

**ASSESSMENT OF NUTRITIONAL STATUS OF
SCHOOL CHILDREN RESIDING IN
G. V. RAJA SPORTS SCHOOL**

BY
MINI K

THESIS

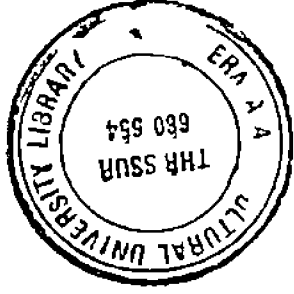
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DECLARATION

I hereby declare that this thesis, entitled 'Assessment of nutritional status of school children' residing in G V Raja sports school' is a bonafide record of research work done by me during the course of research and that this thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title of any other University or Society.

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CERTIFICATE

Certified that this thesis entitled "Assessment of Nutritional status of school children residing in G V. Raja sports school' is a record of research work done independently by Miss Mini, K under my guidance and supervision and that it has not previously formed the basis for the award of any degree, diploma, fellowship or associateship to her



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INTRODUCTION

INTRODUCTION

Sports have been an integral part of man's life and culture. Sports contribute for the building up of the normal and physical health of youth.

Athletes all over the world are looking for a winning edge and the triumph or defeat in sports is decided by one hundredth of a second for even less. This necessitate man's desire to strive for something for advantage and try anything available to achieve man's best.

The relation between nutrition and physical fitness and their role in the top performance in athletes and different sports contests has been explained by various authors. Diet and nutrition play an important part in the performance of an athlete (Navaratilova, 1983). Devadas (1988) also stressed the need for good physique in athletes for maximum performance. Optional diets for sports were of interest even in ancient Greece.

In recommending dietary allowances for sports men and women athletes the emphasis is to achieve maximum possible physical performance with the given physiological and biological attributes, motivation and training (Sathyanarayana et al., 1985). Each component is equally important and mutually complementary in producing successful sports men and athletes.

Meeting nutritional needs of athletes adequately may help not only to improve their performance for an event but also to gain maximum benefit from training and ensure health.

Adolescent athletes needs specific nutritional supports primarily to maintain normal growth and physiological maturation inspite of their physical fitness (Rodwell et al., 1988).

Developing high levels of physical fitness among adolescents will improve their performance in various sports and games activities.

However data related to the nutritional status of adolescents engaged in sports activities in our state are not available at present. Hence the present investigation entitled "Assessment of nutritional status of sports children residing in G.V. Raja Sports School' was taken up with the following objectives

1. To assess the health status of school children involved in sports activities.
2. To ascertain their food habits.
3. To determine the daily energy expenditure of the children for doing various activities with special reference to the sports in which the children are engaged.

- 4 To evaluate the existing hostel diet with respect to its nutritional and dietary adequacy.
5. To give suggestions to modify the hostel diet.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Nutritional assessment is the process where by the state of nutritional health of an individual or group is determined.

Kamath (1986) defined nutritional status as the state of health enjoyed as a result of nutrition. Nutritional status is defined as the state of health of an individual as influenced by intake of the essential food nutrients (American dietetic Association, 1969). Gopalan (1978) reported that maintenance of health is greatly dependent on adequate nutrition.

Under nutrition and malnutrition which affects the physical and psychological development of a child is the most common health problem in third world countries (Sharma, 1987). Eiser (1986) revealed that malnutrition increase the susceptibility to infection, which adversely affect nutritional status and inturn affect the intellectual and physical development. Cavez et al. (1974) reported that poor nutritional status affects social, physical and intellectual development of an individual. Shukla (1982) also supported the same view. Ghosh (1979) and Kaplan (1972) were of the opinion that poor nutritional status affect the physical growth and cognative development in children Klein et al. (1972) was of the view that there is close

relationship between malnutrition and cognitive development. Monckeberg (1972) stated that poor nutritional status and socio cultural factors are reflected in poor mental performance.

Wheeler and Tan (1983) have the view that the nutritional status of an individual has a direct and identifiable effect on his or her productivity at work. According to Satyanarayan et al (1979) nutrition and food intake were closely related to the efficiency and productivity of workers Findings of Hussain (1988) had indicated that good health and nutrition prevent infirmity and absenteeism owing to disease, enhance resistance and increase ability for sustained work. Viteri et al. (1981) had the opinion that increased food availability for the workers can result in significantly desirable changes in their work behaviour

Satyanarayana et al. (1979) reported that the work efficiency of an individual varied inversely in relation to the degree of undernutrition or energy stress. Satyanarayana et al. (1980) revealed that reduced work performance was more likely due to their current and persistent undernutrition, consequence of early childhood malnutrition Basta et al (1979) reported that anaemia reduces working capacity. Leaf (1989) emphasized the importance of developing high levels of physical fitness

in children, young adults as well as in competitive elite athletes he also stressed the role of nutrition in favouring a fit state in elderly adult athletes Kalara et al. (1980) reported a significant difference in athletic performance of children having poor nutritional status and good nutritional status

Diet and nutrition play an important part in the performance of an athlete (Navaratilova, 1983) Hass (1983) was of the opinion that the active people can improve their stamina, sports performance and health, through the scientific use of food supplements and concentrates.

In a report of American dietetic Association (1980) noticed that athletes are well known for their food fads and fallacies Nirupa et al. (1989) opined that the lack of nutritional knowledge was the cause for the dominance of food fads and beliefs in athletes According to Helan (1979) digestibility of the pre-game meal of an athletes, who is under emotional stress is an important factor in athletic performance. Carpender (1981) expressed that athletes should avoid coffee and tea Billiaert et al (1984) pointed out that caffeine can create anxiety, insomnia and headache in athletes and this inturn could interfere with athletic performance. Swaminathan (1974) revealed that tea and coffee may have an immediate stimulating action but have a depressing effect after three or four hours and thus interfere

with the physical performance Greccer (1977) stated that fast foods are not likely to lead to any nutritional disorders among athletes Pande et al (1987) reported that highly spiced foods should be avoided during athletic competition Haris (1966) reported about the usage of dried figs as a concentrated source of carbohydrate for athletes Haas (1983) was of the opinion, that taking large meal before competition or exercise will affect performance of an athlete

Warblow (1978) reported that athletes are especially concerned with diet as it is related to weight control Clara (1980) pointed out ^{that} the high school athletes are particularly interested in diet and programmes to both gain and lose of weight to achieve desired ratio of muscle strength to body weight. Panos et al (1989) reported that athletes' weight and running performance remained substantially constant.

Per-olof (1980) suggested that the need for most of the nutrients is comparatively independent of the individual's activity level The amount of energy expended for physical work is the largest single factor in determining a person's total energy needs, besides the energy expenditure for basal metabolism (Nirupa et al , 1989). According to Edward (1981) various activities involve specific demands for energy

Widdowson (1947) pointed out that the energy expenditure variation persisted with age, weight, height or surface area of the individual, for children who are engaged in sports. Harris et al (1982) pointed out that the calorie requirements varies with the environment in which the activity is conducted. Dauncey et al. (1983) suggested that total energy intake and environmental temperature have a significant influence on energy balance in athletes. Garby et al (1990) had reported that the energy expenditure at rest and various degrees of physical activity, changes with environmental temperature. David (1975) observed that the body size may play a role in the energy expenditure of sportsmen. In running, a longer person will be doing more work and will spend greater amount of energy. Durnin (1990) was of the opinion that measuring the energy expenditure will provide some of the essential information in the dietary modification in athletes. Morehouse et al. (1971) opined that the energy expenditure is commonly determined by calculations from respiratory data. Spence (1977) reported that energy requirements for athletes can be assessed by adding basal rate from estimate of lean body mass to an assumed energy expenditure of 80 Kcals per minute.

According to Williams (1972) a well balanced normal diet with increased calories is what athletes need. Rodwell (1988) was of the opinion that the daily recommended allowance

of calories will support only the body maintenance in most of the athletes. Lothar et al. (1989) was of the opinion that in athletes the observed energy intake exceeds the recommended daily allowances. Carpender (1981) had reported that the calorie requirement of athletes will be doubled during periods of heavy physical activity. Satyanarayana et al. (1985) also supported the same view. According to Jana (1989) the ability to lower the energy cost of certain physical work load, seemed to be one of the pre-requisite for high performance in some athletes. Carpender (1981) stated that though eating before competition has been a subject of controversy, small and balanced meal of 500 Kcals do not produce an adverse effect on the athletic performance. Pollock et al. (1977) reported that a delicate balance between energy expenditure and food intake is often not maintained in sedentary people. Carpender (1981) reported that the higher energy needs of physical activity must be met, but there is often some loss of body weight and a shift in body composition toward more lean and less fat. Dakshayani et al. (1962) proved that the basal metabolic rate of an athlete was not significantly different from that of non athletes. Devadas et al. (1979) reported that the average caloric intake in all the sports categories is about 400 Kcals more than the recommended allowances. Gopalan et al. (1982) suggested that 4320 Kcals should be

provided for men and 3480 Kcals for women engaged in sports activities. Laricheva et al (1979) revealed that energy intake was about 3000 to 3500 Kcals in most athletes

A diet survey was conducted by NIN (1983) in a hostel of the Andhra Pradesh Sports Council at Hyderabad Findings of the survey indicated that the diets provided around 4000 Kcal, 90 to 120 g protein and 90 to 100 g of fat per day per athlete Celijowa et al. (1970) opined that the mean daily energy intake and energy expenditure among weight lifters were 3900 Kcals and 3667 Kcals respectively Devadas (1988) reported a deficit of 185 Kcals in athletes Guzman et al. (1972) reported a mean energy expenditure of 3181 Kcals per day, as against an energy intake of 3007 Kcals per day among athletes. Johnna (1981) reported that the energy expenditure from reclining to extremely heavy activities ranges from about 72 to 720 calories per hour. Franklin (1969) reported that running at 20 miles per hour would require approximately 37 litter of oxygen per minute Kalata (1986) showed that the low calorie intake, abnormal calcium metabolism and increased bone reabsorption may produce athletic amenorrhoea

Jaleovleve et al (1975) had reported that carbohydrates can provide energy upto 64 per cent of the total requirement in athletes. Issekutz et al. (1963) reported

that athletes on high carbohydrate diets used higher proportion of carbohydrates for energy and those on a low carbohydrate diet used fat for this purpose. Carter (1982) suggested that on endurance, athletes who consume a high carbohydrate diet for 3 or 4 days after several days on a normal mixed diet may increase their glycogen store from the normal 15 gms to around 25 gms per kg of muscle. Forgue (1979) had pointed out that the purpose of carbohydrate loading is to supersaturate the muscle glycogen to be used in athletic competition. Jette et al (1978) reported that glycogen loading in athletes reduces the niacin intake in a carbohydrate rich diet. Per-olof (1980) stated that a diet rich in carbohydrate for a few days, increases the glycogen and attain super normal values. Seals et al. (1984) had also proved that the young and old athletes and young untrained men have exhibited similar glucose tolerance. Richard (1981) opined that an adequate glycogen store is essential to meet the needs of high intensity training sessions. Conzalozio et al. (1972) reported that normal reserves of about 800 to 1000 Kcals in the form of glycogen in the liver and muscle can be almost doubled by a dietary regimen of low carbohydrate, high fat and protein for several days. The insulin sparing effect of athletes depend substantially on the level of food intake and physical activity (Leblance et al , 1981)

Van et al (1960) suggested that an athlete being in the growing phase, needs extra protein to meet his growth requirements in addition to the extra protein required for training. On the contrary, Goodman et al (1987) suggested that exercise has negligible effect on protein requirements because aminoacids contribute, very little to the energy expended during exercise. Raymond (1976) depicted that in hot climates the food intake is less and less protein is required as its digestion only produces extra heat. According to Carpender (1981) a large protein diet may cause dehydration and constipation in athletes. Lewis (1977) supported the view that high protein diet improves athletic performance is a wide spread misconception.

Edward (1986) reported that fat free diet is generally positively correlated with athletic performance. William et al (1986) pointed out that the low fat levels in marathon runners which ranged from 1 to 8 per cent of body weight probably reflects on adaption to the severe training requirements. Watson (1977) opined that the percentage of fat was related positively to arm circumference and negatively to height in athletes. According to Lukastri et al (1984) the poly unsaturated fat diet significantly decreases cholesterol in comparison with saturated fat and carbohydrate diet in athletes. The relation with lipid and apolipoprotein profiles showed that swimmers had greatest value for high

density cholesterol and lowest for apolipoprotein B (Ericn et al , 1985) Nikkila et al. (1978) reported a highly significant positive relation between the serum high density lipoprotein cholesterol and low lipoprotein activity in athletes Harris (1982) reported that an athlete in top performance condition generally carries no more than 7 per cent of his body weight in fat.

Ben (1991) reported that the average Indian athletes eats so well that his diet provides all the needed vitamins He also pointed out that the athletes consume the diets containing adequate allowances of animal proteins, vegetables, green leaves, fruits, cereals and milk, and provide the requisite quantities of all the vitamins

Recommended daily allowances of various vitamins and minerals for athletes had been worked out in order to protect their body against deficiency states (Inge et al., 1986). According to Vander et al. (1984) the marginal deficiency of vitamins and minerals influence the performance in athletes. Dorothy (1980) reported that vitamin C will prevent injuries in athletes. He further pointed out that wheat germ oil improves running performance while vitamin B increases endurance in athletes Ben (1991) was of the opinion that vitamin E is consumed with the belief that it will enhance the bio-availability of oxygen in tissues,

improving performance Kristen et al. (1978) expressed that wheat germ and vitamins can be used to improve overall performance during the training seasons in athletes. On the contrary Frank et al. (1988) stated that there is no difference in the vitamin needs of athletes and other active people with that of the requirements of sedentary people. Sharman et al. (1971) reported that deficiency of vitamin B could result in lower muscular performance in athletes. Satyanarayana et al. (1985) recommended an allowance of 3 to 4 mg of thiamine and Riboflavin per day for athletes. Requirements for vitamin C and vitamin E increases in athletes undergoing training in polluted city environment. Vitamin C, E and B in heavy doses, are said to increase endurance but are not well supported by scientific evidences.

Darden (1977) opined that safe quantities of water and sodium chloride should be incorporated in the diets of athletes. Salts can increase the capacity to perform muscular work by altering circulatory ammonia levels (Mathews et al., 1988). Huralambic (1981) observed potassium deficiency in distance runners while Stewart et al. (1984) reported iron deficiency anaemia in long distance runners. Mirrian et al. (1986) suggested that amenorrhoea which may lead to deleterious, long term health consequence in athletes can be prevented with mineral rich diets. Manhan (1984) viewed that athletes has an increased need for water, total

energy, carbohydrate vitamin B and protein

Ben (1991) pointed out that athletes who voluntarily lose weight by controlling their diet should be cautious to take enough vitamins in their diet as vitamin requirements would be the same prior to weight control, during and after

The haemoglobin level was found to be higher for athletes than normal, possibility due to a physiological response to stress and if returned to normal when the boys had become accustomed to their new environment (Larbadarius et al., 1976) Popkin et al (1982) reported that low haemoglobin levels decreases the scholastic achievements of the athletes

Haas (1983) opined that different sports make different metabolic demands of the body.

According to Howard et al (1982) the prolonged exercise in man can decrease the muscle glycogen which may cause hypoglycaemia Chandra (1982) suggested that the muscles are to be kept gently, active for sometime after exercise to facilitate better blood circulation which inturn removes the waste products of excessive metabolism during exercise. David (1975) had proved that large amount of glucose during exercise apparently does not inhibit glycogen breakdown appreciably Harris et al. (1982) reported that exercise lowers blood sugar levels Hunter (1965) reported

that the levels of serum growth hormone is elevated during physical exercise. During the major part of exercise, post oxygen consumption of athletes could be due to an elevation in tissue temperature and increased levels of circulating catecholamines (Gaesser, 1984). Astrand (1986) depicts that the amount of oxygen needed to eliminate the lactate produced during exercise is greater. Jan et al (1990) reported that single bouts of prolonged exercise have a persisting effect on the type of substrate oxidised in the fasting state. Leaf (1989) stressed about the persistence of physical exercise during post competitive years. Ivy et al (1981) stated that in the absence or withstand levels of insulin muscles moderately depletes of its glycogen content by exercise, and demonstrate greater glucose uptake. Leblance et al (1974) suggested that highly trained subjects demonstrate a lower insulin response than that observed in non-trained subjects. Billiaert et al. (1984) opined that there is an increase in the plasma glucose, urea, creatinine, bilirubin and ketone body production in athletes. Bell et al. (1976) reported that the maximum oxygen uptake capacity of the static muscle power, indicated by radial and femoral flexing and stretching, heart rate during effort, and percentage of body fat as skinfold thickness differ significantly between athletes. Lidhurge et al. (1984) stated that there was significant decrease in cortical and trabecular

bone density in the amenorrhoeic runners compared with values in the normal control and euamenorrhoeic runners. Carter (1982) showed that the Indian gymnastics have lesser body fat which leads to the development of better muscle mass.

MATERIALS AND METHODS

MATERIALS AND METHODS

Assessment of Nutritional status of school children residing in G V Raja Sports School was undertaken

1. To ascertain their food habits
- 2 To assess the nutritional status of school children involved in sports activities
- 3 To determine the energy expenditure with special reference to sports in which the children are engaged
4. To evaluate the existing hostel diet with respect to nutritional adequacy

1. Area of study

G V. Raja Sports School, Sanghumugham, Thiruvananthapuram was selected for the study due to the following reasons

1. There are only two sports school in the State and G.V. Raja Sports School is a residential sports school situated in Thiruvananthapuram district
11. The school is operated mainly to educate young athletes and financed by the Government of Kerala and by the Sports authority of India.

2. Selection of sample

The total strength of the school during the study period was three hundred and forty seven The children were involved in different sports activities such as football, basketball, volleyball, athletics, gymnastics, cricket and

FIG. 1
SELECTION OF SAMPLE (G.V. RAJA SPORTS SCHOOL)



FIG. 1
SELECTION OF SAMPLE (G.N. RAJA SPORTS SCHOOL)



hockey The age range of the children were between thirteen to seventeen years Details of the children selected for the study are presented in Table 1

Table 1. Details of the children selected for study

Sl. No.	Activity	Male	Female	Total
1	Basketball	17	9	26
2	Volleyball	22	18	40
3	Hockey	14	16	30
4	Athletics	46	31	77
5	Football	24	0	24
6	Gymnastics	3	0	3
Total		126	76	200

One hundred and forty seven children coming under the following categories were eliminated

The children involved in cricket could not be spared for study since they were having their practice for longer time. Children with scholarship from sports authority of India were deleted since they used to have extra food along with their hostel diets. The eighth standard children had just joined the hostel during the study period and ~~were~~ not included.

3. Conduct of the study

- (i) Ascertaining the social background of the families and dietary and food consumption pattern of the children.

An interview schedule to elicit information on the dietary habits of school children was suitably structured and pre-tested and finalised. Information about the family size, religion and caste, birth order of the child, sports activities in which they are at present involved, food consumption pattern at the hostel and also at home, food preference of the children, general meal pattern during pre and post game period and foods preferred during competitions were the details included in the schedule. The data were collected by interview method. The schedule used is presented in Appendix I. Influence of the socio-cultural factors on the food habits of the children were also ascertained.

- (ii) Assessing the nutritional status

Nutritional status of the children were assessed using the following methods

- (a) Anthropometric measurements
- (b) Clinical examination
- (c) Biochemical examination
- (d) Food weightment survey

FIG. 2
MEASUREMENT OF WEIGHT



FIG. 3
MEASUREMENT OF HEIGHT



FIG. 4

MEASUREMENT OF MID ARM CIRCUMFERENCE



(a) Anthropometric measurements

Anthropometric measurements are reported to be an internationally accepted system for determining nutritional status (Chen et al , 1978). Body weight and height along with measures of sub cutaneous fat such as skinfold thickness are considered to provide adequate information about the body size and fitness of the athlete (Fransancho, 1982) Anthropometric measurements of two hundred athletes were taken according to the techniques explained by Jelliffe (1960). The measurements recorded were height, weight, circumference of mid upper arm, and skinfold thickness Details of the standard techniques used are presented in Appendix II.

(b) Clinical examination

Clinical examination is stated to be one of the most essential and the simplest tool used in the evaluation of human nutritional status (Gupta et al., 1978) Clinical examination is part of nutritional assessment through which direct information of signs and symptoms of dietary deficiency prevalent among the school children can be collected. The clinical deficiency, symptoms was assessed by qualified physician using a schedule presented in Appendix III

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FIG. 5
HAEMOGLOBIN ESTIMATION



(c) Biochemical examination

The haemoglobin level of selected two hundred children was estimated by cyanmethaemoglobin method (Dacie et al., 1975). Details of the method is presented in Appendix IV.

(d) Food weighment survey

Food weighment method was used to elicit information on actual food consumed. The schedule used for this purpose is presented in Appendix V. Out of the two hundred children, ten boys and ten girls were selected at random for weighment survey. Care was taken to get a representative sample from the different categories. Since the weighment survey was conducted in hostel, one day weighment was done. The raw food used for cooking in the hostel were weighed and total cooked weight of all the food items was recorded. Raw equivalent for the prepared items consumed were then computed. The nutrients available in food intake was calculated using food composition table (ICMR, 1987).

Nutritional and dietary adequacy of the hostel diet

Nutritional and dietary adequacy of hostel diet was determined in comparison with the components of balanced diet prescribed for children of that particular age group.

4 Monitoring energy expenditure pattern

The energy expenditure pattern of the children were calculated by using prediction equation suggested by ICMR² (1989) details are presented in Appendix VII

5. Statistical treatments

Suitable statistical analysis were done.

RESULTS

RESULT

A study on "Assessment of Nutritional status of school children residing in G.V Raja Sports School was conducted. The data collected was analysed and the results are presented under the following headings.

1. Social status of the families
2. Dietary and food consumption pattern of the children
3. Nutritional status of the children
4. Dietary adequacy of hostel diet and
5. Energy expenditure pattern of the children

1 Social status of the families studied

Under social status, the data analysed are grouped under religion and castewise distribution of the families, types of families, family composition and birth order of the child. The religion and castewise distribution of the families are given in Table 2.

Table 2 Religion and castewise distribution of families

Religion and caste	Boys		Girls		Total percentage
	No.	Per cent	No.	Per cent	
Hindu	48	38.09	34	45.94	41
Christian	62	49.20	38	51.35	50
Muslim	16	12.70	2	2.70	9
Total	126	100.00	74	100.00	100
Caste					
Forward caste	80	63.40	49	66.20	64.5
Backward caste	31	26.6	24	32.40	27.5
Scheduled caste	15	11.9	1	1.3	8
Total	126	100.00	74	100.00	100

Table 2 revealed that 50 per cent of the children were Christians, 41 per cent of the children were Hindus and remaining 9 per cent were Mus'ims. Castewise distribution of the families revealed that 64.5 per cent belonged to forward community and 27.5 per cent belonged to backward and 8 per cent belonged to scheduled castes.

Details related to the type and size of the families are presented in Table 3.

Table 3. Type and size of the families surveyed

Type and size of the families	Boys		Girls		Total	
	No.	Per cent	No.	Per cent	No.	Per cent
<u>Type of the family</u>						
Nuclear	16	12.7	23	31.0	39	19.5
Joint	110	87.3	51	69.0	161	80.5
Total	126	100.0	74	100.0	200	100.0
<u>Size of the family</u>						
Small size (upto 4 members)	16	12.7	23	31.0	39	19.5
Medium size (4-7 members)	64	50.8	23	31.0	87	43.5
Large size (upto 10)	46	36.5	28	38.0	74	37.0
Total	126	100.0	74	100.0	200	100.0

As revealed in Table 3, 19.5 per cent families belonged to nuclear type while 80.5 per cent belonged to joint families. On the basis of family size 19.5 per cent were small families with members upto 4, while 43.5 per cent medium sized families with 4 to 7 members Remaining 37.0 per cent were large families with members upto 10.

Table 4 presented the details of the children in the families.

Table 4. Details of children in the family

Particulars	Boys		Girls		Total	
	No.	Per cent	No.	Per cent	No.	Per cent
One child	36	28.67	11	14.9	47	23.5
Two children	41	32.6	25	33.8	66	33.0
Three children	21	16.7	23	31.0	44	22.0
Four and above	28	22.2	15	20.27	43	21.5
Total	126	100.00	74	100.00	200	100.00

As depicted in Table 4, while 23.5 per cent of the families had only one child 33 per cent of the families had two children. In 22.0 per cent of the families, there were three children. Remaining 21.5 per cent families had more than three children.

The birth order of the selected children are presented in Table 5.

Table 5. Birth order of the selected children

Birth order of the child	Boys		Girls		Total	
	No.	Per cent	No.	Per cent	No.	Per cent
1	23	18.2	21	28.3	44	22.0
2	27	21.4	19	25.6	46	23.0
3	18	14.2	13	17.6	31	15.5
4	26	20.7	10	13.6	36	18.0
Above 4	32	25.3	11	14.9	43	21.5
Total	126	100.0	74	100.0	200	100.0

As revealed in Table 5, 18.2 per cent of the boys were first in birth order while 21.4 per cent of boys were second in birth order. Among girls 28.3 per cent were first in birth order and 25.6 per cent were second in birth order. The per cent of children (boys and girls) belonging to third and fourth birth order were 15.5 per cent and 18.0 per cent respectively.

2 Dietary and food consumption pattern of the children

Details regarding the dietary habits of the children were collected and it was observed that all the children were in the habit of taking non-vegetarian foods.

Food combinations generally followed by the children in their home diets were collected and are presented in Table 6.

Table 6. Food combinations followed by the children in their home diets

Food combination	Boys		Girls		Total	
	No.	Per cent	No.	Per cent	No.	Per cent
Cereals, pulses, tubers, vegetables, leafy vegetables, animal foods and milk	33	26.1	21	28.3	54	27
Root and tubers, fish and cereals	27	21.4	23	31.0	50	25
Cereals and pulses vegetables with animal foods	26	20.7	8	10.9	34	17
Cereals with animal foods	9	7.1	15	20.2	24	12
Cereals, pulses, animal foods and milk	31	24.7	7	9.4	38	19
Total					200	100

Twenty seven per cent of the children followed a variety of food combinations in their home diet.

Twenty five per cent of the children preferred to consume only limited food combinations like root and tubers with fish and cereals and 19.0 per cent were used to the food combinations including cereals, pulses, animal foods and milk in the daily diet. Seventeen per cent preferred cereals, vegetables with animal foods and 12 per cent preferred food combinations with cereals and animal foods.

Table 7. Food preferences of the children for various food combinations (in general)

Food combinations	Boys		Girls		Total	
	No.	Per cent	No.	Per cent	No.	Per cent
Cereal + meat + vegetable	40	31.8	30	40.6	76	35
Cereal + meat + fruits	39	31.0	3	4.0	42	21
Cereals + pulses + root & tubers + fish + meat + fruits	26	20.6	18	24.3	44	22
Cereal + sweets + fruits + milk	21	16.6	23	31.0	44	22
Total	126	100.0	74	100.0	200	100

Table 7 depicted that food combinations like cereals with meat and vegetables preparations (32 per cent in boys

and 41 per cent in girls), cereals with meat and fruits (31 per cent in boys and 4 per cent in girls) and mixed food combinations like cereals and pulses, root and tuber, fish and meat preparations (21 per cent boys and 24 per cent girls) and cereals preparations with sweets, fruit juice and milk (17 per cent boys and 31 per cent girls) were preferred by the children

Major reasons pointed out by children for their preferences for various food combinations were taste and nutritive value. Majority of the children, 69 per cent of the boys and 86 per cent of the girls gave more weightage for 'taste', for recording the food preferences. While 11 per cent of the boys and 1 per cent of girls considered nutritive value of the food as a basis for their food preferences

Opinion regarding the similarity of the hostel diet with home diet was collected and is presented in Table 8

Table 8. Similarity of the hostel diet with home diet

Opinion	Boys		Girls		Total	
	No.	Per cent	No.	Per cent	No.	Per cent
Similar to home diet	2	1.5	4	5.4	6	3
Not similar to home diet	124	98.5	70	94.6	194	97
Total	126	100.0	74	100.0	200	100

Table 8 explained that only 3 per cent had the opinion that their hostel diet was similar to home diet. Remaining 97 per cent had reported that hostel diet was different from their home diet.

One week menu followed in the hostel diet was collected and is given in Table 9

From the menu it was observed that foods from various food groups such as cereals, pulses, root and tubers, fruits, vegetables and non-vegetarian items such as fish, egg, and meat and milk products were found to be included in the hostel diet

Table 9. General Menu for 1 week

1st day	2nd day	3rd day	4th day	5th day	6th day	7th day
<u>Early morning</u>						
Black coffee	Black coffee	Black coffee	Black coffee	Black coffee	Black coffee	Black coffee
<u>Breakfast</u>						
Sandal bread, banana and tea	Puttu, sandal, banana, egg	Uppuma, egg, banana, tea	Puttu, sandal, egg, banana, tea	Bread, potato curry, tea	Bread, potato curry, egg, banana, tea	Uppuma, egg, banana, tea
<u>Lunch</u>						
Rice, egg, curry, thoran, dhal curry, rasam, pickle	Rice, fish, curry, thoran, sambar, rasam, pickle	Rice, fish, curry, thoran, pulisery, rasam, pickle	Rice, fish, curry, thoran, sambar, rasam, pickle, curd	Rice, fish, curry, thoran, dhal curry, rasam, pickle	Rice, fish, curry, thoran, sambar, rasam, pickle	Rice, fish, curry, pulisery, rasam, pickle
<u>Evening snacks</u>						
Biscuit, tea and horlicks milk	Uzhunnu vada, tea, horlicks and milk	Biscuit, tea, horlicks and milk	Banana, cake, horlicks with milk	Biscuit, tea, horlicks with milk	Bun, horlicks with milk	Bread roset, horlicks, milk
<u>Dinner</u>						
Chappathy, rice, meat, curry, potato, thoran, dhal curry, rasam	Rice, egg, curry, sambar, thoran, pickle	Chappathy/ rice, meat, curry, potato, thoran, dhal curry, rasam	Rice, egg, curry, parippu, pulisery, thoran, pickle	Chappathy/ rice, meat, curry, potato, thoran, dhal, curry, rasam	Rice, meat, curry, pulisery, thoran, pickle	Rice, potato, curry, egg, thoran, pickle, rasam

Variations in the hostel diet in comparison with home diet as reported by the children are presented in Table 10.

Table 10 Variations as reported by the children regarding the hostel diet

Variation	Boys		Girls		Total	
	No	Per cent	No.	Per cent	No.	Per cent
Hostel diet is tasteless	49	39.0	43	58.1	92	46
Strict time schedule in the hostel	35	27.8	6	8.1	41	20.5
Inclusion of more amounts of animal foods	27	21.4	12	16.2	39	19.5
Less inclusion of tubers and vegetables	9	7.1	8	10.9	17	8.5
Non availability of milk insufficient quantities	4	3.1	1	1.3	5	2.5

As depicted in the Table 10, 46 per cent of children had the opinion that food served in the hostel was tasteless and 20.5 per cent of the children had felt that rigid time schedule followed for the meals in the hostel needs to be modified. Nineteen point five per cent children reported that in the hostel diet, more amount of animal foods such as egg, fish and meat were included. Less inclusion of

roots and tubers and milk was also reported by the children (8.5 per cent and 2.5 per cent respectively)

Table 11 represents the food combinations in the hostel as preferred by the children

Table 11 Food combinations in the hostel diet

Food stuffs	Boys		Girls		Total	
	No	Per cent	No.	Per cent	No.	Per cent
Cereals, pulses, animal foods and vegetables	38	30.1	30	40.5	68	34
Cereals, root & tubers, vegetables	22	17.4	20	27.0	42	21
Cereals, pulses and animal foods	34	27	14	18.9	41	24
Cereals, leafy vegetables and eggs	32	25.3	10	13.5	42	21
	126	100.00	74	100.00	200	100.00

Table 11 revealed that 34 per cent of the children preferred to consume cereals, pulses, animal foods and vegetables, served in the hostel diet while 21 per cent of the children preferred to consume cereals, roots and tubers with vegetable combinations. Cereals, pulses and animal food combinations were found to be liked by 24 per cent of the children. Twenty one per cent were preferred food

combinations such as cereals, vegetables, leafy vegetables and eggs.

Preferences of the children for various food preparations served in the hostel were ascertained and data are presented in Table 12.

Table 12. Preference of children for various food preparations served in the hostel (in general)

Food preference	Boys		Girls		Total	
	No.	Per cent	No.	Per cent	No.	Per cent
Chappathy/puri with roots and tubers	112	88.9	69	93.2	181	90.5
Chappathy with meat curry	11	8.8	2	2.8	13	6.5
Rice with vegetable curries	3	2.3	3	4.0	6	3
Total	126	100.00	74	100.00	200	100.00

Majority of the children (90.5 per cent) preferred Chappathy, puri with vegetable curries, to other preparations served in the hostel. Chappathy with meat preparations were liked by only 6.5 per cent. The remaining 3 per cent preferred rice with vegetable curries among the different preparations served in the hostel.

Apart from the normal diet, in the sports school pre game meals were generally taken by the children, 5 to 15 minutes before the various sports and game activities.

The type of foods taken as pre-game meal and the children's preferences for them are shown in Table 13

Table 13 Special food and drink taken by the children before games

Special foods/ drinks	Boys		Girls		Total	
	No.	Per cent	No.	Per cent	No.	Per cent
Glucose	13	33.3	15	50	28	40.5
Banana and Lime juice	2	5.1	5	16.6	7	10.1
Banana and glucose	17	43.5	5	16.6	22	31.8
Grapes	7	17.9	5	16.6	12	17.3
Total	39	100.00	30	100.00	69	34.5
No special foods	87	-	44	-	11	65.5
					200	100.00

s revealed in Table 13 only 34.5 (32 per cent Boys and 40 per cent Girls) per cent of the children were in the habit of taking special foods before games. Forty point five per cent of children (33.3 per cent boys and 50 per cent girls) used to consume glucose Eleven per cent of the children (5.1 per cent boys and 16.6 per cent girls) used to consume banana and glucose and 6 per cent used to consume grapes and remaining 3.5 per cent used to consume banana and lime juice as special foods.

As in the case of pre game meals, post game meals were also served as the sports school.

Special foods taken during post game period by the children are presented in Table 14.

Table 14. Special foods taken during post game period

Meal pattern	Boys		Girls		Total	
	No.	Per cent	No.	Per cent	No.	Per cent
Glucose	10	62.5	6	46.1	16	8
Fruits	6	37.5	7	53.9	13	6.5
Total	16	100.00	13	100.00	29	14.5
No special meal	110	87.3	61	82.4	171	85.5
Total	-	-	-	-	200	100.00

Table 14 explained that only 14.5 per cent of children had the habit of taking special foods after games. Eight per cent were found to take glucose while 6.5 per cent take fruit as special food during post game period.

There is a practice of taking special foods by the children who were selected for various competition in sports & games.

The habits of taking such special foods by the children while preparing for competitions are given in Table 15.

Table 15 The habit of taking special foods by the children while preparing for competitions

Sex	Food selected		Not selected	
	No	Per cent	No.	Per cent
Boys	39	31	87	69.0
Girls	30	40.6	44	59.4
Total	69	34.5	131	65.5

As revealed in Table 15, 34.5 per cent children had the habit of including special foods in their diets, while 65.5 per cent did not include special food while preparing for competitions.

On analysing the type of special foods taken by the children, it was found that majority of the children (74.5 per cent boys and 64.5 per cent girls included fruits as additional food items in their diets. Remaining children included glucose while preparing for competition (boys 24.3 per cent and girls 66.7 per cent).

Certain dietary modifications were brought in the diets of the children while preparing for competition.

The pattern of dietary modification followed by the children before the competitions are presented in Table 16.

Table 16. Modification in the meal pattern of the children during competitions

Modifications	Boys		Girls		Total	
	No.	Per cent	No	Per cent	No	Per cent
Normal foods taken without any modification	103	81.7	48	65.0	151	75.5
Rice restricted	13	56.8	3	11.6	16	32.7
Quantity reduced in all food-stuffs	10	43.4	23	88.4	33	67.3
	23	100.00	26	100.00	49	100.00

From the table it was clear that 24.5 per cent of children had modified their diet, while majority of the children did not change their diets. Among the children who modified their diets, majority of them (67.3 per cent) restricted the quantity of the foods they consumed while 32.7 per cent restricted the intake of rice

3. The nutritional status of the selected children

Nutritional status of the selected children was assessed by collecting the information on anthropometric measurements namely weight, height, mid arm circumferences and skinfold thickness. The weight for age profile of the children is presented in Table 17.

FIG. 6
WEIGHT FOR AGE PROFILE OF BOYS

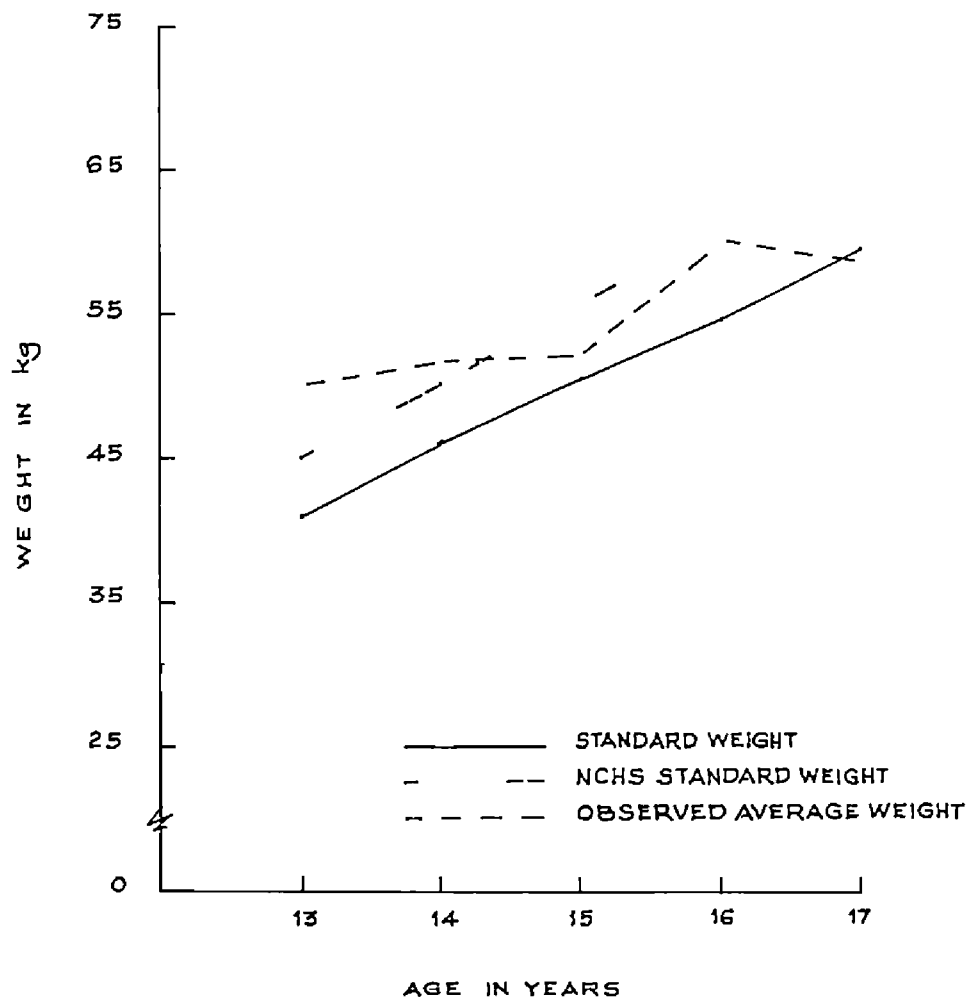


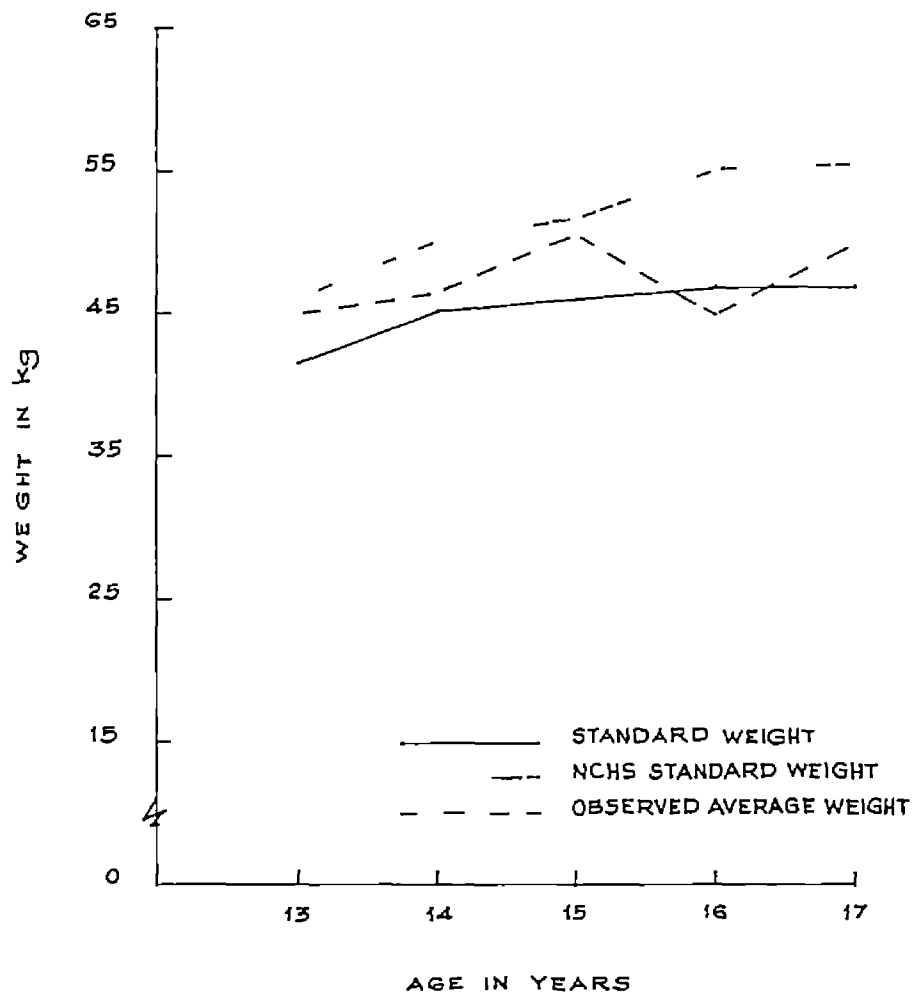
Table 17 Weight for age profile of selected children

Age	Sample size	Observed average weight (kg)	Standard weight (kg)	NCHS standard	tn-1
<u>Boys</u>					
13	14	50 0	42.3	45	1.01
14	52	53 9	47 2	50 8	0.98
15	21	54 4	51 1	56 7	0.36
16	28	60.5	54 7	62 1	0.54
17	11	58.9*	59 0	66.3	0.01
<u>Girls</u>					
13	22	45 6	43 8	46 1	0.34
14	27	48.5	45.0	50.3	0.73
15	10	51.8	47.2	53.7	1.01
16	11	45 0	49 0	55 9	1.04
17	4	50.5*	49.9	56 7	0.07

* ICMR standard (1968)

The weight for age profile of the children were compared with the standard suggested by Vijayaraghavan (1971) and also with NCHS stds (1980). The average weight for age ranged from 55.0 to 60.5 kg for boys and 45 0 to 51.8 kg for girls. Comparison of the observed weight for age of the boys with that of standards revealed that observed

FIG 7
WEIGHT FOR AGE PROFILE OF GIRLS



average weight for age of the boys did not significantly differ from the standard. However when compared to NCHS standard the observed weight fall short from standards in the age groups 15, 16 and 17 for boys and in all age groups for girls.

Table 18 Height for age profile of selected children

Age	Sample size	Observed average height (cm)	Standard height (cm)	NCHS standard	tn-1
Boys					
13	14	163.2	155.6	156.5	1.29
14	52	163.4	162.5	163.1	0.17
15	21	162.5	165.4	169.0	0.43
16	28	166.6	168.3	173.5	0.30
17	11	168.6	168.9*	176.2	0.43
Girls					
13	22	154.0	153.4	157.1	0.08
14	27	154.5	154.5	160.4	0.00
15	10	156.0	155.7	161.8	0.06
16	11	155.9	155.7	162.4	0.06
17	4	154.7	156.7*	163.1	0.40

* ICMR Standard (1968)

The average height for age of the children are presented in Table 18. The average height for age ranged from 162.5 to 168.6 cm for boys and 154.0 to 156.0 cm for girls. The observed average height for age were not

HEIGHT FOR AGE PROFILE OF BOYS

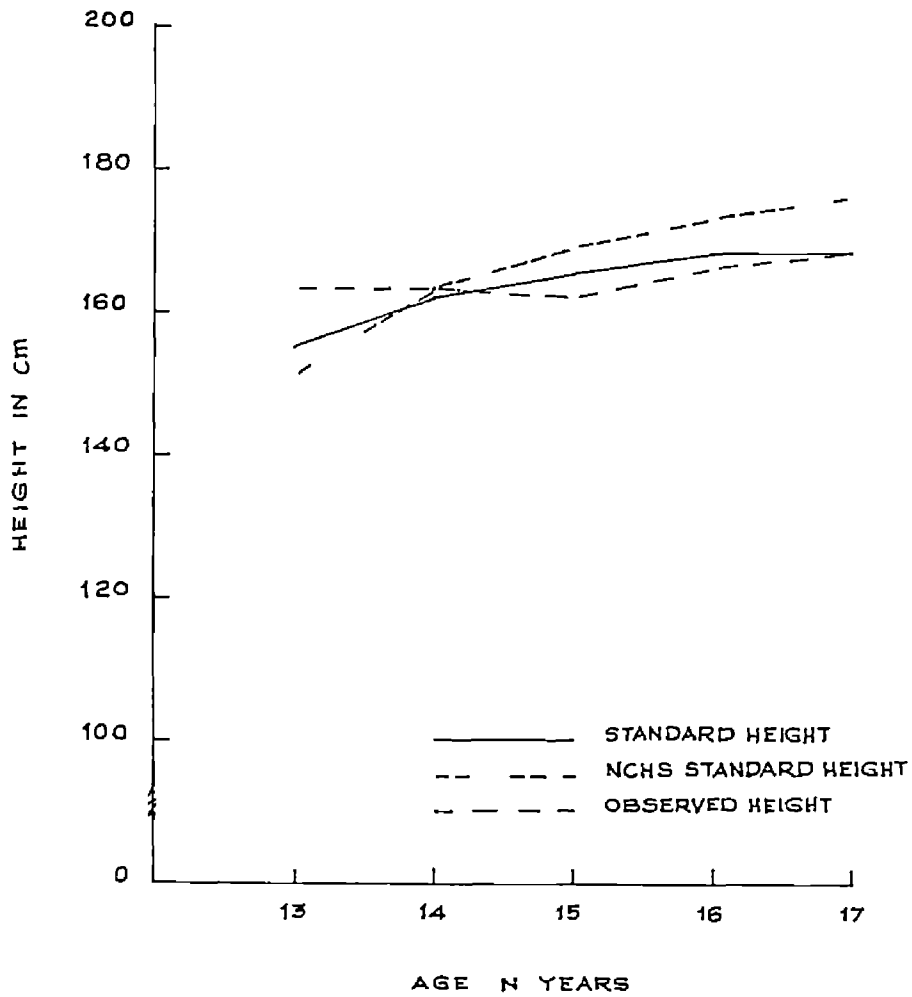
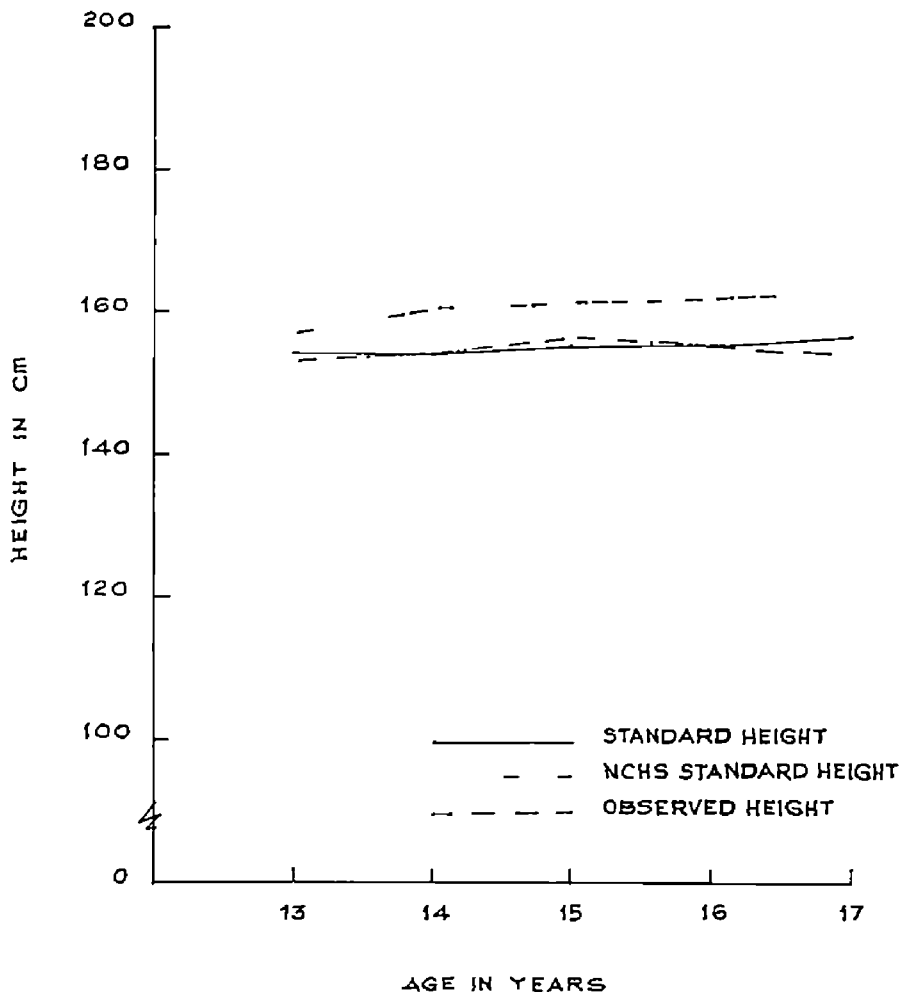


Fig 9
HEIGHT FOR AGE PROFILE OF GIRLS





significantly different from standard height suggested by Vijayaraghavan et al (1971) for boys and girls. However when compared to NCHS standard height for age of boys and girls were below the standards in all the age groups except 13 and 14 years in boys.

Body mass index is regarded as a good indicator of nutritional status (NIN, 1991). Body mass index of all the children were calculated and the data are presented in Table 19.

Table 19 Body mass index of the children

	Boys		Girls	
	No.	Per cent	No.	Per cent
Below normal	59	46.6	26	35.1
Normal	54	44.4	47	63.5
Above normal	13	10.3	1	1.3

(*20-25)

(*19-24)

*Normal value of BMI

From the above table, it is clear that 44 per cent of boys and 64 per cent of girls come under the normal range of body mass index, while 46 per cent boys and 35.1 per cent girls come below the normal values. 10 per cent in boys and 1 per cent in girls body mass index was found to be above the normal.

Arm circumference of the children are presented in
Table 20

Table 20 Arm circumferences of the children

Age	Sample size	Standard Arm circumference (cm)	Observed average arm circumferences
<u>Boys</u>			
13	14	21.09	26.9
14	52	22.22	27.0
15	21	23.22	26.2
16	28	24.06	25.5
17	11	24.82	26.6
<u>Girls</u>			
13	22	21.43	24.6
14	27	22.06	25.3
15	10	22.02	26.5
16	11	23.24	25.1
17	4	22.35	25.6

The average arm circumference of children were compared with the standards suggested by Vijayaraghavan et al (1971). The average arm circumferences ranged from 25.5 to 27 cm for boys and 24.6 to 26.5 cm for girls. It was observed that, Arm circumferences of both boys and girls

in all age groups were found to be above the standards suggested

Skinfold thickness of the children are presented in Table 21.

Table 21 Triceps skinfold thickness of the children

Age	Sample size	Standard skinfold thickness (mm)	Observed average skinfold thickness (mm)
<u>Boys</u>			
13	14	9.49	9.0
14	52	9.08	10.5
15	21	9.03	11.8
16	28	9.21	12.7
17	11	9.32	13.1
<u>Girls</u>			
13	22	13.20	9.6
14	27	13.72	10.7
15	10	14.06	11.2
16	11	14.46	11.9
17	4	13.46	13.1

The average skinfold thickness ranged from 9.0 to 13.1 mm for boys and 9.6 to 13.1 mm for girls. Observed skinfold thickness of boys when compared with the standard skinfold thickness as suggested by Vijayaraghavan (1971)

it was found that except in the age group of 13 years in boys, skinfold thickness was above the standard. However, observed skinfold thickness of girls was found to be below the standard in all the age groups.

Children were examined for various clinical symptoms and the findings are presented in Table 22.

Table 22 Clinical status of children

Deficiencies	Boys		Girls		Total	
	No	Per cent	No	Per cent	No	Per cent
Teeth carries	48	38.0	20	27.0	68	34
Mottled enamel	14	11.1	5	6.7	19	9.5
Conjunctival Xerosis	15	11.9	7	9.4	22	11
Bitot's spots	14	11.1	2	2.7	16	8
Phrynoderma	11	8.7	5	6.7	16	8
Pigmentation at knuckles	10	7.9	3	4.0	13	6.5
Bow legs	13	10.3	-	-	13	6.5
Beading of ribs	3	2.3	-	-	3	1.5
Thyroid gland enlargement (slight)	7	5.5	16	21.6	23	11.5
Ringworm infection in skin	6	4.7	1	1.3	7	3.5
Scabies	6	4.7	-	-	6	3
Wart	1	0.79	-	-	1	15
Dermatosis	2	1.5	-	-	2	1
Carries & mottled enamel	11	8.7	6	8.1	17	8.5

Table 22 depicted that 38.0 per cent boys and 27.0 per cent girls were found to have Dental carries. Mottled

enamel was observed in 11.1 per cent in boys and 6.7 per cent girls. Conjunctival Xerosis and Bitot's spots was seen in 11.9 per cent and 11.1 per cent boys and 9.4 per cent, 2.7 per cent girls respectively. 10.3 per cent boys were found to have bow legs. In girls conjunctival Xerosis and Bitots spot was 9.4 per cent and 2.7 per cent respectively. Slight enlargement of Thyroid gland was observed in 21.6 per cent girls and 5.5 per cent in boys. Occurrence of phrynoderma was 7.9 per cent and 4 per cent in boys and girls.

Table 23 showed the Haemoglobin levels of the Children.

Table 23. Haemoglobin levels of the Children

Observed Haemoglobin range (gm/ml)	Total			
	Boys		Girls	
	No.	per cent	No	Per cent
12-13	8	6.3	-	-
13.1-14	46	36.6	20	27.0
14.1-15	28	22.2	22	29.8
15.1-15.5	44	35.0	32	43.2
	126	100.00	74	100.00

Haemoglobin levels of the Children ranged from 12 to 15.5gm/100 ml for boys and 13.1 to 15.5gm/100 ml for girls

indicating that none of them had anaemia. In 6.3 per cent of boys, haemoglobin level was between 12 to 13 gms/100 ml. In 36.6 per cent boys and 27.0 per cent girls haemoglobin level was between 13.1 to 14 gms/100 ml. The percentage of boys having haemoglobin levels 14.1 to 15.0 and 15.1 to 15.5 were 22 and 35 per cent respectively. In the case of girls 30 per cent had haemoglobin levels 14.1 to 15 gms/100 ml. While 43.2 per cent fall in the range of 15.1 to 15.5.

Table 24. Nutritional status of the athletes (boys & girls)

Age in years	Average N.S.		t values
	Boys	Girls	
13	30.31	23.95	16.73**
14	30.06	23.95	25.45**
15	27.23	43.14	33.14**
16	32.94	68.12	63.96**
17	39.45	137.11	73.98**

** Significant at 1% level

Nutritional status of the athletes was worked out by using anthropometric data and haemoglobin estimation

't values are presented in Table 24 From the above table

it is clear that in the age group of 13 and 14 years nutritional status of the boys were significantly higher than that of girls whereas in the age groups 15, 16, 17 girls Nutritional status were significantly better than boys

Actual food intake of selected children

Dietary intake of twenty children (ten boys and ten girls) were assessed by one day weighment survey Comparison of the diets were made with the recommended dietary intake for Indian Sportsmen and women suggested by Sathyanarayana et al (1985) The average quantity of foods consumed by the children are presented in Table 25

Table 25 Average food consumption of selected athletes

Food groups	Amount consumed in (gms)		Suggested daily allowances		Percentage of suggested daily allowances	
	Boys	Girls	Boys	Girls	Boys	Girls
Cereals	716.5	594.6	570.6	420.0	125.7	141.5
Pulses	84	77.4	35	30	240.0	258
Root and tubers	98.4	89.6	150	150	65.6	59.7
Fruits	145.0	140.0	300	300	48.3	46.6
Green leafy vegetables	56.7	18.8	175.0	150.0	32.3	12.5
Other vegetables	88.3	77.5	200	150.0	44.1	51.6
Milk	120.0	120.0	700	700	17.1	17.1
Egg	50.0	50.0	100	50	50.0	100.0
Meat/fish	130.3	86.3	250	200	52.1	43.1
Sugar	5.0	6.7	50	40	10.0	16.7

FIG 10

AVLRAGE INTAKE OF FOOD STUFFS (MALES)

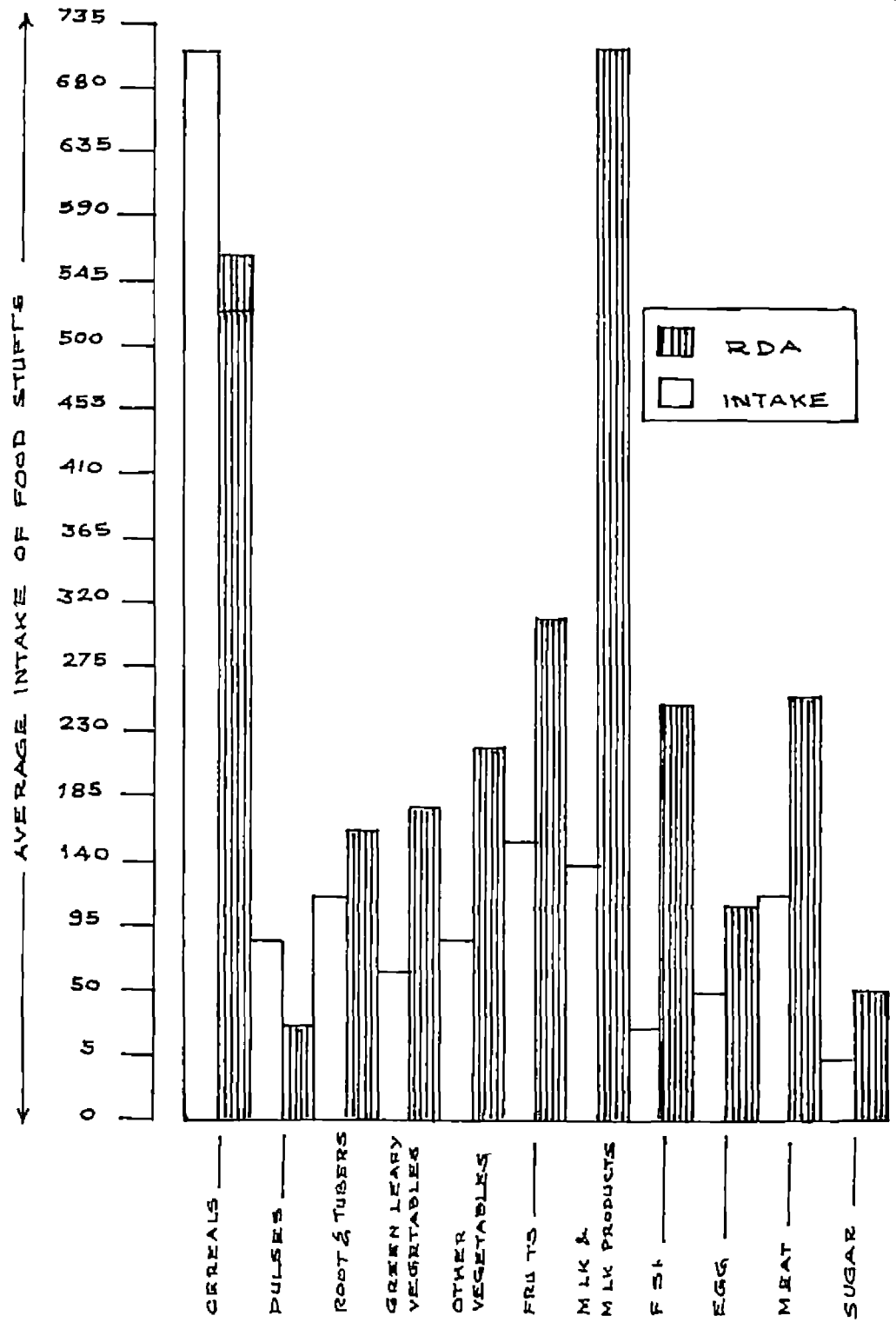


FIG 11
AVERAGE INTAKE OF FOOD STUFFS (FEMALES)

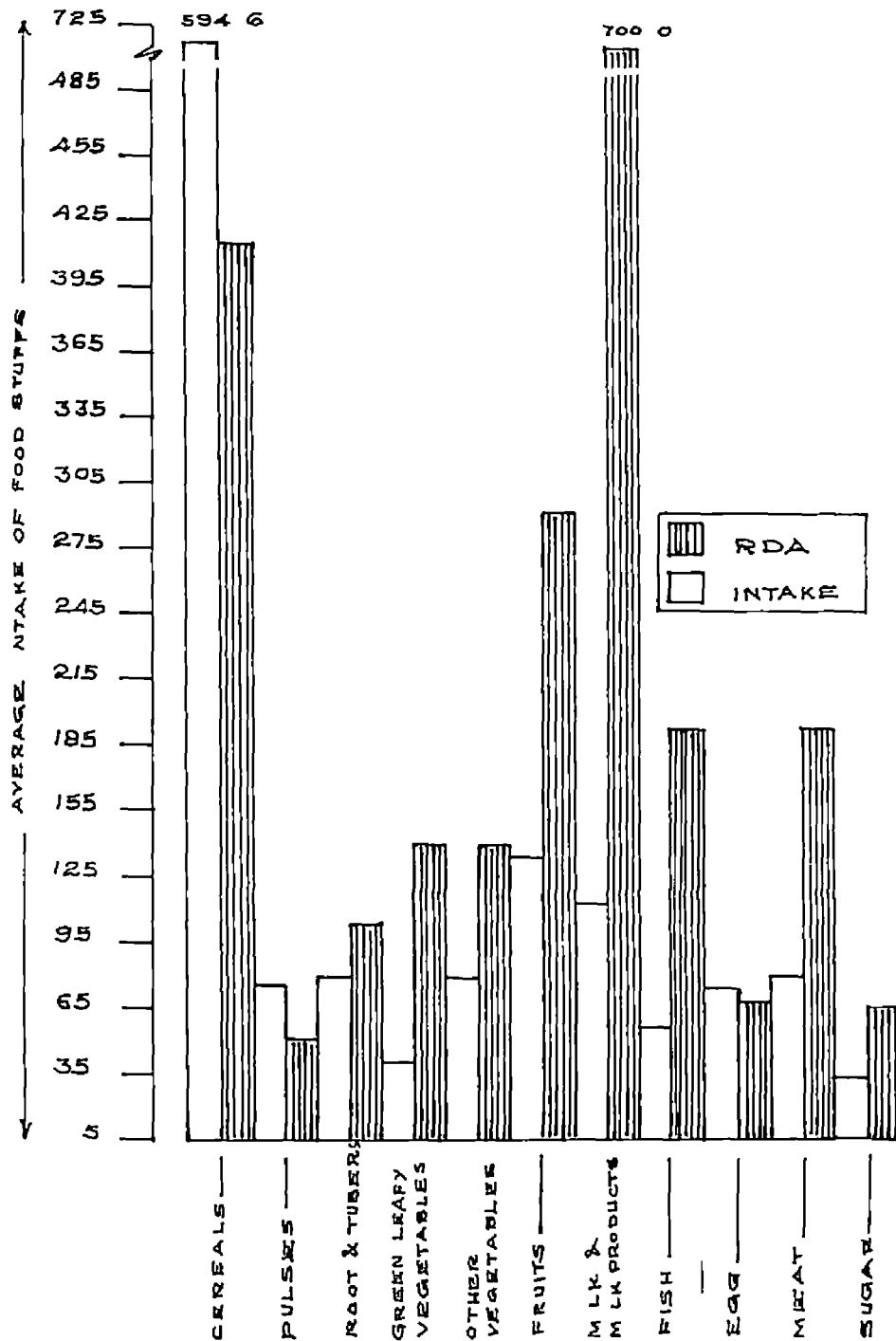


Table 25 revealed that the intake of cereals and pulses of boys and girls were higher than the suggested allowances (125.7, 141.5 per cent and 240, 258 per cent respectively). Consumption of roots and tubers by boys were about 66 per cent of the suggested allowances while in girls only, 59.7 per cent was met. Gross inadequacies were noted in the dietaries of sports children with respect to leafy vegetables, other vegetables, and fruits. The percentage of recommended daily allowances met by the children with respect to fruits, green leafy vegetables, other vegetables, milk, egg, meat/fish were (48.3 per cent boys & 46.6 per cent girls), (32.3 per cent boys and 12.5 per cent girls), (44.1 per cent boys and 51.6 per cent girls), (17.1 per cent both boys and girls), (50 per cent boys and 100 per cent girls), (52.1 per cent boys and 43.1 per cent girls) respectively.

The average nutrient intake of the sports children were compared with R D A recommended for the Athletes by Sathyanarayana et al. (1985)

Table 26 Average nutrient intake of selected athletes

Nutrient	Average nutrient intake		RDA ^a		Percentage of RDA met	
	Boys	Girls	Boys	Girls	Boys	Girls
Calories (Kcal)	3480	2945	4320	3480	80.5	81.6
Protein (gm)	116	89	100-120	30-100	97	89.0
Calcium (mg)	0.3	0.25	1-2	1-2	15	8.3
Iron (mg)	29.4	20	50-75	60-100	39	28.0
Vit A (μ g)	847	890.8	1000-2000	1000-2000	84	89
Thiamine (mg)	1.9	1.6	3-4	2-3	47.5	55.0
Riboflavin (mg)	1.4	1.5	3-4	2-3	36	51.3
Vitamin C (mg)	70.4	35.5	100-200	100-200	35	17.7
Niacin (mg)	29.8	22.9	40-50	40-50	59.6	45.9

Table 26 reveals that the average energy intake of boys and girls was 3480 Kcals and 2945 Kcals respectively. The percentage of calories met by boys and girls was 80.5 and 84.6 per cent respectively. Requirement of proteins in the case of boys and girls found to be within the range R.D.A. suggested. Vitamin A requirement of the boys and girls was met by 84 per cent and 89 respectively. Requirement of vitamin A was met around 85 per cent in boys and 89 per cent in girls when compared to Recommended daily allowances. The percentage of R.D.A. met by the boys with regard to B complexes, namely Thiamine, Riboflavin and Niacin were 47.5, 36 and

59.6 per cent respectively. Whereas in girls, the percentage of Recommended daily allowances met with regard to Thiamine, Riboflavin and Niacin were 55.3, 45.9 per cent respectively. Inadequacies were noted in the nutrients namely Calcium, Iron and vitamin C in the sports children (both boys and girls)

5 Energy expenditure pattern of the children

The children of the sports school participated in different sports and games activities such as Basket ball, Hockey, Volleyball, Football, Gymnastic and athletics

Distribution of selected two hundred children according to their participation in the different sports and games activities are presented in Table 27.

Table 27 Participation of the children in different sports and games activities

Activity	Boys		Girls		Total	
	No	Per cent	No.	Per cent	No	Per cent
Athletics	46	36.6	31	41.9	77	38.5
Basketball	17	13.4	9	12.1	26	13
Hockey	14	11.1	16	21.8	36	15
Volleyball	22	17.4	18	24.3	40	20
Football	24	19.0	-	-	24	12
Gymnastics	3	2.3	-	-	3	1.5
	126	100.00	74	100.00	200	100

Thirtyeight point five per cent of children (36.6 per cent boys and 41.9 per cent girls) participated

in athletics. The percentage of children engaged in games activities namely Basketball, Hockey, Volleyball, Football, Gymnastics were 13 per cent (13.4 per cent boys & 12.1 per cent girls), 25 per cent (11.1 per cent boys & 21.8 per cent girls), 20 per cent (17.4 per cent boys & 24.3 per cent girls), 12 per cent (19 per cent boys) and 1.5 per cent (2.3 per cent boys) respectively.

Reasons for the selection of specific sports and games activities of the children were enquired and are presented in Table 28.

Table 28 Reasons for the selection of specific sports and games

Activity	Personal interest				Familiarities of the game				As per the motivation of coaches				Compulsion of the others			
	Boys		Girls		Boys		Girls		Boys		Girls		Boys		Girls	
	No	%	No	%	No	No	No	/	No	%	No	No	No	No		
Athletics	29	63 0	21	67 8	13	28 2	7	22 5	4	8 6	3	9 6	-	-	-	-
Basketball	17	72 2	13	72 2	2	9 0	1	5 6	2	9 0	4	22 2	1	4 5	-	-
Football	15	62 5	-	-	-	-	-	-	2	8 3	-	-	7	29 1	-	-
Handball	11	64 7	7	77 7	1	8 0	1	11 1	2	11 7	-	-	3	17 6	1	11 1
Hockey	8	57 3	12	75	3	21 4	2	12 5	3	21 4	2	12 5	-	-	-	-
Gymnastics	3	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	83	41 5	53	26 5	19	8 5	11	5 5	13	6 5	9	4 5	11	5 5	1	0 5

Table 28 depicted that, activities like athletics, Volleyball, Football, Basketball, Hockey, Gymnastics were selected by the children due to different reasons such as personal interest 68 per cent, 41.5 per cent boys and 24.5 per cent girls, familiarity of the games 15 per cent (9.5 per cent boys and 5.5 per cent girls), motivation of coaches 11 per cent (6.5 per cent boys and 4.5 per cent girls) and compulsion by others 6 per cent (5.5 per cent boys and 0.5 per cent girls).

Regularity of the children in different sports and games activity are presented in Table 29.

Table 29. Regularity of the children in different sports and games activities

Activity	Daily engaged				Not engaged daily			
	Boys		Girls		Boys		Girls	
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
Athletics	43	93.4	30	96.8	3	6.6	1	3.2
Volleyball	20	91.0	16	88.9	2	9.0	2	11.1
Football	24	100.0	-	-	-	-	-	-
Hockery	13	92.9	16	100.0	1	7.1	-	-
Basketball	16	94.1	8	88.9	1	5.89	1	11.11
Gymnastics	3	100.0	-	-	-	-	-	-
	119	94.4	70	94.5	7	5.6	4	5.4

Table 29 revealed that more than 90 per cent of the children ^{were} engaged in their specific sports activities regularly. Only 10 per cent ~~did~~ not engage in their activities regularly and the major reason pointed out by the children was poor health.

Energy intake and energy expenditure pattern of the selected twenty children (boys and girls) were calculated and are presented in Tables 30 and 31.

Table 30 Energy intake and energy expenditure of male athletes

Sl. No.	Age _n Years	Body weight k th kilograms	Energy intake (Kcal)	Energy expenditure (Kcal)	Difference (Kcal)	Percentage of difference
1	17	57.00	2528.8	3291.7	-762.9	-30.1
2.	14	57.00	4055.3	3291.7	763.6	18.8
3	13	43.00	3015.1	3264.2	-249.1	-8.2
4.	15	73.00	3274.5	3236.6	37.9	1.15
5.	14	65.00	4394.2	3016.2	1378	31.3
6.	14	40.00	3760.0	2878.5	881.5	23.4
7.	14	60.00	3945.4	2878.5	1066.9	27.04
8.	15	57.00	3426.5	2795.8	630.7	18.4
9	17	55.00	3178.0	2740.7	437.6	13.7
10	14	54.00	3229.7	2713.2	516.5	15.9

FIG 12
ENERGY INTAKE AND ENERGY EXPENDITURE PATTERN
OF MALE ATHLETES

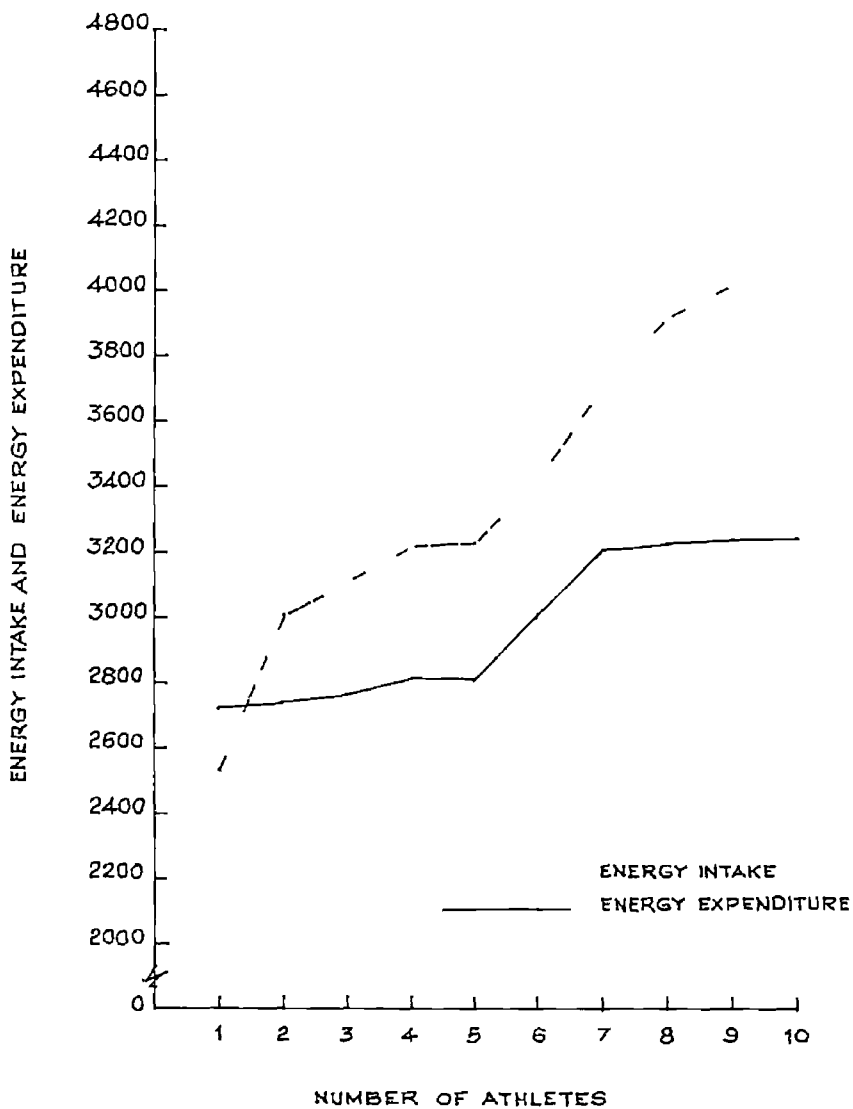


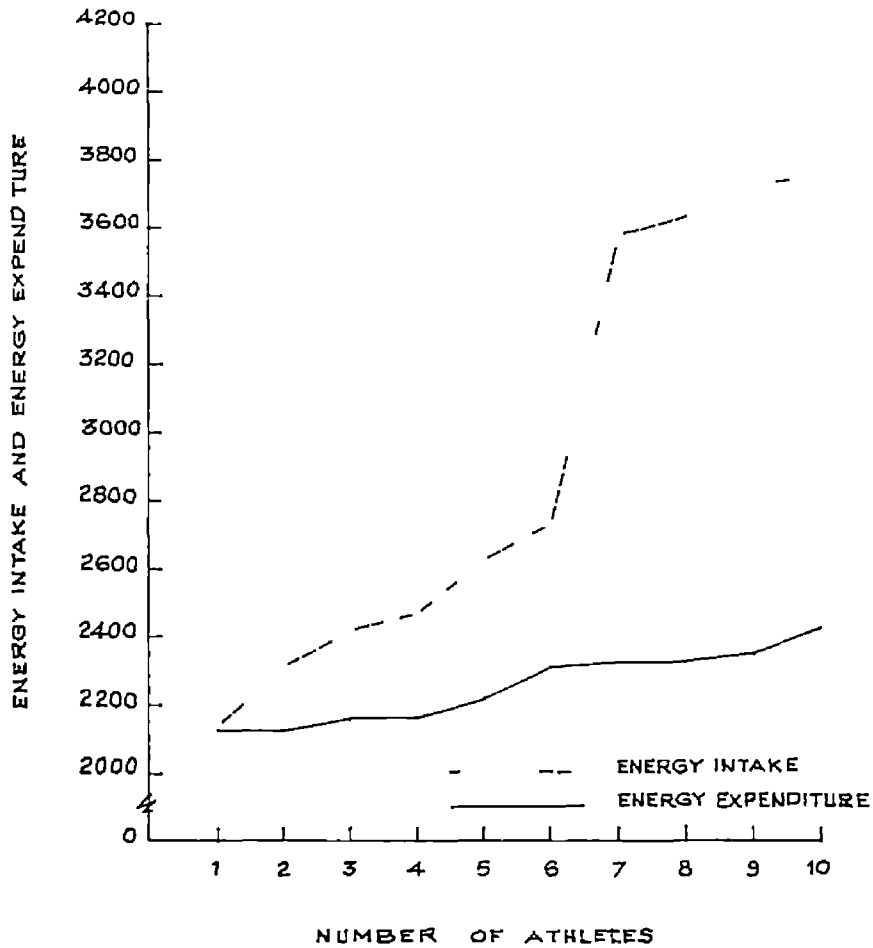
Table 30 revealed that 80 per cent of the boys spent less energy than intake and the percentage of variation ranged from 8.15 to 31.3. And remaining 20 per cent of the boys spent more energy than intake. The percentage of variation ranged from 8.2 to 30.1 per cent.

Table 31 Energy intake and energy expenditure of female athletes

Sl No	Age in Years	Body weight (ⁱⁿ kilograms)	Energy intake (Kcal)	Energy expenditure (Kcal)	Difference	Percentage of difference
1.	14	55	2619.0	2351.9	+261.1	9.9
2.	13	55	3606.3	2357.9	+1246.4	34.5
3	15	56	3595.3	2384.5	+1210.8	33.6
4.	17	48	2338.3	2171.7	+166.6	7.1
5.	13	52	2451.8	2278.1	+173.7	7.08
6.	16	48	2406.9	2171.7	+235.2	9.7
7	16	47	2769.0	2145.1	+623.9	22.5
8	16	47	2174.1	2145.1	+29	1.3
9.	17	60	3723.4	2490.9	+1232.5	33.1
10.	13	55	3749.1	2351.9	+1411.2	37.6

Table 31 revealed that all the female athletes spent less energy than the intake. The percentage of variation ranged from 1.3 to 34.5 per cent.

FIG 13
ENERGY INTAKE AND ENERGY EXPENDITURE PATTERN
OF FEMALE ATHLETES



DISCUSSION

DISCUSSION

The study on "Assessment of Nutritional Status of Sports Children residing in G.V Raja Sports School" was conducted mainly to assess their food consumption and dietary habits, nutritional status and energy expenditure pattern of the sports children.

Out of the two hundred children selected for the study, fifty per cent of them were Christians, followed by Hindus (41.00 per cent) and Muslims (9.00 per cent). Thirty five point five per cent of the children surveyed were from the under privileged section of the community. Majority of the children (80.5 per cent) surveyed belonged to joint family systems. This may be attributed to fact that most of children were coming from rural areas of the different districts of Kerala. Saxena (1986) was of the opinion that the nuclear families are generally, better than joint families for the healthy development of a child.

On analysing the details of the total number of members in the families, it was noted that only few families (19.5 per cent) were small sized. Thirty seven point seven per cent families were found to be large sized, while 43 per cent medium sized, probably because in majority of the families joint family system existed. Devadas et al. (1980) had the opinion that family size is an important factor

which generally influenced the development of children in all respects. Gosh (1977) had rightly pointed out that family size had an important correlation with the nutrition of a child. On further enquiry about the size of the individual families it was noted that majority of them were small ones with one to two children (56.5 per cent). The remaining 43.5 per cent families had children above 3.

Birth order of the children under study indicated that forty five per cent of the children were born either as the eldest or as the second one (18.2 per cent boys and 28.3 per cent girls were born as first child). Twenty one point four per cent boys and 25.6 per cent girls were born as second child. Thus it was observed that in most of the families, elder children were engaged in sports activities. Shaffer (1980) reported that new and popular sports readily attracted our youth, more than 6 million were involved in a wide variety of high school sports activities.

Dietary and food consumption pattern of the children

Dietary habits of the children indicated that all the children were non-vegetarians.

Food combinations followed by the children in their home diets were enquired, and revealed that 27.0 per cent followed a variety of food combinations namely cereals, pulses, tubers, vegetables, leafy vegetables and animal foods, milk etc. Twenty five per cent of children followed

only limited food combinations namely, cereals, roots and tubers and fish. Preference of various food combinations revealed that cereals with vegetable and meat preparation, were liked by 31.8 per cent boys and 40.6 per cent girls. Food combinations such as cereals with meat and fruits were liked by only 4 per cent girls. Cereal preparations with sweets, fruit juices and milk were liked more by girls than the boys. The combinations namely cereals, pulses, root and tubers, fish, meat and fruits were preferred equally by boys and girls.

Taste and nutritive value were the major criteria followed by the children for recording their food preferences. When compared to boys, girls gave more weightage to taste, whereas boys considered nutritive value of food combinations for their food preferences.

Comparing of the hostel diet with that of home diet it was observed that most of the children (97 per cent) were of the opinion that the hostel diet was different from their home diet.

One week menu of the hostel diet was assessed, and on analysing the hostel diet, it was seen that care was taken by authorities of the sports school to include food from various food groups in the daily dietaries of the children, in order to avoid monotony.

On comparing the hostel diet with that of home diet it was observed that, most of the children (97 per cent) did not appreciate the hostel diet in comparison with home diet probably because of the insufficiency of familiar foods like roots and tubers, vegetables etc., rigidity of time schedule and also due to the inclusion of too much of animal foods in the diet. An analysis of food combinations preferred by the children in the hostel diet indicated that 34 per cent of the children preferred cereals, pulses, animal foods and vegetables. The preferences of the above combinations may be attributed to the fact that the above combinations were served regularly in the hostel. Cereals, roots and tubers and vegetable combinations were consumed by 27.0 per cent girls and 17.4 per cent boys. 18.9 per cent girls and 27.0 per cent boys consumed cereals, pulses and animal food combinations were as cereals, green leafy vegetables and egg combinations were consumed only by 13.5 per cent of girls and 25.3 per cent of boys. From the above data it was clear that even though all food stuffs were supplied in the hostel, children had their own selection of foods. Green leafy vegetables were not consumed by most of the children. Usha (1985) also supported this view that consumption of green leafy vegetables was rare in the hostel diet.

Preference of children for various food preparations served in the hostel indicated that preparations with wheat along with roots and tubers mainly potato was preferred by majority of boys and girls. Preparations with wheat along with animal foods were liked only by a few children (6.5 per cent), (both boys and girls). Similarly rice preparation along with vegetables was found to be least preferred item in the hostel dietaries. It was also observed that children had a tendency to choose wheat preparations than rice preparations when served simultaneously. Consumption of more rice may affect their physique may be one of the reasons for their preferences for wheat preparations.

Special foods were taken before and after the sports activities in the hostel in order to improve the vigorous stamina for various games activities. Helen (1979) pointed out that the digestibility of the pre-game of an athlete influences the athletic performances. Inclusion of such pre-game foods by the children indicated that only 34.5 per cent consumed such special foods before games. It was also found that girls included special foods than boys. The type of special foods included glucose, fruits & fruit juices. Among those who took special foods, 50 per cent of girls and 33 per cent of boys consumed glucose as special foods before games while 53 per cent boys preferred banana and glucose as their special food. Banana, lime juice and grapes were taken by very few children. Among the different

foods taken glucose and banana were the most preferred items by the children

On analysing the pattern of inclusion of special foods during post-game period indicated that only very few children (14.5 per cent) had the habit of taking special foods after games. There is not much variation in the consumption pattern of post-game foods among boys and girls. Glucose and fruits were the items generally taken after the games.

While preparing for various competitions special care was taken by the athlete to improve their health by taking extra foods. It was observed that in the present study 34 per cent of the athletes were in the habit of taking special foods. It was observed that when compared to boys, girls consumed extra foods while preparing for various competitions. Special foods included were mainly fruits and glucose. Among those who consumed special foods during their preparations for various competitions, majority of the boys (62.5 per cent) included glucose while majority of girls included (53.9 per cent) fruits.

It was observed that certain dietary modifications were made by the sports children before their participation in the various competitions. On enquiry about the dietary modifications they made before the competition, it was seen

that majority of the children (82 per cent boys and 65 per cent girls) did not change their pattern of diet, only 25 per cent made some type of modification in the diet. Among those who modified their diets majority (67.3 per cent) restricted the quantity of the food they consumed, 32 per cent restricted the intake of rice. Hass (1983) was of the opinion, that taking large meal before competition or exercise will affect performance of an athlete. When compared to boys, girls made dietary modifications more during the preparation for competitions.

Nutritional status of the sports children were assessed by collecting the anthropometric measurements. Data revealed that weight for age profile of the children did not significantly differ from the standard weight for age profile suggested by Vijayaraghavan (1971). However the weight for age profile were found to be below the NCHS standards.

Height for age profile revealed the same trend. No significant difference was noted between the standard and observed height for age for both boys and girls. However when compared to NCHS standard, height for age of boys and girls were below the standards in all the age groups, except in 13 and 14 year age group boys.

Body mass index of children indicated that (64 per cent girls and 44 per cent boys came under normal range of body mass index. When compared to boys majority of the girls had normal body mass index. The children having body mass index above normal were 10 per cent in boys and 1 per cent in girls.

Arm circumferences of both boys and girls in all age groups were found to be above than the standards.

Skinfold thickness of the children revealed that except in the age group of 13 years, skinfold thickness was above the standard in boys. However the observed skinfold thickness of girls was found to be below than standards in all age groups.

Clinical assessment of the sports children indicated that dental carries, and mottled enamel were the common clinical manifestations in boys and girls. Compared to girls, more percentage of boys, had dental carries and mottled enamel. Xerosis and Bitot's spot were found in 11 per cent of the boys whereas in girls it was observed to be less than 9 per cent and 6 per cent respectively. Enlargement of thyroid gland was observed more in girls than boys (21.6 per cent girls and 5.5 per cent boys).

The haemoglobin levels of the athletes revealed that all of them had higher haemoglobin values (12-17 gm/100 ml). This observation is supported by Labadarivus et al. (1976).

He has pointed out that haemoglobin levels were higher for athletes than normal, possibly due to physiological response to stress. Apart from the dietary iron, athletes were found take iron tablets as to improve their iron status. This may also contribute to their higher haemoglobin levels.

Nutritional status of boys in the age groups 13 and 14 years were found to be significantly higher than that of girls. In the age groups 15, 16, 17 years girls were significantly superior in nutritional status than boys.

Actual food intake of the children revealed that the intake of cereals and pulses were very much higher than the Recommended daily allowances suggested for athletes by Sathyanarayana (1985) for (both boys and girls). Roots and tubers were nearly met (65 per cent in boys and 60 per cent in girls) whereas allowances for eggs were met sufficiently by girls and 50 per cent by boys. Allowances for other non-vegetarian items were met above 50 per cent in boys and 43 per cent in girls. Inclusion of other vegetables were comparatively better in girls than boys. However, they were below the recommended daily allowances. Allowances for green leafy vegetables were the least food group met by both groups. Study conducted by NIN in 1989 among the athletes also supports that green leafy vegetables were not included in the dietaries of sports women and men.

Nutrient intake of the athletes revealed that the percentage of calories and vitamin A met by both boys and girls were 80.5 and 84.6 per cent and 85.0 and 89.0 per cent respectively. William (1977) stressed the need for increased calories for athletes but, in contrast to this, in the present study, athletes did not meet calorie requirement suggested for athletes. The percentage of proteins were met in nearly 90 per cent in both boys and girls. All the other nutrients were found to be inadequately met by the children. This was contrast the findings of Ben (1991). He has pointed out an average Indian athletes eats so well that his diet provides all the vitamins he could possibly needed. The nutrient which is met least by the children was calcium. The inclusion of milk and milk products were found to be very rare in the dietaries and that may be the reason for the inadequacy of this nutrient.

Activitywise distribution of the children revealed that among the different types of sports activities, 38.5 per cent of the children had selected athletics. It was noted that athletics was the highest preferred activity among boys and girls (36.6 per cent boys and 41.9 per cent girls) compared to boys, girls preferred hockey and volleyball, 15 per cent (11.4 per cent boys and 21.8 per cent girls) and 20 per cent (17.4 per cent boys and 24.3 per cent girls) respectively to the other games. This may be due to the

fact that football and gymnastics were offered only to the boys in the sports school.

Among the various reasons for the selection of activities, personal interest 68 per cent (41.5 per cent boys and 20.5 per cent girls) played a major role. Familiarity of the games, motivation of coaches, compulsion by others were observed to be the other main reasons given by the Children for their selection.

With regard to the regularity in attending the activities, it was observed that majority of the children were regular in their sports activities. This may be due to the fact that, their activities were selected mainly out of their own interest.

Energy expenditure pattern of sports children was studied and observed that in majority of boys (80.0 per cent) intake was surplus than their expenditure. This finding is supported by study conducted and NIN (1989) they pointed out all three groups of players studied namely hockey players, track athletes, and male hockey players (juniors) spent less energy than their intakes. Only in 20 per cent boys had energy expenses fall short of their intake, the percentage of variation ranged from 8.2 to 30.1 per cent. However in girls it was found that in all the female athletes intake was surplus than their expenditure.

SUMMARY

SUMMARY

A study on the 'Assessment of Nutritional status of sports children residing in G V Raja Sports School" was conducted among two hundred children.

The social status of the family, food consumption and dietary pattern, anthropometric, clinical, biochemical investigations and energy expenditure pattern of the children were assessed.

The analysis of data on social status of the children revealed that fifty per cent of the samples belonged to Christian religion and most of them were belonged to forward community. Analysis of family structure revealed that joint type families of medium size were common. Regarding the birth order of the athletes most of them were born as first or second child.

Dietary and food consumption pattern of the athletes revealed that all of them were non-vegetarians and used to consume cereals, pulses, tubers, vegetables, leafy vegetables, animal foods and milk. Better food combinations were followed in their home diets. Data on food preferences of the children showed that many of them preferred food combination namely cereals, meat with vegetable preparations.

Major reasons given by the children for recording their food preferences were taste and nutritive value. Most

of the children were of the opinion that the hostel diet was different from their home diet.

Analysing one week menu of the hostel diet, it was observed that different food groups were included in the dietary of hostel. Most of them did not appreciate the hostel diet because of the unfamiliarity of the foods served, and also due to the inclusion of more of non-vegetarian foods. It was also observed even though foods from different food groups were included in the hostel menu, the children follow their own selection.

Preferences of the athletes for various food preparation served in the hostel indicated that preparations with wheat along with roots and tubers were liked in general by both boys and girls.

Habit of taking pre and post game meals by athletes indicated that only few children were taken pre and post game meals. Special foods taken by the athletes while preparing the various competitions revealed that only 34 per cent of the children take special foods.

Further analysis, on the dietary modification of the athletes made while preparing for competition indicated that majority of them restrict the quantity of foods they consume.

Anthropometric measurements of the children revealed that weight for age and height for age of the children did not significantly differ from the standards. However when compared to NCHS standard it was below the standards. On analysing the body mass index majority of them had normal body mass index and few of them were above normal. Arm circumferences of both boys and girls were found to be above the standards. Skin fold thickness was above the standard in boys except in the age group 13 years whereas in girls it was below the standard.

Clinical examination of the athletes showed that dental carried and mottled enamel were the most common clinical manifestation in both boys and girls.

All the athletes under study were found to have higher haemoglobin levels (12-13.5gm/100 ml).

Nutritional status of boys in the age groups 13 and 14 years were found to be significantly higher than that of girls. In the age groups 15, 16 and 17 years girls were significantly superior in nutritional status than boys.

Actual food intake of the children indicated that the intake of cereals and pulses were very much higher than the recommended daily allowances suggested for athletes. Foods, belonging to all the other food groups were found to be met insufficiently. Green leafy vegetable was the food group met least by both the groups.

With regard to the nutrient intake, it was found that all the nutrients were met inadequately in both groups. Among the various nutrients, calories and proteins were met about 85 per cent of recommended daily allowances suggested for athletes.

Activity-wise distribution of the children indicated that athletics was the highest preferred activity among boys and girls. Personal interest, familiarity of the games, motivation of coaches, compulsion by others were the reasons pointed by the children for their selection of activity and majority of the children were found to be regular in their activities.

Energy expenditure pattern of the children revealed that in majority of the boys, and in all the girls energy intake was surplus than their expenditure.

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APPENDICES

APPENDIX-I

KERALA AGRICULTURAL UNIVERSITY

DEPARTMENT OF HOME SCIENCE

(Assessment of Nutritional status of school children residing in G V Raja sports school)

1. Name of the student

Socio-economic background of the family

(a) Age of the child

(b) Class

(c) Address

2. Religion and caste

Family size

No. of children

3. Birth order

Dietary and food consumption pattern of the child

4. Dietary habit of the child

Veg./Non-veg

5 Food consumption pattern followed by the children at home

6. Food preference of the child

7 Is the food pattern of hostel similar to home pattern

Yes/No

If no state the variation in the meal pattern of the hostel

- 8 Food consumption pattern of the children in the hostel
9. Food preferences of the children in the hostel
- 10 General menu pattern of the hostel for one week
11. Pre-game meal pattern
 - a) Are you taking pre-game meal?
 - b) Type of foods served
12. Post-game meal pattern
 - a) Are you taking post-game meal
 - b) Type of foods served
13. Do you have the habit of taking special foods during competitions

Yes/No

If yes what are they
14. Do you have the habit of restricting food while preparing for various competitions

Yes/No

If yes what are the modifications you make
15. What type of sports and games activity you have selected
 - a) State the reasons for selecting that activity

Activity	Reasons
----------	---------
- 16 Do you engage in the activities selected regularly

Yes/No

APPENDIX-2

Methods used for anthropometry

1 Height

The height of the children were measured using a stadiometer. The children were made to stand on a flat floor by the scale with feet parallel and with heels, buttocks, shoulders and back of the head touching the upright. The head was held comfortably erect with the lower border 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 to 0.5 cm necessary.

2 Weight

The weight was measured using a platform beam balance. Children were weighed wearing very light clothing, without shoes, beam balance scales. The child was made to stand on the centre of the platform without touching anything else. Care was taken to use the balance on a firm mottled surface and it was checked before use. The measurements was taken to an accuracy of 0.1 kg.

3 Mid-upper arm circumference

Mid-upper arm circumference was measured to the nearest 0.1 cm with a 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.

4 Skinfold thickness

The skinfold measured consists of a double layer of skin and subcutaneous fat. The measurement was taken by using Lange's caliper. A lengthwise skinfold is firmly grasped and slightly lifted up between finger and thumb of left hand. Care was taken not to include underlying muscle. The calipers were applied about 1 cm below the operator's finger at a depth about equal to the skinfold while the skinfold is still gently held throughout the measurement. Three measurements were taken and results averaged.

APPENDIX-3

National Institute of Nutrition
Nutritional Assessment schedule

Name of the athlete

Sex

Age

Standard

Clinical Examination

- | | |
|--|------------------------------|
| 1. Hairsparse | 18. Corneal opacity |
| 2. Discoloured | 19. Night blindness |
| 3. Easily plucked | 20. Photophobia |
| 4. Moon face | 21. Anaemia |
| 5. Parotid enlargement | 22. Nasolabial dysebacia |
| 6. Oedema | 23. Angular stomatitis |
| 7. Emaciation | 24. Cheilosis |
| 8. Marasmus | 25. Red and raw tongue |
| 9. Pellagra | 26. Beading of ribs |
| 10. Crazy pavement dermatosis | 27. Knockness/bow legs |
| 11. Pigmentation at
knuckles/fingers/toes | 28. Frontal-parietal bossing |
| 12. Phynoderma | 29. Causes |
| 13. Gum-Spongy bleeding | 30. Teeth mottled enamel |
| 14. Grarotapes | 31. Enlargement of spleen |

- | | | | |
|-----|------------------------|-----|----------------------|
| 15 | Epiphyseal enlargement | 32. | Enlargement of liver |
| 16 | Conjunctival Xerosis | | Soft |
| 17. | Bitot's spot | | Firm |
| | | | Hard |
| | | 33 | Thyroid enlargement |
| | | | Tongue papillae |

APPENDIX-4

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 n.m. 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 1 g of sodium bicarbonate in 1 litre distilled water.

Procedure

20 ml of blood are measured accurately from a haemoglobin pipette and delivered on to a whatman No. 1 filter paper disc. The filter paper is airdried labelled and can be stored upto one week. The portion of filter paper containing the blood is cut and dipped on 5 ml Drabkins solution taken in a test tube wait for 30 minutes and mix the contents on a vortex mixture and take the readings.

Construction of standard curve

If the blood drawn from the subject contain haemoglobin

15 g/dl. after estimation then prepare three reference standards as follows

1. Reference standard A

4 ml blood in 1000 ml Drabkins reagent contain haemoglobin 15 g/dl.

2. Reference standard B

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

3. Reference standard C.

200 ml of reference standard A and 300 ml of Drabkins reagent contain a haemoglobin concentration of 7.5 g/dl.

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

APPENDIX-5

National Nutrition monitoring bureau
(Indian Council of Medical Research)

Hostel diet survey - One day weighment

1) Name of the athlete

Age

Activity

Weight of Raw Foods in grams

Food stuff

Weight
in grams

Cereals

Rice

Wheat

Rava

Maida

Wheat flour

Pulses

Bengal gram whole

Red gram dhal

Green gram dhal

Green gram whole

Black gram dhal

Others

Leafy vegetables

Cabbage

Amaranth

Drumstick

Other vegetables

Cucumber

Ladies finger

Brinjal

Snake gourd

Bitter gourd

Green plantain

Root and tubers

Carrot

Beet root

Potato

Raddish

Onion

Fruits

Plantain

Tomato ripe

Fish

Sardine

Mackeral

Other flesh foods

Meat

Hen

Beef

Egg

Milk

Curds

Oils and oil seeds

Coconut oil

Dalda

Other Food stuffs

Biscuit

Bread

Sugar

Dietary information

Meal pattern	Type of preparation	Ingredients	Raw amount	Total cooked amount
--------------	---------------------	-------------	------------	---------------------

Early morning

Breakfast

Lunch

Evening snack

Dinner

APPENDIX-6

Calculation method of energy expenditure

$\text{BMR} \times \text{BMR factor} = \text{Energy expenditure}$

$\text{BMR} = 14.5 \times \text{B.w (kg)} + 645 \text{ (male)}$

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

Recommended BMR factor for computing energy requirement - 1.9

**ASSESSMENT OF NUTRITIONAL STATUS OF
SCHOOL CHILDREN RESIDING IN
G. V. RAJA SPORTS SCHOOL**

BY
MINI K

ABSTRACT OF THE THESIS
SUBMITTED IN PARTIAL FULFILMENT OF
THE REQUIREMENT FOR THE DEGREE OF
MASTER OF SCIENCE
IN FOOD SCIENCE & NUTRITION
FACULTY OF AGRICULTURE
KERALA AGRICULTURAL UNIVERSITY

DEPARTMENT OF HOME SCIENCE
COLLEGE OF AGRICULTURE
VELLAYANI
THIRUVANANTHAPURAM

1992

ABSTRACT

A study on the Assessment of nutritional status of school children residing in G V. Raja Sports School was conducted on G V. Raja Sports School, Sanghumugham

It was found that majority of them were Christians and belonged to forward community and families were joint type with medium size. Most of the children were born as first or second child.

Food consumption pattern revealed that all of them were non-vegetarians and consume all of foods from different food groups viz. cereals, pulses, roots & tubers, animal foods, milk and leafy vegetables in their home diet.

Many of the athletes preferred food combinations like cereals, meat with vegetable preparations. Taste and nutritive value were the major reason for recording the food preferences. Analysis of the dietary menu followed in the hostel it was observed that foods from different food groups were included in the dietaries of the hostel. However the athletes resort to their own food preferences in both groups Reason being the unfamiliarity of foods, and inclusion of more amount of non-vegetarian foods served There is a practice of taking special foods by sports children during pre and post game periods. But it was observed that very few of them practice such a habit Special foods were also

taken by the athletes while preparing for competitions. It was observed that 34 per cent of them taken special foods while preparing for competitions. Majority of the athletes restrict the quantity of food they consume, during the period of preparation for competitions.

On analysing anthropometric data it was found that weight for age, height for age of athletes did not significantly differ from the standards suggested by Vijayaraghavan (1971). However when compared to NCHS standards the weight and height profile of the children were found to be below the standard. Majority of boys and girls had normal body mass index whereas arm circumference of the girls were above than the standards. Same trend was seen in boys with regard to skinfold thickness.

Clinical examination of the athletes indicated that dental caries and mottled enamel were common manifestations. Haemoglobin levels were found to be higher than the normal for all athletes.

Nutritional status of the boys in the age groups 13 and 14 years were found to be significantly higher than that of girls. In the age groups 15, 16 and 17 girls were significantly superior in nutritional status than boys.

Consumption pattern of the athletes depicted that cereals and pulses were consumed higher than the recommended

daily allowances whereas other food stuffs were consumed inadequately. Nutrients such as calories, proteins and vitamin A were met around eighty five per cent of the recommended daily allowances. The other nutrients were met inadequately when compared to the recommended daily allowances.

Athletics was the most preferred activity among the children surveyed and majority of them participate regularly in their activities.

Energy expenditure pattern of the athletes revealed that in majority of the boys and in all the girls energy intake was surplus than expenditure