighment method. Comparison of the diets were made with the RDA (suggested by ICMR). Average quantity of foods consumed by the inmates obtained from actual food weighment are presented in Table 19 and Fig. 6.

Table 19 revealed that the average intake of cereals, pulses, other vegetables, milk, fish and meat products consumed by inmates in MCLH were found to be higher than the suggested allowances of ICMR. At the same time average intake of green leafy vegetables, fruits, sugar and jaggery, fats and oils were found to be below the RDA. In the case of AGCLH, the cereals, pulses, roots and tubers, fish and meat products were found to be higher than the suggested allowances of ICMR. Whereas green leafy vegetables, fruits, milk, sugar and jaggery, fat and oils were found to be below the requirements. In ZMLH, the intake of pulses, other vegetables, fish, egg and meat were found to be higher than the suggested allowances of ICMR. At the same time, average intake of cereals, green leafy vegetable, fruits, milk, sugar and jaggery and fats and oils were found to be below the RDA.

Table 19. Actual food intake of selected inmates

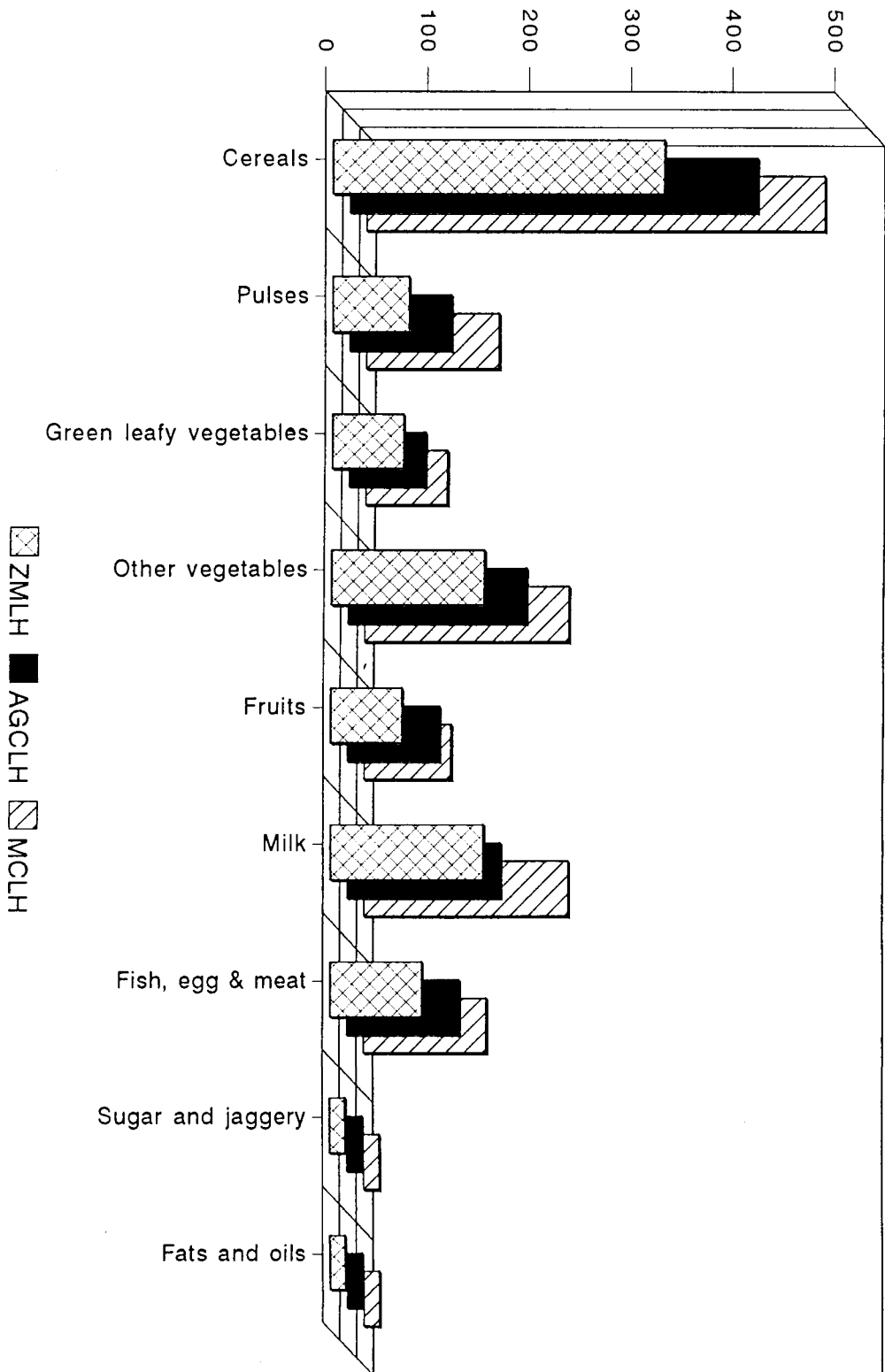
Food stuffs	RDA	MCLH		AGCLH		ZMLH	
		Average amount of food consumed (g)	% of RDA met	Average amount of food consumed (g)	% of RDA met	Average amount of food consumed (g)	% of RDA met
Cereals (g)	350	450	129	400	114	325	107
Pulses (g)	50	130	260	100	200	75	150
Green leafy vegetables (g)	150	80	53	75	50	70	47
Other vegetables(g) (Roots and tubers)	150	200	133	175	116	150	100
Fruits (g)	100	85	85	90	90	70	70
Milk (l)	400	200	50	150	38	150	38
Fish, egg and meat (g)	80	120	150	110	138	90	126
Sugar and jaggery (g)	30	15	50	15	50	15	50
Fats and oils (g)	30	15	50	15	50	15	50

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Fig. 6. Actual food intake of inmates



Nutrient intake of selected inmates

The average nutrient intake of inmates in the three hostels are given in Table 20 and Fig. 6. Calorie and protein intake of inmates in MCLH were 2810 kcal and 103 g respectively. The nutrients such as calcium, vitamin A, thiamine, riboflavin, niacin, and vitamin C were met satisfactorily by the inmates of MCLH whereas iron was comparatively less when compared with RDA.

The percentage of RDA met by the inmates in AGCLH with regard to calorie, protein, calcium, retinol, thiamine, riboflavin, niacin and vitamin C were comparatively higher in comparison with RDA. In the case of iron, it was comparatively less in comparison with RDA.

Nutrient intake such as thiamine, riboflavin, niacin and vitamin C were found to be higher in the three hostels. However in the case of ZMLH calorie and iron requirements were found to be less when compared with RDA.

4.7. Energy intake and energy expenditure pattern of selected inmates

The energy expenditure pattern of selected inmates were worked out using prediction equation based on their work schedule with relevance to age and weight as suggested by ICMR (1989) and are presented in Table 21 and Appendix IV.

Table 20. Nutrient intake of the selected inmates

Nutrients	MCLH			AGCLH			ZMLH		
	Average intake of nutrients	RDA (1989)	% of RDA met	Average intake of nutrients	RDA (1989)	% of RDA met	Average intake of nutrients	RDA (1989)	% of RDA met
Protein (gm)	103	65	158	86.24	65	132	98.2	65	151
Energy (kcal)	2810	2050	137	2324.9	2050	113	1807.1	2050	88.15
Calcium (mg)	764	500	152.8	683.34	50	136.6	484.3	500	96.86
Iron (mg)	36	50	72	43.02	50	86.04	37.95	50	75.9
Retinol (µg)	1238.9	600	206	776.61	600	129.43	693.81	600	115.63
Thiamine (mg)	2.157	1	215.7	1.624	1	162.4	1.45	1	145
Riboflavin (mg)	1.25	1.2	104	2.62	1.2	218	1.60	1.2	133
Niacin (mg)	28.09	14	200	23.98	14	171	26.43	14	188
Vitamin C (mg)	172.7	40	431.7	118.6	40	296.5	131.25	40	328.12

MCLH - Medical College Ladies Hostel

AGCLH - Agriculture College Ladies Hostel

ZMLH - Zenana Mission Ladies Hostel

Table 21. Energy intake and energy expenditure pattern of selected inmates

Sl. No.	Age	MCLH				AGCLH				ZMLH			
		Body wt. in (kg)	Energy intake (kcal)	Energy expenditure (kcal)	Difference (kcal)	Body wt. in (kg)	Energy intake (kcal)	Energy expenditure (kcal)	Difference (kcal)	Body wt. in (kg)	Energy intake (kcal)	Energy expenditure (kcal)	Difference (kcal)
1	18	52	2810	2785	+25	49	2310	2260	+50	40.5	1800	1980	-180
2	18	47	2805	2770	+40	45	2220	2175	+45	49	2132	2005	+127
3	18	60	2870	2776.5	+93	53	2304	2280	+24	53.5	1820	2000	-180
4	18	51	2780	2705	+75	53	2400	2325	+75	56.5	1795	1885	-90
5	18	46	2785	2727	+58	62	2500	2470	+30	41	1615	1895	-280
6	18	51	2800	2875	-75	54	2330	2280	+50	43	1885	2000	-115
7	18	51	2820	2830	-10	49	2230	2280	-50	49	1785	1990	-205
8	18	46	2800	2700.7	+99.3	54	2400	2340	+60	50	1745	1899	-154
9	18	54	2750	2680	+70	43	2320	2240	+80	44.3	1810	2005	-195
10	18	45	2880	2805	+75	44	2250	2175	+75	44	1690	1800	-110
Average			2810	2765.42			2324.9	2282.5			1807.6	1807.7	

MCLH - Medical College Ladies Hostel

AGCLH - Agriculture College Ladies Hostel

ZMLH - Zenana Mission Ladies Hostel

Average energy intake of inmates in MCLH, AGCLH and ZMLH were found to be 2180 kcal, 2324.9 kcal and 1807.6 kcal, respectively. Average energy expenditure of inmates in MCLH, AGCLH and ZMLH were 2765.42 kcal, 2285.5 kcal and 1807.7 kcal respectively. Majority of the inmates in MCLH and AGCLH were thus found to be in energy deficient state. But at the same time the average energy intake and expenditure of the inmates in ZMLH were found to be the same (1807 kcal).

4.8. Nutritional status of selected inmates

The weight for age profile of selected inmates in the hostels and the average weight of the inmates are given in Table 22 and Appendix X, XI, XII. Observed average weight of inmates in the three hostels were compared with National Centre for Health Statistics (NCHS) standard and standard recommended by ICMR (1990). Average weight for age profile of inmates in the age of 18 years was found to be 50.3 kg in MCLH, 50.6 kg in AGCLH and 47.1 kg in ZMLH. Average weight of inmates in the three hostels were found to be lower than NCHS standard.

From the table it was observed that two inmates in MCLH, three inmates in AGCLH and one inmate in ZMLH were having weights above the NCHS standard, at the same time 8 inmates in MCLH, 7 inmates in AGCLH and 9 inmates in ZMLH were found to have weights below the NCHS standard. When compared with ICMR standard, 6 inmates in MCLH, 7 inmates in AGCLH and 5 inmates in ZMLH were found to have

weights above the ICMR standards whereas 4 inmates in MCLH, 3 inmates in AGCLH and 5 inmates in ZMLH were found to have weights below the ICMR standards. On the basis of above findings it can be observed that the observed average weight of inmates in MCLH and AGCLH were found to be higher than ICMR standard. While, average weight of inmates in ZMLH were found to be lower than both International and Indian standards.

Table 22. Weight for age profile of selected inmates

Hostels	Age	Sample size	Observed average wt. (kg)	NCHS standard (kg)	NFI standard (kg)
MCLH	18	10	50.3	54.4	48.7
AGCLH	18	10	50.6	54.4	48.7
ZMLH	18	10	47.1	54.4	48.7

MCLH - Medical College Ladies Hostel
 AGCLH - Agriculture College Ladies Hostel
 ZMLH - Zenana Mission Ladies Hostel
 NFI - Nutritional Foundation of India
 NCHS - National Centre for Health Statistics

The height for age profile of selected inmates in the three hostels are depicted in Table 23 and Appendix X, XI and XII. Observed average height for age of inmates were compared with NCHS standard and Indian standards (NFI). The average height for age profile of inmates in the

three hostels were 156.7 cm (MCLH), 157.35 cm (AGCLH) and 159.1 cm (ZMLH) respectively. The observed average height for age of inmates in the three hostels were found to be below NCHS standard. At the same time observed average height for age of inmates in ZMLH were found to be higher than the NFI standard. While observed average height for age of inmates in MCLH and AGCLH were found to be lower than the NFI standard. Here two inmates each in MCLH and AGCLH and one inmate in ZMLH were found to be above the NCHS standard, at the same time eight inmates each in MCLH, and AGCLH and nine inmates in ZMLH were found to be below the NCHS standards. Four inmates in MCLH, six inmates in AGCLH and seven inmates in ZMLH were found to be above the NFI standard and at the same time six inmates in MCLH, four inmates in AGCLH, and three inmates in ZMLH were found to be below the NFI standard.

Table 23. Height for age profile of selected inmates

Name of hostels	Age	Sample size	Observed average ht. (cm)	NCHS standard (cm)	NFI standard (1989) (cm)
MCLH	18	10	156.7	164	158
AGCLH	18	10	157.35	164	158
ZMLH	18	10	159.1	164	158

MCLH - Medical College Ladies Hostel
 AGCLH - Agriculture College Ladies Hostel
 ZMLH - Zenana Mission Ladies Hostel
 NFI - Nutritional Foundation of India
 NCHS - National Centre for Health Statistics

The ratio between height and weight as reflected in Body Mass Index (BMI) was worked out and details are presented in Table 24 and Appendix X, XI and XII.

Table 24. Body mass index of selected inmates

	MCLH		AGCLH		ZMLH	
	No.	%	No.	%	No.	%
Normal	8	80	8	80	5	50
Below normal	2	20	2	20	5	50
Above normal	—	—	—	—	—	—

Normal value of BMI (18.5 - <25.0)
(Adolescent girls)

MCLH - Medical College Ladies Hostel
AGCLH - Agriculture College Ladies Hostel
ZMLH - Zenana Mission Ladies Hostel

From the above table it was observed that 20 per cent inmates in MCLH, 20 per cent inmates in AGCLH and 50 per cent inmates in ZMLH were below the normal value of BMI. However 80 per cent inmates in MCLH, 80 per cent inmates in AGCLH and 50 per cent inmates in ZMLH were having BMI in the normal range. None of the inmates were found to be above normal or obese.

The Waist / Hip Ratio (WHR) of selected inmates in the three hostels are presented in Table 25. WHR of inmates in MCLH were found

to be between 0.70 to 0.81 cm. Whereas in the case of inmates in AGCLH, WHR was found to be between 0.82 to 0.93 cm. While inmates in ZMLH were found to be between 0.68 to 0.75 cm. WHR of inmates were compared with normal range, and found that all the inmates in AGCLH had a ratio above the normal. At the same time inmates in other two hostels such as ZMLH and MCLH were found to have a ratio below the normal.

Table 25. Waist / Hip ratio of selected inmates

Sl. No.	MCLH (cm)	AGCLH (cm)	ZMLH (cm)
1	0.70	0.93	0.68
2	0.69	0.85	0.73
3	0.75	0.82	0.68
4	0.72	0.88	0.75
5	0.71	0.91	0.73
6	0.71	0.83	0.72
7	0.81	0.89	0.75
8	0.76	0.85	0.72
9	0.70	0.89	0.68
10	0.76	0.87	0.71

Normal range of waist / Hip ratio = 0.8 cm

MCLH - Medical College Ladies Hostel

AGCLH - Agriculture College Ladies Hostel

ZMLH - Zenana Mission Ladies Hostel

The Mid Upper Arm Circumference (MUAC) and Triceps Skin Fold Thickness (TST) of selected inmates in the three hostels were assessed and details are given in Table 26.

Table 26. MUAC and TST of selected inmates

Sl. No.	MCLH		AGCLH		ZMLH	
	MUAC (cm)	TST (mm)	MUAC (cm)	TST (mm)	MUAC (cm)	TST (mm)
1	20	17	20	19	20	17
2	23	22	23	22	25	21
3	28	20	26	20	23	18
4	24	19	26	20	25.5	20
5	21.5	16	26	20	21.5	19
6	25	21	26	21	24	20
7	27	20	23	19	23	22
8	24	20	26	20	23	20
9	23	20	19	16	21.2	17
10	25.5	21	24	18	21	17

Normal range of MUAC - 23.3 cm

Normal range of triceps skinfold thickness - 17.9 mm

MCLH - Medical College Ladies Hostel

AGCLH - Agriculture College Ladies Hostel

ZMLH - Zenana Mission Ladies Hostel

Mid upper arm circumference of inmates in the three hostels were found to be between 19 to 28 cm and TST between 16 to 22mm. Six inmates each in MCLH, and AGCLH and three inmates in ZMLH were found to have the mid upper arm circumference value above the normal. In the case of triceps skin fold thickness, eight inmates in MCLH, nine inmates in AGCLH and seven inmates in ZMLH were found to have normal value.

Results of clinical examination carried out among the inmates are presented in Table 27.

Table 27. Clinical status of the selected inmates

Deficiencies	MCLH		AGCLH		ZMLH	
	No.	%	No.	%	No.	%
Anaemia	5	50	4	40	5	50
Dental caries	4	40	6	60	8	80
Thyroid enlargement	2	20	4	4	3	30

MCLH - Medical College Ladies Hostel
 AGCLH - Agriculture College Ladies Hostel
 ZMLH - Zenana Mission Ladies Hostel

Common deficiency diseases observed among the inmates were anaemia (50 per cent inmates in MCLH, 40 per cent inmates in AGCLH and 50 per cent inmates in ZMLH). Non-nutritional manifestation such as dental caries was observed in 40 per cent in MCLH, 60 per cent in AGCLH and 80 per cent in ZMLH. Thyroid enlargement was observed in

20 per cent inmates in MCLH, 40 per cent inmates in AGCLH and 30 per cent inmates in ZMLH.

Haemoglobin estimation of the selected inmates was conducted by the cyanmethaemoglobin method and the procedure used is given in Appendix XIII and the values are depicted in Table 28 and Appendix X, XI, XII and Fig. 7.

Table 28. Haemoglobin levels of selected inmates

Observed haemoglobin range (g/ml)	MCLH		AGCLH		ZMLH	
	No.	%	No.	%	No.	%
8 to 10	3	30	4	40	3	30
10 to 11	2	20	1	10	3	30
above 11	5	50	5	50	4	40
Total	10	100	10	100	10	100

Normal range 14 ± 2.5 (female)

MCLH - Medical College Ladies Hostel
 AGCLH - Agriculture College Ladies Hostel
 ZMLH - Zenana Mission Ladies Hostel

Fifty per cent inmates both in MCLH and AGCLH and 40 per cent inmates in ZMLH had normal haemoglobin values while 20 per cent inmates in MCLH, 10 per cent inmates in AGCLH and 30 per cent inmates in ZMLH had haemoglobin values between 10.1-11.9 g/ml. Haemoglobin levels between 8-10 g/ml were located in 30 per cent inmates in MCLH, 40 per cent inmates in AGCLH and 30 per cent inmates in ZMLH.

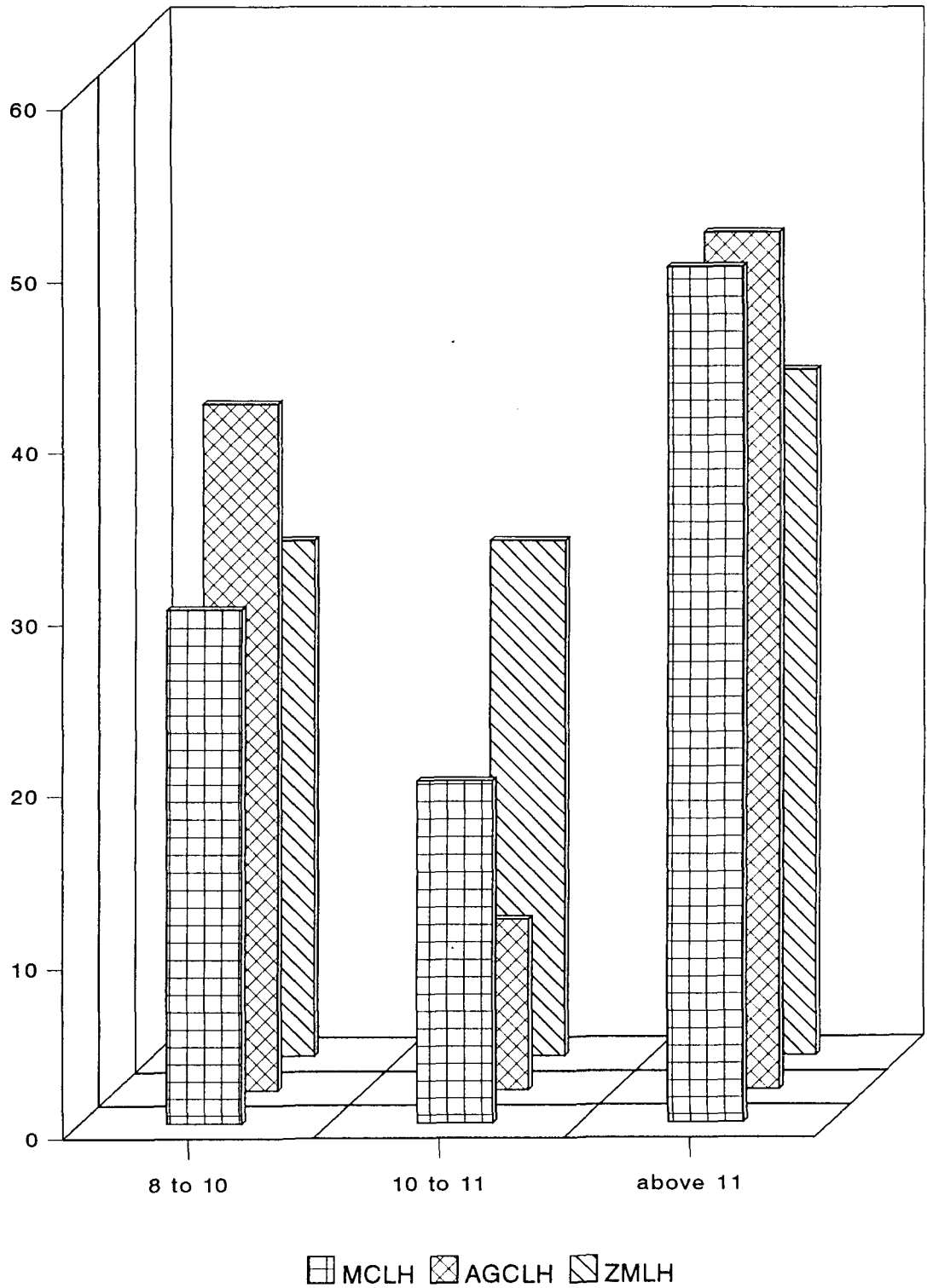


Fig. 7. Haemoglobin levels of selected inmates

4.9. Association between adequacy of diets and health profile of inmates

The association between nutritional adequacy of diets and health profile of inmates (Appendix XIV) revealed a significant positive correlation between haemoglobin and weight ($r = 0.4300^*$) and haemoglobin and height ($r = 0.3722^*$). Highly positive correlation was found between BMI and body weight ($r = 0.7927^{**}$) and negative correlation between BMI and height ($r = -0.4616^*$). Results indicated a highly positive and correlation between midupper arm circumference and weight ($r = 0.6317^{**}$) and a highly positive and correlation between midupper arm circumference and BMI ($r = 0.6592^{**}$). Highly positive significant correlation was found between TST and weight ($r = 0.7036^{**}$), TST and BMI ($r = 0.6818^{**}$) and TST and MUAC ($r = 0.7699^{**}$). In the present study a positive and significant correlation was found between WHR and TST ($r = 0.3668^*$).

A positive correlation was also found between calorie and BMI ($r = 0.4015^*$) and calorie and MUAC ($r = 0.3346^*$). A negative but highly significant correlation was found between protein and WHR ($r = -0.6796^{**}$). Association between β carotene and other nutrients such as calorie and protein indicated a highly positive and significant correlation ($r = 0.8989^{**}$). A highly positive and significant correlation was also found between β carotene and protein ($r = 0.5486^{**}$) and between iron and WHR ($r = 0.4501^*$).

4.10. Nutritional status index of the selected inmates

Nutritional status index of the inmates was worked out by using anthropometric data such as height, weight, MUAC, WHR, BMI, TST, haemoglobin and major nutrients such as calorie, protein, β carotene and iron. The index worked out for the selected inmates in the three hostels are presented in Table 29 and Fig. 8.

Table 29. Nutritional status index of selected inmates

Sl. No.	MCLH	AGCLH	ZMLH
1.	138.34	177.54	134.39
2.	136.26	162.03	142.15
3.	148.77	160.77	136.34
4.	142.53	169.68	146.58
5.	138.69	177.03	143.64
6.	139.38	162.04	140.77
7.	157.45	169.39	147.88
8.	150.11	166.30	143.54
9.	140.85	168.30	135.71
10.	149.74	165.35	139.58
Average	144.22	167.85	141.06

MCLH - Medical College Ladies Hostel

AGCLH - Agriculture College Ladies Hostel

ZMLH - Zenana Mission Ladies Hostel

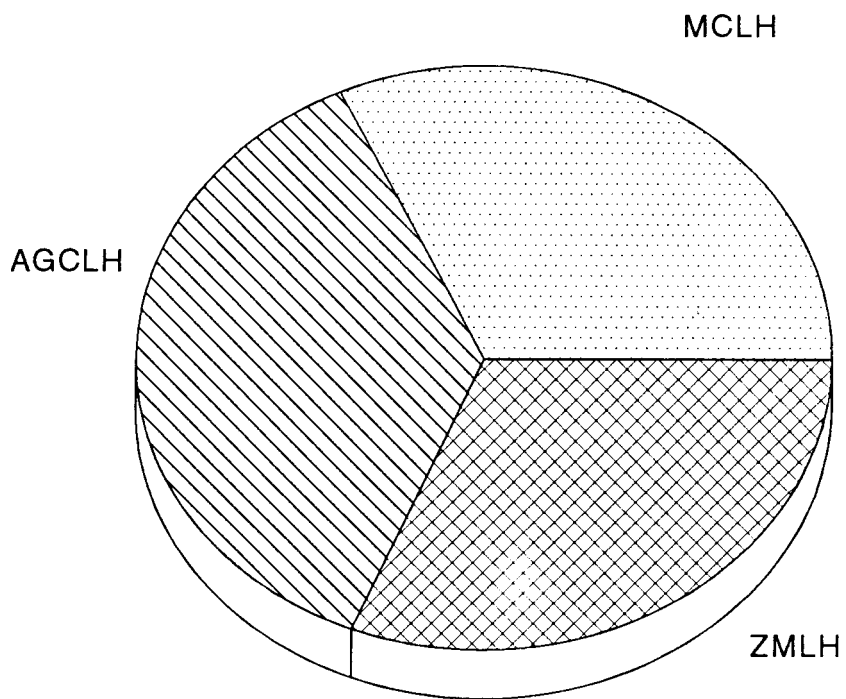
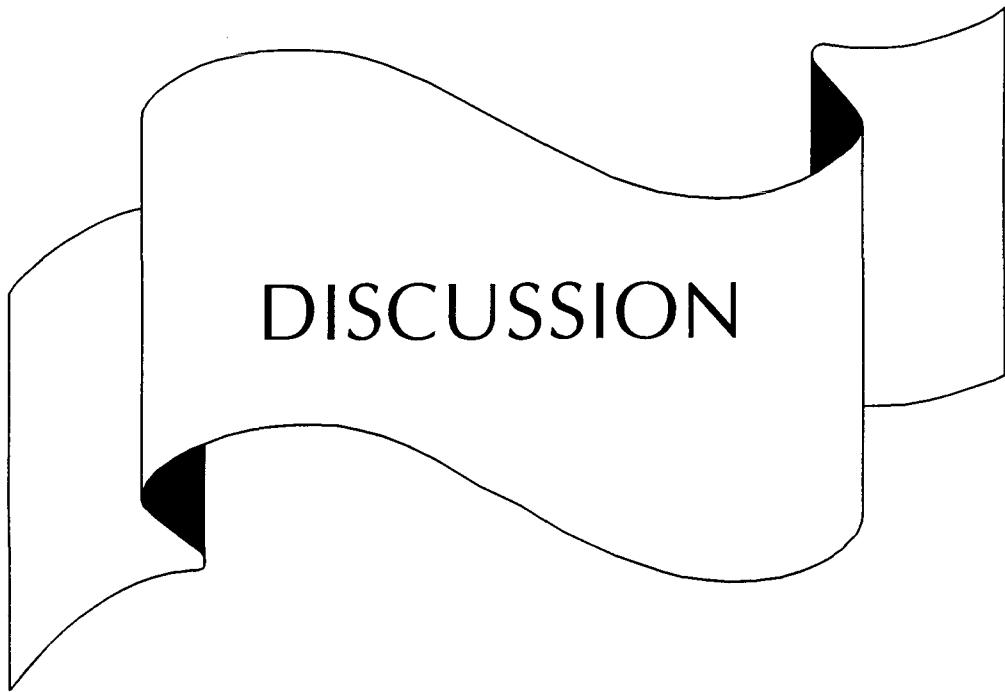


Fig. 8. Nutritional status index of selected inmates

From the above table it was obvious that nutritional status of inmates in AGCLH was significantly higher followed by inmates in MCLH and ZMLH. The average nutritional status index of AGCLH, MCLH and ZMLH were found to be 167.85, 144.22 and 141.06 respectively. The study revealed that the hostel run by inmates (AGCLH) was found to be nutritionally superior when compared with hostels run by Government (MCLH) or Private organization (ZMLH).



DISCUSSION

DISCUSSION

5.1. Food expenditure pattern of inmates

The expenditure pattern of various food items varied in the three hostels. The average expenditure of the various food items were assessed and it was found that Medical College Ladies Hostel (MCLH) had spent maximum money for purchasing the food materials than the other two hostels, especially cereals, pulses, other vegetables, green leafy vegetables, fruits, milk and milk product, meat, poultry and fish. Inmates of Agriculture College Ladies Hostel (AGCLH) had spent more money for food materials like sugar, jaggery, fat and oils, bakery foods and other miscellaneous items.

5.2. Food preference of inmates

Food preference of the inmates indicated that inmates in the three hostels liked cereals such as rice and wheat but majority disliked ragi. Studies of Gopalan (1979) on dietary pattern of adolescents revealed that their diet included 75 per cent of the cereal requirement. Result of the present study also agrees with those findings. Bengal gram, peas, redgram, greengram, and horse gram were found to be the preferred pulses among the inmates surveyed. Among these, bengal gram and green gram were

found to be the highly preferred pulses. Pulses were deficient in the diets of adolescents and the diets of female groups were more deficient in this respect. This type of deficient intake has been reported by Rao *et al.* (1976), Pushpamma *et al.* (1982) and in the surveys conducted by National Nutrition Monitoring Bureau (NNMB) (1989).

The highly preferred vegetables among inmates in the three hostels were found to be ladies finger, cucumber, brinjal and pumpkin. Other vegetables such as snake gourd, plantain, beans, papaya, ashgourd, bittergourd, ivy gourd, bread fruit, plantain stem and plantain flower were found to be less preferred compared to above foods. Gnweeki *et al.* (1981) found that raw vegetables, salad items, especially tomato and carrot were popular among adolescents. Desserts were also found to be highly appreciated. The present study revealed that vegetables like ladies finger, cucumber, brinjal and pumpkin were highly preferred by the inmates of the three hostels.

With regard to green leafy vegetables, amaranthus and drumstick leaves were highly preferred by the inmates in the three hostels. Cabbage, coriander and curry leaves were found to be less preferred. Usha (1985) also supported this view that consumption of green leafy vegetable was rare in the hostel diets.

It was observed that roots and tubers were found to be liked by inmates in the three hostels. Majority of the inmates recorded their

likeness to root and tubers such as tapioca, potato, yam, colacasia, carrot, beetroot, sweet potato, big onion and small onion.

The highly preferred fruits among the inmates were mango, guava, orange, pineapple, roseapple, star gooseberry and water melon. Not much difference was noticed in the preference of fruits among the inmates in the three hostels. The reason for the highest preference for the above fruits may be due to the fact that these fruits are available in plenty during seasons in our State. Fruits like banana, tomato, gooseberry, jackfruit, apple, papaya, sapota, ayani, plum and anona were found to be less preferred. Krishna kumari (1983) found that the intake of fruits by the adolescents were negligible. But in the present study majority of inmates in the three hostels were found to be consumed higher amounts of fruits.

With regard to milk and milk products, cow's milk was highly preferred when compared to goat's and buffalo milk. Majority of them recorded their likeness for milk products such as curd, butter milk and butter. Both hen's egg and duck's egg were liked by most of the inmates in the three hostels. Fish was also highly preferred by majority of the inmates in the three hostels. The most preferred meat among the inmates in the hostels were found to be beef followed by chicken and mutton. Sato *et al.* (1984) reported that adolescent preferred meat. According to Gopalan (1974) fish is the most abundant food in Kerala and serves as a major source of nutrients along with cereals, roots and tubers. The

present study revealed that animal products like milk, meat, egg and fish were highly preferred by the inmates in the three hostels.

NNMB (1989) reported that Kerala diets are found to be deficient in fats and oils. But it was observed that nuts and oil seeds such as coconut and cashew were highly preferred by inmates in the three hostels.

Inmates preferred sweet preparations, such as *jilebi*, *icecream*, *five star*, *perk*, *fruit salad*, *cake* and fried items such as *banana chips*, *potato chips*, *jack chips*, *puffs*, *vada* and *banana fry*. Robson *et al.* (1991) studied the snacking habits of 1015 randomly selected adolescents and found that majority of them preferred sweet preparations such as *cake*, *puddings* and *biscuits*.

The food preference score revealed that highly preferred foods with a score above 78.83 per cent were sweet preparations, animal products and nuts and oil seeds. Medium preferred foods with scores between 61.83 and 78.83 per cent were fruits, sweet preparations and pulses and low preferred food with scores below 61.83 per cent were vegetables, roots and tubers and cereals.

5.3. Percapita availability of foods

A diet survey conducted by Krishnakumari (1983) had reported that food stuffs available per person per day was calculated by dividing the total amount of food stuffs by the number of people for each day.

Similar study was conducted by Bhatnagar (1992). In the present study percapita availability of foods in the three hostels were computed and it was found that per capita of cereals, pulses, green leafy vegetables, roots and tubers, milk, sugar and jaggery and fats and oils were higher in MCLH when compared to other two hostels. At the same time percapita of fruit was higher in AGCLH.

5.4. Percapita availability of nutrients

The percapita availability of nutrients among inmates in the hostels revealed that percapita availability of protein, energy, calcium, retinol, thiamine, niacin and vitamin C were found to be higher in MCLH when compared with other two hostels. Nirmala *et al.* (1968) revealed that diets consumed by the College students were inadequate in calories, proteins, vitamins and minerals. They failed to meet the accepted standards of nutritional requirements as proposed by the Nutritional Advisory Committee of India. Percapita availability of iron and riboflavin were found to be higher in AGCLH. However average iron intake was found to be less when compared with Recommended Dietary Allowances (R.D.A.) among the inmates in the three hostels. In a study of 110 Scandinavian teenage girls by Elsberg and Rusenquiste (1979), the intake of iron ranged from 6 to 28 mg daily, mean intake being 14.9 mg/day. Only 17 per cent of the girls surveyed had an iron intake above R.D.A., where as it was less than 10 mg in 10 per cent of the girls surveyed. McNutt and McNutt (1978) reported low intake of green leafy vegetables among the

adolescents, contributed to the low amount of retinol in the diet. But in the present study the vitamin A intake was higher than that of R.D.A.

5.5. Personal characteristics of the selected inmates

Place (1980) stated that the adolescent stage of life is the period of identifying oneself as a total person. Personal characteristics of the inmates in the selected hostels such as reading habits, exposure to mass media and their social participation were observed. Manoff (1973) pointed out that mass media had an influence in modifying the adolescent's food beliefs, food attitudes and eating pattern.

It was observed that inmates in AGCLH were more interested in listening to radio than the inmates of other two hostels. Forty per cent inmates in AGCLH were listening to radio daily. At the same time 20 per cent inmates in MCLH and 10 per cent inmates in Zenana Mission Ladies Hostel (ZMLH) were also listening to radio daily. Hence it can be concluded that majority of the inmates (70 per cent in MCLH and 50 per cent inmates in AGCLH and 70 per cent inmates in ZMLH) did not like to listen radio programmes.

Furhan and Gunter (1989) reported that majority of the adolescents residing in the hostels were having the habits of watching television programme daily. Sixty per cent inmates in AGCLH were found to be the daily viewer of the television programme. However 30 per cent inmates in each of the other two hostels were found to be the daily viewer

of the television programme. Compared to the viewing of TV, listening to the radio programme were more popular among the studied inmates. At the same time 50 per cent inmates in MCLH, 20 per cent inmates in AGCLH and 40 per cent inmates in ZMLH were not in the habit of viewing television programme.

It was observed that cent per cent inmates in MCLH and AGCLH were more interested in reading newspaper than the inmates in ZMLH. At the same time 50 per cent inmates in MCLH, 60 per cent inmates in AGCLH and 40 per cent inmates in ZMLH were in the habit of reading weeklies and magazines daily. However 30 per cent inmates in MCLH and 40 per cent inmates in ZMLH were not in the habit of reading weeklies and magazines. Hence it was observed that inmates in AGCLH were more interested in reading newspaper and magazines than inmates in other two hostels.

Mohan and Rees (1984) viewed that adolescents in general were found to be active and are found to engage themselves in various activities. In the present study 60 per cent inmates in AGCLH were interested in sports and games activities than inmates in other two hostels. At the same time 50 per cent inmates in ZMLH and 20 per cent inmates in MCLH enjoyed sleeping. However equal per cent of inmates in each hostels were interested in gossiping with their friends. This was supported by Shingi *et al.* (1980). They had reported that popular activity among adolescent is gossips apart from games and sports. In the present study

majority of inmates in the three hostels were interested in sports and games.

Participation of inmates in various organization indicated that 70 per cent inmates in ZMLH participated in the activities of various organizations. However 40 per cent inmates in AGCLH also participated in different activities such as youth club, camera club and forestry club. Approximately half of the inmates in MCLH were found to participate in youth club. It was found that majority of inmates in AGCLH participated in college union and half of the inmates of MCLH participated in youth clubs. At the same time majority of inmates in ZMLH were not found to participate in the activities of various organizations.

5.6. Dietary habits of the selected inmates

Majority of the inmates in AGCLH and MCLH preferred Tea. Prattala (1988) reported that girls used less coffee and soft drinks than boys.

It was revealed that majority of the inmates in the three hostels were found to be in the habit of eating in between meals. Wilson *et al.* (1971) and Rao (1985) were of the opinion that teenage period is the time when they exercise full authority in matter of what they will and will not eat. Bellisle *et al.* (1997) suggested that increasing eating frequency is associated with improved body weight control and reduced likelihood of over eating and fat deposition. Kardjati *et al.* (1983) found

that female adolescents were found to consume the same type of food irrespective of their physiological state. Eating in between meals is a common dietary habits possessed by adolescents.

In the present study cent per cent inmates in three hostels preferred to eat sweet or fried items in between meals. Poppit *et al.* (1995) reported the tendency to eat snack foods in between meals. Mohan and Rees (1984) observed that adolescent's food habits are reflective of many and diverse influence such as the family, peers and their own physico - social development.

Assessing the preference of inmates for different cooking methods indicated that deep frying was the most favourite method of cooking among inmates. This finding coincides with the study reported by Ghuweki and Pazola (1981) and Sato *et al.* (1984). With regard to the type of preparation, it was observed that sweet preparation scored the highest. Similar finding was also reported by Tourilla and Kuttanen (1985).

The type of various preparation consumed by the inmates for the main meals revealed that *dosa, idiyappam, idli, chappathy* and *uppuma* along with vegetable curry and tea were commonly used items for breakfast, for majority of inmates. In the case of lunch, majority of inmates (50 per cent inmates in MCLH, 60 per cent inmates in AGCLH and 40 per cent inmates in ZMLH) were found to have a combination of

cereals, meat, curd and vegetables. According to Eggert (1984) food preference are formed as a result of the complex interactions of many factors in an individual environment. These preference play a critical role in influencing food choices and consumption.

Bull (1988) stated that adolescent's food preference and food selection were influenced by social or external pressure. In the case of the evening tea, majority of the inmates in MCLH, AGCLH and ZMLH consumed tea along with banana fry. Survey conducted by Pearce *et al.* (1987) reported that 15 per cent of adolescent girls eat snacks for fun while 14 per cent eat snacks out of control. Cereals-fish-vegetable combination was consumed for dinner by majority of the inmates in the three hostels. Preference of various food combination revealed that taste and nutritive value were the major criteria followed by the inmates for recording their food preference. Inmates from AGCLH gave more weightage to taste whereas inmates in MCLH gave weightage to nutritive value of food.

Frequency use of various foods among the inmates

Frequency use of various food items indicated that rice was used as a staple among all the inmates surveyed. Next to cereal, roots and tubers and milk were included in the daily diets of inmates (roots and tubers cent per cent in AGCLH and milk cent per cent in ZMLH). Other food items like pulses, other vegetables, green leafy vegetables, fruits,

fish, meat, egg etc. were included twice in a week or once in a week. Fats and oils, sugar and jaggery and spices were included daily in the dietaries, as these items were needed in small quantities for various preparations. Devadas (1970) stated that the intake of green leafy vegetables, roots and tubers and other vegetables by the adolescents were reported to be low when compared with other food items. Anuradha (1981) had concluded from her study that in the age group of 16 to 18 years, intake of pulses and leafy vegetables were grossly deficient. Adolescent girls were consuming less amount of pulses, vegetables, roots and tubers, fruits and flesh foods. Similar findings were observed by Prameela (1991). Green leafy vegetables, meat, fruit and egg were found to be used less frequently in the diets of the inmates surveyed. Comparison of the frequency use of various foods among the inmates in the hostel revealed that use of pulses, roots and tubers were found to be comparatively more among the inmates as against vegetables, fish and egg etc. Bozza *et al.* (1980) studied the food use frequency of school children in the age group of 10 to 16 years old and found that the intake of foods having nutritional value such as egg, fish, fruits and vegetables were below the optimum and they also reported that there were differences between the sexes in food habits. Krishnakumari (1983) reported that the intake of fruits and greens by the adolescents were negligible. The present study revealed that frequency use of various foods like pulses, roots and tubers among the inmates in the three hostels were comparatively more than that of any other foods.

Actual food intake of selected inmates

Actual food intake of inmates in MCLH revealed that the average intake of cereals, pulses, other vegetables, milk, fish, meat were found to be higher than the suggested allowances of Indian Council of Medicinal Research (ICMR) whereas average intake of green leafy vegetables, fruits, sugar and jaggery, fats and oils were found to be below the Recommended Dietary Allowances (R.D.A.). Actual food intake of inmates in AGCLH found that cereals, pulses, other vegetables, fish and meat products were higher than the suggested allowances of ICMR. Whereas green leafy vegetables, fruits, milk, sugar and jaggery, fats and oils were found to be below the requirements. Average food intake of inmates in ZMLH revealed that pulses, other vegetables, fish, egg and meat were higher than the suggested allowances of ICMR. But average intake of cereals, green leafy vegetables, fruits, milk, sugar and jaggery, fats and oil were found to be below the R.D.A. It was found that adolescent girls were consuming less amount of pulses, vegetables, roots and tubers, fruits and flesh foods. Similar findings were reported by Prameela (1991). Srinivasan *et al.* (1991) reported that the cereals in sufficient quantity were consumed by adolescent females of 16 to 18 years. An appraisal of the diets of the adolescents in general had revealed that expensive foods like milk, fats and oils, pulses and other vegetables had not found a place in their daily diets. These findings were similar to those reported in the surveys conducted by N.N.M.B (1982). The salient observation of these studies showed that girls were being fed with inferior quality food, a clear

indication of gender discrimination. Comparison of actual food intake of inmates in the three hostels revealed that majority of food items were higher than the R.D.A. However the intake of cereals were below the R.D.A. among the inmates in ZMLH.

Nutrient intake of selected inmates

Average nutrient intake of inmates in the three hostels were calculated and observed that the intake was higher than the suggested R.D.A. But in the case of iron, it was below the requirement when compared with R.D.A. The requirement for iron increases during adolescence for girls by approximately or exceeding that of adult life due to rapid growth and menstrual losses (Krause, 1964); Bogert, 1964 and Cooper *et al.*, 1963). But in the present study the average intake of iron was less among the inmates in the three hostels.

Pushpamma *et al.* (1982) proved that nutrients like fat, iron and vitamin C were inadequate in the diets of girls and the percentage deficiency of all nutrients except riboflavin and energy was more significant among girls than boys. Results of seven day dietary survey conducted by Hampton *et al.* (1967) in California among small group of teenage girls had revealed that mean nutrients intake were below 2/3 of R.D.A. and the most neglected nutrients were calcium and iron particularly for the girls. Studies carried out by Krishnamachari *et al.* (1974) in Andhra Pradesh revealed that the prevalence of nutritional deficiency was

higher among girls of 15 to 19 years and anaemia was observed in 59.9 per cent of the girls.

5.7. Energy intake and energy expenditure pattern of selected inmates

According to Beaton *et al.* (1990) body weight is influenced by both energy intake and energy expenditure. Majority of the inmates in MCLH and AGCLH spent less energy when compared with energy intake. But at the same time, the average intake and expenditure of the inmates in ZMLH were found to be the same. According to Nair and Poehlman (1991) energy balance is determined by energy intake and energy expenditure. Durnin (1990) also stated that satisfactory energy balance is not attainable if the energy intake is low. In the present study inmates in MCLH had spent more energy than inmates in AGCLH and ZMLH.

5.8. Nutritional status of selected inmates

Nutritional anthropometry is measurement of human body at various ages and levels of nutritional status. According to Beaton *et al.* (1990) anthropometry is useful because it provides strong and feasible predictors, at individual levels of subsequent ill health, functional impairment and or mortality. Body weight is the most widely used and simplest reproducible anthropometric measurement for the evaluation of nutritional status. It indicates the body mass and is a composite of all

body constituents like water, minerals, fat, protein, bone etc. Weight for age profile of the inmates revealed that average weight for age of the inmates were below the NCHS standard. However average weight for age of the inmates in MCLH and AGCLH were higher than the Indian Standards (NFI). It can be seen that inmates in ZMLH were found to be lower in both standards. Deficit in body weight was reported among the rural and urban adolescents of low socio-economic status by NIN (1990). Pant and Solanki (1989) reported that the mean height and weight of adolescents were far below the NCHS standards. Kramer (1987) observed that adolescence is an important time for gain in weight as well as height. Both muscle and fat increases during adolescent period gaining relatively more fat in girls and relatively more muscle in boys.

The height of an individual is influenced by genetic (hereditary) and environmental factors. The maximum growth potential of an individual is decided by hereditary factors, while the environmental factors, the most important being nutrition and morbidity, determine the extent of exploitation of that genetic potential. Inadequate dietary intake and / or infections reduce nutrient availability at cellular level resulting in growth retardation.

Height for age profile of the inmates indicated that the average height for age of inmates were far below the NCHS standard. But in the case of Indian Standards (NFI), majority of inmates in two hostels such as MCLH and AGCLH were below the standard. While in the case of inmates in ZMLH were found to have higher height when compared with

NFI standard. Vijayaraghavan *et al.* (1971) reported that well to do Indian children were found to be taller and heavier than the children belonging to lower income group of corresponding ages. Certain factors like social and environmental strains and nutritional status of the family, educational status of the family are depending on the health profile of the adolescents are revealed in the study of Ramachandran *et al.* (1978).

The ratio of weight (in kg) / height² (m) is referred to as Body Mass Index (BMI). The BMI of inmates indicated that 80 per cent inmates in two hostels such as MCLH and AGCLH were having normal BMI. WHO (1995) revealed that under nutrition is used as an indicator of current nutritional status and is defined as a body mass index that is less than the 5th percentile of the NCHS/WHO reference data. Nutritional deprivation in early childhood and adolescence also results in the failure to achieve full growth potential as reported by Beaton *et al.* (1990). 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.

In the study of Waist Hip Ratio (WHR), majority of the inmates in MCLH and ZMLH were found to be below the normal range. However inmates in AGCLH were found to be above normal. Tuomilenhto *et al.* (1990) reported that WHR was independently related to several cardiovascular risk factors and an increased WHR indicates increase accumulation of abdominal fat.

Mid Upper Arm Circumference (MUAC) of inmates in MCLH were found to be between 20 to 28 cm and Triceps Skin fold Thickness (TST) between 17 to 22 mm. Whereas mid upper arm circumference of inmates in AGCLH were found to be between 19 to 26 cm and triceps skin fold thickness between 16 to 22 mm. At the same time mid upper arm circumference of inmates in ZMLH were found to be between 20 to 25.5 cm and triceps skin fold between 17 to 22 cm. Majority of inmates in the three hostels were found to have a normal mid upper arm circumference. But in the case of triceps skin fold thickness majority of inmates in AGCLH were found to be normal when compared with inmates in other two hostels. Two inmates in MCLH, one inmate in AGCLH and three inmates in ZMLH had TST below the normal range reflecting a shift in the individual's energy balance. This measurement helps to assess the amount of subcutaneous fat which in turn gives an indication of the calorie reserves in the body of an individual as stated by Malina *et al.* (1974).

Clinical examination was the most effective measure to find out the nutritional deficiencies among individuals. Anaemia, thyroid enlargement and dental caries were observed among the inmates in the three hostels. Gupta and Sazena (1977) reported that vitamin A deficiencies, anaemia and vitamin B complex deficiencies were noted among the adolescents. Apart from the deficiency diseases, teeth was also observed in the surveyed adolescents. Park and Part (1991) observed that the ultimate objective of a clinical examination is to assess levels of health of individuals in relation to the food they consume.

Weiner *et al.* (1980) reported that mean haemoglobin levels of adolescents were found to be low. Saini and Verma (1989) reported that the mean haemoglobin value of girls from low socio-economic group varied from 9.4 to 10.68 g/100 ml. In the present study fifty per cent of inmates both in AGCLH and MCLH had normal haemoglobin values.

5.9. Association between adequacy of diets and health profile of inmates

Correlation analysis of the anthropometric parameters revealed a significant positive association between haemoglobin and height, and haemoglobin and weight. Highly positive correlation between BMI and weight and negative correlation between BMI and height were noted. Results indicated a highly positive and significant correlation between MUAC and weight, and a highly positive and significant correlation between MUAC and BMI. Wallace (1987) observed that anthropometry is not synonymous with nutritional status, moreover, anthropometry may be correlated with physical activity, morbidity and psychological development. Interaction between TST and other anthropometric parameters were also noticed. The association between nutrients and anthropometric parameters revealed a negative but highly significant correlation between protein and WHR. A highly positive and significant correlation was found between β carotene and calorie and between β carotene and protein. The result revealed a highly positive correlation between β carotene and calorie and β carotene and protein.

5.10. Nutritional status index of selected inmates

Nutritional status is an indicator of social well being of a community (Krishna, 1988). According to Robinson (1970) nutritional status is the condition of the health of the individual as influenced by the utilization of the nutrients. Nutritional status index of the selected inmates carried out revealed that inmates in AGCLH were found to be nutritionally better than the inmates in MCLH and ZMLH, eventhough the food intake of inmates in MCLH were found to be higher. Nutritional status index of the inmates depended on their social, economic and their health status etc. Ottesen *et al.* (1989) reported that nutritional status was found to be influenced by factors such as psychological, socio-cultural and physiological influence and also by thoughts, beliefs, and emotions. Nutritional deprivation in early childhood and adolescence also results in the failure to achieve full growth potential as reported by Beaton *et al.* (1990). In the present study all findings revealed that nutritional status index of the inmates was mainly based on their socio-cultural and family background and also on their daily food consumption pattern.



SUMMARY AND
CONCLUSION

SUMMARY

A study entitled “Nutritional adequacy of diets in selected hostel messes” was undertaken among thirty selected inmates in three hostels. Three hostels messes selected were viz., (1) Medical College Ladies Hostel (MCLH) (a hostel mess run by government), (2) Zenana Mission Ladies Hostel (ZMLH) (a hostel mess run by private organisation management) and (3) Agriculture College Ladies Hostel (AGCLH) (a hostel mess run by the inmates).

The average food expenditure pattern of the inmates in the three hostels revealed that the MCLH spent more money when compared to other two hostels. They allocated more money for the purchase of cereals followed by vegetables, fish, pulses, green leafy vegetables, fruits, sugar and jaggery.

Cereals, pulses, vegetables, roots and tubers, fruits, milk, fish, meat, fats and oil, sugar and jaggery and spices were the most frequently used food item by inmates in MCLH. While cereals, pulses, vegetables, green leafy vegetables, roots and tubers, fish, meat, egg, fat and oils, sugar and jaggery and spices were the high frequently used food items by inmates in AGCLH. On the other hand cereals, pulses, vegetables, green

leafy vegetables, roots and tubers, fruits, milk, meat, fat and oils, sugar and jaggery and spices were the most frequently used food items by the inmates in ZMLH.

Cereals, pulses, vegetables, roots and tubers, leafy vegetables, fruits, milk, meat, fats and oils, sugar and jaggery were the most frequently used food items by the inmates in the the three hostels.

Percapita availability of foods in the three hostels indicated that it was higher in MCLH when compared to other two hostels. The actual food intake of the inmates were met above the recommended dietary allowances. At the same time average intake of green leafy vegetables, vegetables, fruits, sugar and jaggery, fats and oils were found to be below the R.D.A. specification. In the case of inmates of AGCLH, cereals, pulses, roots and tubers, fish and meat products were found to be higher than the suggested allowances of ICMR. Whereas green leafy vegetables, fruits, milk, sugar and jaggery, fat and oils were found to be below the requirements. In ZMLH the intake of pulses, other vegetables, fish, egg and meat were found to be higher than the suggested allowances of ICMR. At the same time average intake of cereals, green leafy vegetables, fruits, milk, sugar and jaggery, fat and oils were found to be below the R.D.A.

On analysing the personal characteristics of inmates it was observed that the inmates of the three hostels were well exposed to reading news paper, magazines and weeklies. Viewing of television

programme was also found to be more popular among the inmates than listening to the radio programme. Inmates in MCLH and AGCLH enjoyed sports and games activities. While inmates in ZMLH were found to be more interested in sleeping. In the present study, majority of the inmates in AGCLH were found to participate in the activities of various organizations.

The average nutrient intake assessed indicated that inmates in MCLH and AGCLH were found to have an intake higher than R.D.A. But in the case of inmates in ZMLH, all nutrients except calcium were found to be higher when compared with R.D.A. In the case of iron it was comparatively less when compared with R.D.A. The percapita of nutrients among the inmates in MCLH were found to be higher when compared with inmates in other two hostels.

Dietary habits and food consumption pattern of the inmates surveyed indicated that majority of the inmates in three hostels preferred tea than coffee. Inmates in AGCLH highly preferred deep fried foods when compared to inmates in other two hostels. In the case of sweet preparations, majority of inmates in the three hostels preferred sweet preparations. Regarding the food combination of inmates, majority preferred cereal preparation. *Dosa, Idiyappan, Idli, Chappathy* and *Uppuma* along with vegetable curry and tea were the commonly used items for breakfast. Cereal with fish and vegetable was found to be the commonly consumed items for lunch. Tea along with banana fry was used

during evening tea. Cereals with fish and vegetable combinations were used for dinner.

Energy intake and energy expenditure pattern of selected inmates indicated that majority of the inmates in MCLH and AGCLH spent less energy when compared with energy intake.

Anthropometric measurements of the inmates were surveyed and the average height and weight of inmates were compared with NFI standards. An assessment of weight / height ratio of the inmates revealed better health status. Waist / Hip ratio was found to be normal among the inmates in the hostels.

Clinical examination of the inmates revealed that anaemia, dental caries and thyroid enlargement were the most common clinical manifestations identified among the inmates.

The nutritional status index of the inmates were carried out and revealed that the inmates of AGCLH were better than the inmates in other two hostels.

The study threw light on the food consumption pattern of the adolescent girls of better economic strata and on the significance of self managed mess run in hostels.



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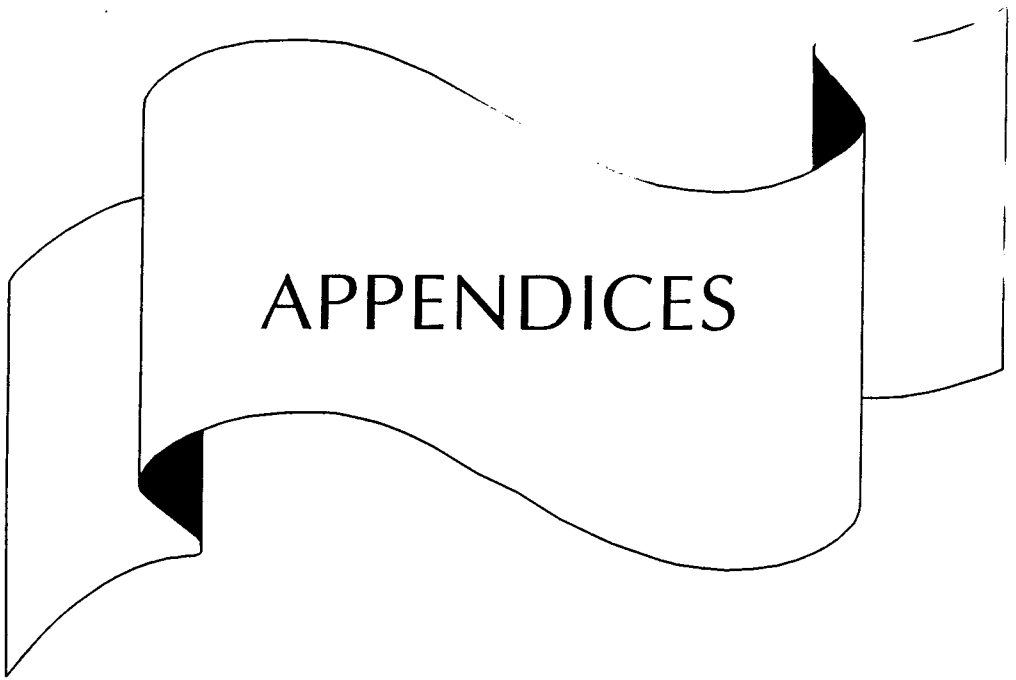
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* Original not seen



APPENDIX - I

Schedule to collect dietary characteristics of selected inmates in the hostels

A. Frequency of using different food stuffs

1. Cereals
2. Pulses
3. Vegetables
4. Green leafy vegetables
5. Roots and tubers
6. Fruits
7. Milk and milk products
8. Fish
9. Meat
10. Egg
11. Fats and oils
12. Sugar and jaggery
13. Spices

B. Food preparations commonly used - particulars of the food consumed at the hostels

14. Breakfast
15. Preparation you like most
16. Lunch
17. Preparation you like most
18. Evening tea
19. Preparation you like most
20. Dinner
21. Preparation you like most
22. Preference for foods prepared by different cooking methods
23. Preference for type of preparation

C. Preference of food - Food list method

	Name of the item	Quantity consumed (g/ml)
Breakfast	Tea	
	Coffee	
	(Other specify)	
Lunch	Rice	
	Chappathi	
 Curry	
	Sambar	
	Pappad	
	Curd	
	Buttermilk	
	Pickle	
	Egg	
	Chicken	
	Meat	
	Avial	
	Others specify	
Evening snacks	
	Tea	
	Coffee	
Dinner	Rice	
	Chappathi	
 Curry	
	Sambar	
	Rasam	
	Curd	
	Pappad	
	Buttermilk	
	Pickle	
	Egg	
	Chicken	
	Meat	
	Others specify	

APPENDIX - II

Schedule to collect food preference of selected inmates in the hostels

	Extremely preferred	Preferred	Less preferred	Not at all preferred
1. Rice				
2. Wheat				
3. Ragi				
4. Peas				
5. Bengalgram				
6. Redgram				
7. Greengram				
8. Horsegram				
9. Amaranthus				
10. Drumstick leaves				
11. Cabbage				
12. Coriander leaves				
13. Curry leaves				
14. Tapioca				
15. Potato				
16. Yam				
17. Colocasia				
18. Carrot				
19. Sweet potato				
20. Raddish				
21. Coleous				
22. Dioscorea				
23. Lesser yam				
24. Small onion				
25. Big onion				
26. Ladies finger				
27. Cucumber				
28. Brinjal				
29. Bittergourd				
30. Ashgourd				
31. Snakegourd				
32. Plantain				
33. Beans				
34. Pumpkin				

	Extremely preferred	Preferred	Less preferred	Not at all preferred
35. Ivy gourd				
36. Dolichos beans				
37. Bread fruit				
38. Papaya				
39. Plantain flower				
40. Plantain stem				
41. Peas				
42. Banana (ripe)				
43. Tomato				
44. Gooseberry				
45. Jackfruit				
46. Mango				
47. Guava				
48. Orange				
49. Apple				
50. Papaya (ripe)				
51. Pineapple				
52. Sapota				
53. Ayani				
54. Palm fruit				
55. Anona				
56. Rose apple				
57. Star gooseberry				
58. Watermelon				
59. Dates				
60. Sabarjil				
61. Cashew fruit				
62. Groundnut				
63. Gingelly				
64. Coconut				
65. Cashewnut				
66. Goat's milk				
67. Cow's milk				
68. Buffalo milk				
69. Curd				
70. Butter milk				
71. Butter				
72. Hen's egg				
73. Duck's egg				

	Extremely preferred	Preferred	Less preferred	Not at all preferred
74.				
75.				
76.				
77.				
78.				
79.				
80.				
81.				
82.				
83.				
84.				
85.				
86.				
87.				
88.				
89.				
90.				
91.				
92.				
93.				
94.				
95.				
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100.				
101.				
102.				
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106.				
107.				
108.				
109.				
110.				
111.				
112.				
113.				
114.				

APPENDIX - III

Diet survey - Weighment method

Weight of raw foods in grams

Food stuff	Food code	Raw intake	Food stuff	Food code	Raw intake
Cereals			Other vegetables		
Rice parboiled	01		Ashgourd	29	
Wheat flour	02		Bittergourd	30	
Rice flakes	03		Brinjal	31	
Rice raw	04		Beans	32	
Wheat (whole)	05		Cauliflower	33	
Maida	06		Cucumber	34	
			Drumstick	35	
			Kovai	36	
Pulses and Legumes			Ladies finger	37	
Blackgram dhal	07		Mango green	38	
Bengalgram dhal	09		Papaya green	39	
Bengalgram (whole)	09		Peas	40	
Greengram (whole)	10		Plantain green	41	
Greengram dhal	11		Pumpkin	42	
Peas (dry)	12		Snakegourd	43	
Redgram dhal	13		Tomato green	44	
			Fruits		
Leaf vegetables			Amla	45	
Amaranthus tender	14		Apple	46	
Cabbage	15		Banana (ripe)	47	
Chekkurmanis	16		Grapes blue	48	
Colacasia leaves	17		Gauva	49	
Coriander leaves	18		Lime	56	
Drumstick leaves	19		Mango (ripe)	51	
			Orange	52	
Roots and tubers			Papaya (ripe)	53	
Beetroot	20		Pineapple	54	
Carrot	21		Tomato (ripe)	55	
Colacasia	22		Fats and oil seeds		
Onion big	23		Coconut fresh	56	
Onion small	24		Cashew nuts	57	
Potato	25		Mustard seed	58	
Tapioca	26		Coconut dry	59	
Sweet potato	27		Groundnuts	60	
Yam	28				

Food stuff	Food code	Raw intake	Food stuff	Food code	Raw intake
Fishes			Other food stuffs		
Crab	61		Sugar	86	
Mackeral	62		Jaggery	87	
Oil sardine	63		Biscuit (salt)	88	
Prawns	64		Biscuit (sweet)	89	
Sardine	65		Bread	90	
Shark	66		Jam	91	
Other flesh foods			Pappad	92	
Beef	67		Sago	93	
Egg duck	68		Salt	94	
Hen egg	69		Yeast	95	
Chicken	70		Condiments and spices		
Liver	71		Asafoetida	96	
Mutton	72		Cardamom	97	
Milk and milk products			Chillies green	98	
Buffalo's milk	73		Chllies dry {powder}	99	
Cow's milk	74		Cloves dry	100	
Goat's milk	75		Coriander powder	101	
Curd	76		Cumin seed	102	
Cheese	77		Fenugreek seed	103	
Butter	78		Ginger fresh	104	
Butter milk	79		Pepper dry	105	
Milk powder	80		Tamarind pulp	106	
Ghee	81		Turmeric powder	107	
Fats and edible oils			Coffee	108	
Hydrogenated oil	82		Tea	109	
Coconut oil	83				
Palm oil	84				
Gingelly oil	85				

APPENDIX - IV

Diet survey - Weighment method

Weight of cooked foods (in grams)

Name of the meals	Menu	Weight of container	Weight of cooked food	Weight of food waste	Actual quantity of food consumed
Breakfast					
Lunch					
Tea					
Dinner					

APPENDIX - V

Nutritional Assessment Schedule

Serial No.
Name of the subject
Age

Anthropometry

1. Height
2. Weight
3. Midupper arm circumference
4. Triceps skinfold thickness

Clinical Examination

Hair

Discoloured	01*	Cheilosis	19
Easily plucked	02*	Red and raw	20
Moon face	03*	Tongue :	
Parotid enlargement	04	Papillae - atrophic	21
(bilateral painless)		Papillae - hypertrophic	22
Oedema	05	Pellagra	23
Emaciation	06	Crazy pavement dermatosis	24
Marasmus	07	Pigmentation at Knuckles	25
Conjunctival xerosis	08	Finger / toes phrynoderma	26
	09	Koilonychia	27
Bitot's spots	10	Gums - spongy bleeding	28
Corneal xerosis	11	Craniotabes	29
Keratomalacia	12	Epiphysial enlargement	30
Corneal opacity	13	Beading of ribs	31
Night blindness	14	Knock - knees / bow legs	32
Photophobia	15	Teeth : mottled enamel	33
Anaemia	16	Teeth caries	34
Nasolabial seborrhoea	17	Enlargement of liver	35
Angular stomatitis	18	Thyroid enlargement	36

* For children below five years old

APPENDIX - VI

Formulae for making food use frequency table

$$\text{Score} = \frac{R_1 S_1 + R_2 S_2 \dots\dots\dots + R_n S_n}{n}$$

where,

S_n = Scale of rating

R_n = Percentage of respondents selecting a rating

n = Maximum scale rating

APPENDIX - VII

Food preference of inmates

Preference of the inmates for cereals and pulses (in percentage)

	Rice			Wheat			Ragi			Peas			Bengalgram			Redgram			Greengram			Horsegram			
	M	A	Z	M	A	Z	M	A	Z	M	A	Z	M	A	Z	M	A	Z	M	A	Z	M	A	Z	
Extremely preferred	40	50	40	30	60	30	10	20	—	30	30	30	10	—	—	40	50	30	10	10	30	10	20	10	
Preferred	60	50	40	60	40	50	40	50	20	40	50	70	50	70	90	50	50	70	70	90	50	60	70	40	
Less preferred	—	—	10	10	—	20	30	30	50	20	20	—	30	30	10	10	—	—	20	—	20	20	10	30	
Not at all preferred	—	—	10	—	—	—	20	—	30	10	—	—	10	—	—	—	—	—	—	—	—	—	10	—	20

M - Medical College Ladies Hostel

A - Agricultural College Ladies Hostel

Z - Zenana Mission Ladies Hostel

Preference of inmates for vegetables (in percentage)

	Ladies finger			Cucumber			Brinjal			Bittergourd			Ashgourd			Snakegourd			Plantain			Beans				
	M	A	Z	M	A	Z	M	A	Z	M	A	Z	M	A	Z	M	A	Z	M	A	Z	M	A	Z		
Extremely preferred	50	50	40	80	60	70	40	60	50	30	50	40	20	10	30	20	10	40	20	40	20	40	50	40	40	40
Preferred	40	20	50	20	40	30	50	30	40	60	40	50	50	60	40	50	70	50	60	50	60	60	50	60	40	50
Less preferred	10	20	10	—	—	—	10	10	—	10	10	10	30	30	20	20	10	10	20	—	—	—	—	—	20	10
Not at all preferred	—	10	—	—	—	—	—	—	10	—	—	—	—	—	—	10	10	—	—	—	—	—	—	—	—	—

	Pumpkin			Ivy gourd			Dolichos Beans			Bread fruit			Papaya			Plantain flower			Plantain stem			Peas				
	M	A	Z	M	A	Z	M	A	Z	M	A	Z	M	A	Z	M	A	Z	M	A	Z	M	A	Z		
Extremely preferred	50	40	30	10	10	—	10	40	60	20	10	—	10	—	10	—	—	—	—	—	—	—	—	—	—	—
Preferred	50	40	50	80	60	60	50	50	10	70	50	80	40	50	30	50	40	60	70	50	80	70	—	60	—	60
Less preferred	—	10	20	10	20	40	30	—	20	10	30	20	50	50	10	30	40	20	10	50	—	30	90	30	—	—
Not at all preferred	—	10	—	—	10	—	10	10	10	—	10	—	—	—	50	20	20	20	20	—	20	—	10	10	—	—

M - Medical College Ladies Hostel

A - Agricultural College Ladies Hostel

Z - Zenana Mission Ladies Hostel

Preference of inmates for leafy vegetables (in percentage)

	Amaranthus			Drumstick leaves			Cabbage			Coriander leaves			Curry leaves		
	MCLH	AGCLH	ZMLH	MCLH	AGCLH	ZMLH	MCLH	AGCLH	ZMLH	MCLH	AGCLH	ZMLH	MCLH	AGCLH	ZMLH
Extremely preferred	90	70	70	100	100	100	50	40	20	40	30	40	—	40	20
Preferred	10	20	30	—	—	—	50	50	50	50	40	30	50	60	40
Less preferred	—	10	—	—	—	—	—	10	30	—	20	20	30	—	20
Not at all preferred	—	—	—	—	—	—	—	—	—	10	10	10	20	—	20

MCLH - Medical College Ladies Hostel

AGCLH - Agricultural College Ladies Hostel

ZMLH - Zenana Mission Ladies Hostel

Preference of the inmates for roots and tubers (in percentage)

	Extremely preferred			Preferred			Less preferred			Not at all preferred		
	M	A	Z	M	A	Z	M	A	Z	M	A	Z
Tapioca	10	20	20	60	80	60	20	—	30	10	—	—
Potato	50	60	50	50	40	40	—	—	10	—	—	—
Yam	—	10	30	60	50	60	20	30	10	20	10	—
Colocasia	10	10	—	50	60	40	20	20	30	20	10	30
Carrot	50	30	10	50	70	50	—	—	40	—	—	—
Beetroot	60	40	20	40	50	50	—	10	30	—	—	—
Sweet potato	—	10	—	50	60	40	30	20	50	20	10	10
Raddish	10	—	10	—	—	30	40	80	50	60	20	20
Coleous	—	—	—	40	60	40	30	40	30	30	—	30
Dioscorea	—	10	—	30	50	20	20	40	70	50	10	10
Lesser yam	40	50	20	30	20	60	20	20	10	10	10	10
Small onion	50	10	30	50	20	40	—	50	20	—	20	10
Big onion	50	70	40	30	30	50	20	—	10	—	—	—

M - Medical College Ladies Hostel

A - Agricultural College Ladies Hostel

Z - Zenana Mission Ladies Hostel

Preference of the inmates for fruits (in percentage)

	Extremely preferred			Preferred			Less preferred			Not at all preferred		
	M	A	Z	M	A	Z	M	A	Z	M	A	Z
Big banana	40	60	40	60	40	50	—	—	10	—	—	—
Tomato	10	30	20	50	60	80	20	10	—	30	—	—
Gooseberry	50	60	30	50	40	40	—	—	30	—	—	—
Jack fruit	30	50	30	40	50	70	30	—	—	—	—	—
Mango	100	100	100	—	—	—	—	—	—	—	—	—
Guava	100	100	100	—	—	—	—	—	—	—	—	—
Orange	100	70	80	—	30	20	—	—	—	—	—	—
Apple	40	40	30	40	50	40	20	—	10	—	10	—
Papaya	30	40	50	30	30	30	30	20	—	10	10	10
Pineapple	—	100	50	100	—	50	—	—	—	—	—	—
Sapota	50	50	50	40	50	40	—	—	10	10	—	—
Ayani	—	—	—	50	50	50	30	40	20	20	10	30
Palm fruit	—	—	—	60	80	50	30	20	40	10	—	10
Anona	50	100	60	20	—	40	20	—	—	10	—	—
Rose apple	100	50	100	—	50	—	—	—	—	—	—	—
Star gooseberry	60	100	100	40	—	—	—	—	—	—	—	—
Water melon	100	100	100	—	—	—	—	—	—	—	—	—

M - Medical College Ladies Hostel

A - Agricultural College Ladies Hostel

Z - Zenana Mission Ladies Hostel

Preference of the inmates for animal product (in percentage)

	Extremely preferred			Preferred			Less preferred			Not that much preferred		
	M	A	Z	M	A	Z	M	A	Z	M	A	Z
Goats milk	—	—	—	—	—	—	50	20	60	—	—	—
Cows milk	100	100	100	—	—	—	—	—	—	—	—	—
Buffalo's milk	50	70	60	30	10	20	10	10	40	—	—	—
Curd	100	100	100	—	—	—	—	—	—	—	—	—
Butter milk	50	80	10	40	20	90	10	—	—	—	—	—
Butter	70	100	50	30	—	50	—	—	—	—	—	—
Hen's egg	100	100	100	—	—	—	—	—	—	—	—	—
Duck's egg	50	60	30	10	30	40	30	10	30	10	—	—
Fish	100	100	100	—	—	—	—	—	—	—	—	—
Beef	100	100	100	—	—	—	—	—	—	—	—	—
Chicken	100	100	100	—	—	—	—	—	—	—	—	—
Mutton	40	60	50	40	40	30	20	—	20	—	—	—

M - Medical College Ladies Hostel

A - Agricultural College Ladies Hostel

Z - Zenana Mission Ladies Hostel

Preference of the inmates for nuts and oil seeds (in percentage)

	Ground nut			Gingelly			Coconut			Cashew nut		
	M	A	Z	M	A	Z	M	A	Z	M	A	Z
Extremely preferred	50	20	40	—	—	—	100	100	100	100	100	100
Preferred	30	50	30	50	100	50	—	—	—	—	—	—
Less preferred	10	30	20	30	—	40	—	—	—	—	—	—
Not at all preferred	10	—	10	10	—	—	—	—	—	—	—	—

M - Medical College Ladies Hostel

A - Agricultural College Ladies Hostel

Z - Zenana Mission Ladies Hostel

Preference of the inmates for sweet preparations (in percentage)

	Extremely preferred			Preferred			Less preferred			Not that much preferred		
	M	A	Z	M	A	Z	M	A	Z	M	A	Z
Ladu	70	100	50	30	—	50	—	—	—	—	—	—
Jilebi	100	100	100	—	—	—	—	—	—	—	—	—
Peda	50	100	50	—	—	—	—	—	—	—	—	—
Ice Cream	100	100	100	—	—	—	—	—	—	—	—	—
Coco cola	100	70	90	—	—	—	—	—	—	—	—	—
Pepsi	100	100	100	—	—	—	—	—	—	—	—	—
Limca	100	90	50	—	—	—	—	—	—	—	—	—
Merinda	100	100	100	—	—	—	—	—	—	—	—	—
Citra	100	100	100	—	—	—	—	—	—	—	—	—
Lime juice	50	70	30	50	30	70	—	—	—	—	—	—
Fruit juice	100	70	100	—	30	—	—	—	—	—	—	—
Water melon	100	100	100	—	—	—	—	—	—	—	—	—
5 star	100	100	100	—	—	—	—	—	—	—	—	—
Sip-up	80	100	70	20	—	30	—	—	—	—	—	—
Jam	70	80	60	20	20	20	10	—	20	—	—	—
Perk	100	100	100	—	—	—	—	—	—	—	—	—
Dilkush	60	100	80	20	—	20	20	—	—	—	—	—
Fruit salad	100	100	100	—	—	—	—	—	—	—	—	—
Biscuit (salt)	10	30	40	50	70	50	—	—	10	—	—	—
Biscuit (sweet)	100	50	80	—	50	20	—	—	—	—	—	—
Bread (white)	40	20	40	60	80	50	—	—	10	—	—	—
Cake	100	100	100	—	—	—	—	—	—	—	—	—
Honey	60	80	70	20	20	30	30	—	—	—	—	—
Sugar	—	50	60	100	50	40	—	—	—	—	—	—
Jaggery	30	50	20	30	30	30	40	20	50	—	—	—

M - Medical College Ladies Hostel

A - Agricultural College Ladies Hostel

Z - Zenana Mission Ladies Hostel

Preference of the inmates for other food stuffs (in percentage)

	Extremely preferred			Preferred			Less preferred			Not that much preferred		
	M	A	Z	M	A	Z	M	A	Z	M	A	Z
Jack fruit seed	—	—	—	30	50	—	20	20	20	50	30	50
Pappad	50	100	80	50	—	20	—	—	—	—	—	—
Soya mixture	50	70	90	30	20	10	20	10	—	—	—	—
Banana chips	100	100	100	—	—	—	—	—	—	—	—	—
Potato chips	100	100	100	—	—	—	—	—	—	—	—	—
Jack chips	100	100	100	—	—	—	—	—	—	—	—	—
Puffs	100	100	100	—	—	—	—	—	—	—	—	—
Onion vada	90	70	80	—	—	—	—	—	—	—	—	—
Bengalgram dhal vada	80	40	50	10	30	30	10	20	20	—	—	—
Blackgram dhal vada	100	100	100	—	—	—	—	—	—	—	—	—
Banana fry	100	100	100	—	—	—	—	—	—	—	—	—

M - Medical College Ladies Hostel

A - Agricultural College Ladies Hostel

Z - Zenana Mission Ladies Hostel

APPENDIX - VIII

Food preference score of selected inmates in the hostels

Food stuffs	MCLH	AGCLH	ZMLH
Rice	85	87.5	77.5
Wheat	80	90	77.5
Ragi	60	72.5	47.5
Peas	72.5	77.5	82.5
Bengalgram	65	67.5	72.5
Redgram	82.5	80	82.5
Greengram	72.5	77.5	77.5
Horsegram	67.5	77.5	60
Amaranthus	90.7	90	77.5
Drum stick leaves	100	100	100
Cabbage	87.5	82.5	72.5
Coriander leaves	86	72.5	54.7
Curry leaves	57.5	44.5	65
Tapioca	67.5	80	80
Potato	87.5	90	85
Yam	60	65	80
Colocasia	62.5	70	52.5
Beet root	90	82.5	72.5
Sweet potato	57.5	57.5	57.5
Raddish	45	45	62.5
Coleous	52.5	65	52.5
Dioscorea	45	70	52.5
Lesser yam	75	77.5	72.5
Small onion	87.5	55	72.5
Big onion	82.5	92.5	82.5
Ladies finger	85	77.5	82.5
Cucumber	95	90	92.5
Brinjal	82.5	87.5	82.5
Bittergourd	80	85	82.5
Ashgourd	72.5	70	70
Snakegourd	70	70	82.5
Plantain	75	85	87.5
Beans	85	80	82.5
Pumpkin	87.5	77.5	77.5

Food stuffs	MCLH	AGCLH	ZMLH
Ivy gourd	75	77.5	65
Dolichos beans	65	80	30
Bread fruit	77.5	65	70
Papaya (green)	65	62.5	57.5
Plantain stem	57.5	55	65
Plantain flower	70	62.5	70
Peas	67.5	47.5	62.5
Banana (ripe)	85	90	42
Tomato	58.2	87.5	80
Goose berry	87.5	90	75
Jack fruit	75	87.5	82.5
Mango	100	100	100
Guava	100	100	100
Orange	100	92.5	87.5
Apple	80	80	65
Papaya (ripe)	70	75	85
Pineapple	100	100	87.5
Sapota	82.5	87.5	85
Ayani	57.6	60	48.2
Palm fruit	49	70	60
Anona	77.5	100	90
Rose apple	100	87.5	100
Star gooseberry	90	100	100
Watermelon	100	100	100
Groundnut	80	72.5	75
Gingelly	57.5	75	60
Coconut	100	100	100
Cashewnut	100	100	100
Goat's milk	25	10	30
Cow's milk	100	100	100
Buffalo's milk	77.5	82.5	95
Curd	100	100	100
Butter milk	85	95	77.5
Butter	92.5	100	87.5
Hen's egg	100	100	100
Duck's egg	75	87.5	75
Fish	100	100	100
Beef	100	100	100

Food stuffs	MCLH	AGCLH	ZMLH
Chicken	100	100	100
Mutton	80	90	82.5
Biscuit (salt)	47.5	82.5	82.5
Biscuit (sweet)	100	87.5	95
Bread (white)	85	80	82.5
Cake	100	100	100
Honey	90	95	92.5
Sugar	75	87.5	90
Jack fruit seed	45	55	37.5
Pappad	87.5	10	95
Sago mixture	82.5	90	97.5
Banana chips	100	100	100
Potato chips	100	100	100
Jack chips	100	100	100
Puffs	100	100	100
Onion vada	90	70	80
Bengalgram dhal vada	92.5	72.5	82.5
Blackgram dhal vada	100	100	100
Banana fry	100	100	100
Ladu	92.5	100	87.5
Jilebi	100	100	100
Peda	50	100	50
Ice Cream	100	100	100
Pepsi	100	100	100
Limca	100	90	50
Coco-cola	100	70	90
Mirinda	100	100	100
Citra	100	100	100
Lime juice	87.5	92.5	82.5
Fruit juice	100	92.5	100
Watermelon juice	100	100	100
Five star	100	100	100
Sip-up	95	100	92.5
Jam	90	95	85
Perk	100	100	100
Fruit salad	85	100	95
Dilkush	100	100	100

APPENDIX - IX

Formula for calculating energy expenditure

BMR x BMR factor = Energy Expenditure

BMR = $14.0 \times \text{B.W (kg)} + 471$ (Female)

Recommended BMR factor for computing energy requirement = 1.9

APPENDIX - X

Nutritional status of selected inmates in MCLH

Sl. No.	Age (years)	Weight (kg)	Height (cm)	Haemoglobin (g/ ml)	BMI
1.	18	52	167	10.8	18.6
2.	18	47	152	10	20.3
3.	18	60	156	11.5	24.6
4.	18	51	165	11.5	18.7
5.	18	46	155.5	9.8	19.0
6.	18	51	157	10	20.6
7.	18	51	144	10.2	24.5
8.	18	46	158	12	18.4
9.	18	54	150.5	11.5	23.8
10.	18	45	162	11.5	17.1
Mean	50.3	156.7	10.88	20.56	

APPENDIX - XI

Nutritional status of selected inmates in AGCLH

Sl. No.	Age (years)	Weight (kg)	Height (cm)	Haemoglobin (g/ml)	BMI
1.	18	49	167	11.5	17.6
2.	18	45	163.5	10	16.8
3.	18	53	158.5	12	21.0
4.	18	53	159.5	11.0	20.8
5.	18	62	160.5	12.3	24.0
6.	18	54	158	11.5	21.6
7.	18	49	152	10	21.2
8.	18	54	156	12	22.1
9.	18	53	150	9.2	19.1
10.	18	44	148.5	9.5	20.3
Mean		50.6	157.35	10.9	39.35

APPENDIX - XII

Nutritional status of selected inmates in ZMLH

Sl. No.	Age (years)	Weight (kg)	Height (cm)	Haemoglobin (g/ml)	BMI
1.	18	40.5	156	10.8	16.6
2.	18	49	164	9.8	18.2
3.	18	53.5	160	11.5	20.8
4.	18	56.5	163	9.9	21.2
5.	18	41	158	11	16.4
6.	18	43	150	10	19.1
7.	18	49	162	11.5	18.6
8.	18	50	157	11.8	20.2
9.	18	44.5	161	11.5	17.1
10.	18	44	160	10.8	17.1
Mean		47.1	159.1	10.86	18.53

APPENDIX - XIII

Estimation of Haemoglobin (cyanmethaemoglobin method)

Principle

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

Reagent

Drabkin's solution : Dissolve 0.05 g of potassium cyanide, 0.2 g of potassium ferricyanide and 1g of sodium bicarbonate in one litre distilled water.

Procedure

20 ml of blood are measured accurately from a haemoglobin pipette and delivered on to Whatman No. 1 filter paper disc. The filter paper is air dried, labelled and can be stored upto one week. The portion of filter paper containing the blood is cut and dipped in 5 ml, Drabkin' solution taken in a test tube. Wait for 30 minutes and mix the contents on a vovte and take the readings.

Construction of standard curve

If the blood drawn from the subject contains haemoglobin 15 g/dl after estimation then prepare three reference standard as follows.

1. Reference standard A

4 ml blood in 1000 ml Drabkin's reagent contains haemoglobin 15 g/dl.

2. Reference standard B

300 ml of reference standard A + 200 ml Drabkins reagent contains haemoglobin concentration of 10 g/dl

3. Reference standard C

200 ml of reference standard A and 300 ml Drabkin's reagent contains a haemoglobin concentration of 7.5 g/dl.

Thus we have three reference standards at three levels of haemoglobin concentration. 5 ml from each standard whenever haemoglobin estimations are done.

APPENDIX - XIV

Association between adequacy of diets and health profile of inmates

	Wt.	Ht.	Hb	BMI	MUAC	TST	WHR	Cal	Pro	β-Car.	Ir
Wt	1.000										
Ht.	0.1708	1.000									
Hb	0.4300*	0.3722*	1.000								
BMI	0.7927**	-0.4618*	0.1551	1.000							
MUAC	0.6317*	-0.1409	0.2379	0.6592**	1.000						
TST	0.7036**	-0.0824	0.2873	0.6818**	0.7699**	1.000					
WHR	0.2109	-0.0802	-0.0076	0.2497	0.1894	0.3668*	1.000				
Cal	0.3291	-0.1388	0.02470	0.4015*	0.3356*	0.1134	0.1149	1.000			
Pro	0.0048	0.1714	0.2060	-0.0929	0.0577	-0.1969	-0.6796**	0.2848	1.000		
β-Car.	0.1695	-0.1361	0.0385	0.2568	0.1847	-0.0840	-0.2449	0.8989**	0.5486**	1.000	
Ir	-0.1127	-0.1338	-0.0204	-0.0221	-0.0740	-0.0336	0.4501*	-0.0351	-0.2195	-0.2045	1.000

Levels of significance

* 5%

** 1%

Wt - Weight

WHR - Waist Hip / ratio

0.3809

0.4869

Ht - Height

Cal - Calorie

0.3494

0.4487

Hb - Haemoglobin

Pro - Protein

MUAC - Mid upper arm circumference

β-Car - Beta carotene

Ir - Iron

***NUTRITIONAL ADEQUACY OF DIETS
IN SELECTED HOSTEL MESSSES***

By

BEATRICE P. J.

ABSTRACT OF THE THESIS

*SUBMITTED IN PARTIAL FULFILMENT OF
THE REQUIREMENT FOR THE DEGREE OF
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ABSTRACT

A study entitled “Nutritional adequacy of diets in selected hostel messes” was undertaken to assess the personal characteristics, dietary habits, foods expenditure pattern, frequency use of various foods, food preference, percapita availability of foods, actual food intake, nutrient intake, percapita availability of nutrient, energy intake and energy expenditure, nutritional status of the inmates and nutritional status index of selected inmates in the hostels.

The average food expenditure pattern of the inmates in the three hostels revealed that the MCLH spent more money when compared to other two hostels.

On analysing the personal characteristics of inmates it was observed that the inmates of the hostel will be exposed to mass media by reading newspapers, magazines and weeklies. Viewing of television programme was also found to be more popular among the inmates than listening to the radio programme.

Dietary habits of inmates were assessed and revealed that the respondents were non vegetarian. Cereals, pulses, vegetables, green leafy

vegetables, roots and tubers, milk, fish, fats and oils, sugar and spices were found to be high frequently used foods among the inmates in the three hostels. At the same time fruit, milk and egg were less frequently used food among the inmates in the three hostels. The inmates liked fried foods and sweet preparations.

Consumption of cereals, pulses, other vegetables, roots and tubers, milk, fish and meat were above the recommended dietary allowances (R.D.A) and nutrients such as calorie, protein, calcium, retinol, thiamine, riboflavin, niacin and vitamin 'C' were comparatively higher in comparison with R.D.A. But the use of iron was less in comparison with R.D.A. Energy intake and energy expenditure of inmates were surveyed and indicated that majority of the inmates spent less energy when compared with energy intake.

Weight for age and height for age of inmates were below the NCHS standards. Waist / Hip ratio of inmates were found to be normal. Mid upper arm circumference and triceps skin fold thickness of inmates in the three hostels were assessed and found that only few inmates were found to be normal. Anaemia, dental caries and thyroid enlargement were the most common clinical manifestations among the inmates in the three hostels. Normal haemoglobin level was noticed only in negligible inmates. The nutritional status index of the inmates in AGCLH were better than the inmates in other two hostels.