ASSESSMENT OF NUTRITIONAL STATUS OF TRIBAL SCHOOL-GOING CHILDREN

By

POORANI R.

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LIST OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

INTRODUCTION

I INTRODUCTION

In the recent years tribals of India are drawing the attention of planners and administrators and are given priority in developmental measures. Geographically and culturally speaking tribals are at widely different stages of social as well as economic development and their problems differ from area to area and even within their own groups. The unique characteristic of the tribesman in our country is that he lives not only for himself but he is an integral part of the community to which he belongs.

Tribal population which constitutes about 7.5 percent of the country's total population is fairly distributed throughout India. The tribal population in Tamil Nadu is 1.1 percent to the total population of the State according to 1981 census Mahalingam (1988).

In Tamil Nadu the tribals are dispersed over all the districts but with a heavy concentration in selected pockets. About 24 percent of the State's tribal population is in Salem district alone. Besides this, other districts of importance in this regard are North Arcot (18 percent) South Arcot (10.3 percent) Trichy (9.9 percent) and Dharmapuri (8.9 percent) which together account for half of the State's tribal population.

Tamil Nadu consists of 36 tribes such as Malayalis,

Todas, Valayaras, Kotas, Irulas, and Kurumbas etc., but the predominant community among the tribes in the State are Malayalis who live in the contiguous hills viz., Elagiri hills, Sitheri hills, Yercaud hills, Kalrayan hills, Kolli hills, Aranuthamalai, Bodamalai and Pachamalai in Eastern Ghats situated in the districts of North Arcot, Dharmapuri, South Arcot, Tiruchirapalli and Salem constituting about 75 percent of the total tribal population in the State Mahalingam (1988).

The word 'Malayali' denotes the inhabitant of the hills viz "Malai" in Tamil, means hill or mountain. The Malayalis do not speak Malayalam but are Tamil speaking people who migrated from the plains in the 16th century. The Malayalis originally belonged to Vellala caste and migrated from the sacred city of Kancheepuram to the hills about 10 generations ago.

Tribals are one of the most backward social groups. Despite the fact that they are economically backward they contribute variety and richness to the culture of the country. They are poor, illiterate and economically backward due to uneconomic shifting cultivation and collection of minor forest produce characterised by their backwardness and low productivity in yields insufficient to meet even their basic requirements. They are known to be victims

of exploitation by non-tribals. The main source of sustenance is the forest, agricultural activities occupy a secondary place. They are also engaged in maintenance of livestock, cow and goat rearing for commercial purposes Rao and Reddy (1985), Shah (1986).

School Children form an important vulnerable segment of the population of India. They constitute 20 percent of total population as per census report (1981). The literacy rate among scheduled tribes to the total population of India is 16.4 percent.

A great majority of tribal children in the school-going age have never attended school because child labour is required at home for supplementing the family income. To send a child to school is essentially a matter of economics and dislocation in the traditional pattern of division of labour. Children are mainly engaged in tending the cattle Gunasekaran and Ramasamy (1988), Guruswamy (1988).

While some information is available on tribal diets, detailed information on food habits, nutrient content of the food, nutritional status and nutritional problems of the school-going children have not been studied.
Due to dearth of information on the above said points the following research study was undertaken with the following specific

objectives.

A. Survey of the socio-economic profile of the tribal population of "Malayalis" in two hill areas, namely Kolli hills and Pachamalai.

B. Study of the dietary practices and food habits of the tribal population. and

C. Nutritional assessment of selected 200 tribal school children in the age range of 6-12 years through

   1. Nutritional anthropometry.
   2. Clinical Assessment.
   3. Food intake on a sub sample of 40 children.
   4. Haemoglobin estimation.

REVIEW OF LITERATURE

II. REVIEW OF LITERATURE

The review of literature pertaining to the study of the nutritional status of tribal children is discussed under the following headings:

A. Tribal population of India.

B. Food habits and dietary practices.

C. Nutritional problems among children.

D. Practical yardsticks for nutritional assessment.

A. Tribal Population of India:

India ranks second in having the largest concentration of tribal people next to Africa Shah (1986), Gunasekaran and Ramasamy (1988). Tribals live generally in hills and dense forests that are inaccessible and remote parts of the country Rao and Reddy (1985).

The tribal situation in India presents a varied picture because some areas have a high tribal concentration while some other areas have no tribal population at all. According is Shah (1986) about 50 percent of the total tribal population in the country is concentrated in the States of Madhya predesh, Bihar, Orissa. Besides there is a sizeable tribal population in Maharashtra, Gujarat, Rajasthan, Andhra Pradesh and West Bengal.

Ahsan (1987) states that the tribal population in India consists of the Scheduled Tribes as notified by the President of India under Article 341 of the constitution.

" A social group usually with a definite area, dialect cultural homogenity and unifying social organisation" is the definition of a tribe as stated by Chattopadhy (1979). As urbanisation grew rapidly in the country the tribals who did not get into the mainstream of change got isolated and continued living in their ancient patterns.

Tribals are one of the most backward social groups in India. They have been living under unique culture which is quite different from the mainstream of social life for centuries Narayana (1985). Different tribal groups represent different levels of techno-economic development and social organisation with wide variations in customs and practices Shah (1986).

Forest and agriculture are the main sources of sustenance to the tribals. The tribals are accustomed to collect various items of minor forest produce to supplement their meagre earnings from agriculture and other allied sources Narayana (1985), Shah (1986) and Rao (1987).

Nagda (1988) study report on the tribes in Banswara

reveal that a majority were engaged as labourers in agriculture, fishing, forestry and allied activities. Narayana et al.(1987) state that 54.43 percent constitute cultivators, 32.67 percent agricultural labourers and 11.48 percent other workers. Literacy rate among scheduled tribes in India is only 16.35 percent, state Narayana et al.(1987) and Pawar and Bhuvanedran (1988). The literacy rate of tribals in Tamil Nadu is 20.45 percent Mahalingam (1988). 0.07 lakh tribals are literate tribals in the state as per (1981) census. Illeterates of the Irula tribe of Nellithurai was as high as 91.67 percent Gurusamy (1988). The literacy level is very low among the tribes in Banswara and lower in the case of females Nagda (1988).

A major portion of the earnings is still spent for food and related items indicating the extent of low standard of living Narayana et al. (1987).

The major occupation of the Malayalis is agriculture and a few of them work as agricultural labourers and forest labourers. They raise paddy crops in areas where stream water is available and in the other parts dry crops are grown. Besides, fruit trees are also grown in large number. The other trees which form part of the tribal community in the State are walnut, tamarind, pongam and

ettikottain trees. Normally these tribals bring their produce to the plains where they sell them to private trade cum-moneylenders Mahalingam (1988).

B. Food Habits and Dietary Practices:

The tribals of our country, the most backward section of the society are not exceptionals with their inherent variations in food habits influencing thereupon the food intake and hence nutritional status as the more civilized peers.

Prakasam (1988) states that wild roots, tapioca, ragi and rarely rice form the staple food of Uralies of Kerala. They take coffee without milk or sugar. Jackfruit and other forest fruits are consumed. They eat all kinds of meat but the eating of fresh buffalo, cow and bison is a taboo.

Gujjars are a pastoral tribe of Himachal Pradesh and Jammu and Kashmir. Their staple diet is simple but nourishing. It consists of maize, milk and ghee. A vast majority of them neither use any beverage nor any stimulant Shashi (1988).

The Irulas and Kotas of Nilgiris have a mixture of cereals and millets including rice and ragi as chief

food Rao (1971). They do not eat the flesh of buffaloes or cattlle but will eat sheep, goat, fieldrats, pigs, deer, jungle fowl, pigeons and quail Thurston (1975).

Talking on the food habits of Izhavas living in Malabar, Cochin and Travancore Thurston (1975) observes that they are fish and flesh eaters. Rabbits, deer, pigs, sheep, porcupines, fowls,doves, quiree fowls, peacocks and owls are their popular dishes. The sweetmeat called 'ariyunta' and a curry known as muthirakkary are peculiar to the Izhavas and best prepared by them.

The Marias inhabiting the North Eastern part of Sironcha use red ants as a souring agent in their vegetable preparations and tamarind is used as a substitute by the better off. Wild roots and tubers are eaten as a staple food. Tellagadda is commonly consumed. Fish and meat of animals like pigs, rabbits, goats, deer, fieldrats, birds are largely consumed. Wild leafy vegetables, bamboo shoots and mushrooms form a part of the food they eat according to Pingle (1974).

The traditional crops of Bhils of Madhya pradesh are corn, minor millets, sorghum, horsegram, groundnut and pigeon pea Ghesal (1986).

Narayana (1985) states that the Tandas of Warangal take

Bhati (Chapati) made of Jowar or Bajra as major food stuff. Ragi, samai, thinnai and varagu constitute the staple food of Malayalis Gunasekaran and Ramasamy (1988).

For Onges (Little Andaman Islands) the food sources are pork and seafish. Onges eat turtles and its eggs. Fieldrats are eaten after roasting by the Abors (Assam) Baigas (Madhya pradesh) Yerukalas and Yenadis. Murias and Savaras feast upon tiger flesh. Roasted insects are a delicacy among Riangs and Murias. Chutney made from a paste of roasted ants with chillies and salt is a favourite dish of these groups Rao (1971).

Rao (1982) states that the Paharias of Bihar make use of wild fruits and berries available in the hills. Roots and tubers form an important part of tribal diets. Pandanus and Mangroove are often eaten by the Onges. Honey collected from the woods is a common article of food for several tribes Rao (1971). Buffalo or goat milk for human consumption is almost unknown to the paharias Rao (1982).

Milk and milk products are rarely consumed by the tribals with the exception of the Todas who take a good amount of butter and buttermilk but milk as such is rarely drunk. Cheese and butter from the cow and yak are

regularly consumed by the Monpas of North East Frontier Area Rao (1971), Rao and Sathyanarayana (1974), Gore et al.(1977), Gupta (1980), Prema et al (1982), and Rao (1982).

Alcohol is consumed by almost all tribal groups. Abors make an alcoholic drink from fermented millet known as 'Mirung'. Monpas prepare 'Bang chang' and Aara from fermented cereal or millet. Liquors made from palm and Mahawa plays a pervasive role in religious and social life of Bhils, the tribals of Orissa, Madhya pradesh and Andhra pradesh Rao (1971), Jena (1982), Ghosal (1986), and Prakasam (1988).

Swain (1985) and Dave and Tavkar (1985) state that no special food or separately cooked foods are used for supplementary feeding. The usual family diet is given in a mashed form. Soft rice gruel and pulses form a major supplementary food.

The new mother of Uralies goes for digging roots in the forest after 4 or 5 days after delivery. This is cooked in bamboo containers and eaten. During prenatal period they abstain from milk for some period Prakasam (1988).

Gore et al. (1977) are of the opinion that pregnant and lactating mothers are generally not given any special food in the Indravathi Basin.

C. Nutritional Problems among Children:

The reason for backwardness are poverty, poor health which in turn leads to poor nutritional and socioeconomic status Sagar and Dusane (1982).

1. Malnutrition

Malnutrition and undernutrition are widespread in developing countries. It is regarded as a spectrum of disease arising from an inadequate diet especially in childhood. 70 - 80 percent of children suffer from various forms of growth retardation as stated by Anne and Begum (1985). The statement of computations based on severe form of incidence indicate that nearly a million children in our country are victimised every year as a result of severe malnutrition Devadas (1979). Calorie undernutrition and protein malnutrition are common findings in India. United Nations study in India (UNICEF 1975) indicates that two out of every five person are under-nutrished.

The high incidence of malnutrition and under nutrition have been reported by many through the years Gupta et al.(1985). studied the growth and development of 1,000 children upto 15 years in rural slums of Kanpur, India and reported of

the high incidence of different grades of malnutrition. Studies conducted by Dores et al. (1982) indicate that the children in Ilheus suffer from chromic malnutrition.

The prevalance of protein calorie malnutrition among the Chenchus and the Gonds was the highest prevalance being 19 and 16 percent respectively. The proportions of children classified as belonging to group III malnutrition was more among children of Gonds and Savaras. The extent of severity of malnutrition among the children of Konda Reddis, Savaras and in Yanadi children was similar to that of Hyderabad pre-school children opine Rao and Sathyanarayana (1974). A country wide nutrition survey carried out on a large number of pre-school children showed 17 percent of the children suffered from grade III malnutrition and 65 percent from grade I and II as reported by Devadas (1979). Incidence of undernutrition was reported by Robert et al. (1986) in their cross sectional health survey studies.

2. Anemia:

Anemia is a worldwide nutritional problem, its prevalance being particularly high among women and children. It is a public health problem in developing countries including India. It is estimated that 40 - 60 percent

of pre-school children suffer from anemia Rao (1982). Medappa (1978) points out that the morbidity and mortality rate due to anemia is considerable. Latham (1984) is of the view that iron deficiency anemia is one of the most important forms of malnutrition in the developing countries today.

According to Anne and Begum (1985) the percentage of anemic children from 5 - 6 years was 10 percent and the prevalance of anemia gradually fell with age and anemia was more prevalent among boys than girls. Studies conducted in pre-school children in Gangwa village revealed that Haemoglobin levels in blood was low indicating the prevalance of anemia.

Mild anemia was the commonest deficiency both in boys and girls according to Easwaran et al. (1972). The Haemoglobin values were found to be lower in girls between 11 and 13 years of age as reported by Prakash et al. (1973). in children of Achampet.

3. Vitamin A Deficiency Diseases

Vitamin A deficiency in children leading to irreversible blindness is yet another major public health problem. This is due to inadequate dietary intake of vitamin as well as to repeated infections which children in poor communities are exposed to Medappa (1978).

Easwaran et al. (1972) state that the percentage prevalance of vitamin A deficiency was 1 percent in the age group 6, 7 and 8.

Xerosis and Bitot spots were common among rural primary school children. Bitot spots was absorved only in 8 and 9 year old children according to Rao et al. (1984).

Prevalance of signs of vitamin A deficiency in all tribes studied was much lower than that seen among rural Hyderabad pre-school children. In the 4 tribes studied the prevalance varied between 1 and 4 percent as compared to over 12.7 percent among rural Hyderabad pre-school children say Rao and Sathyanarayana (1974).

4. B. Complex Deficiency Diseases:

Angular stomatitis, cheilosis or glossitis was a common finding that was reported by Prakash et al. (1973) and Rao et al. (1984). Rao and Sathyanarayana (1974) stated the absence of B complex deficiency signs among children of the Koya Doras and Savara tribe and less than I percent in Jatapu tribe.

2. Clinical Examination:

According to Swaminathan (1985) clinical examination is the most essential part of all nutritional surveys since the ultimate objective is to assess levels of

health of individuals and population groups as influenced by the diets they consume.

Studies conducted in Hissar reveal that 77.5 percent children showed signs of nutritional deficiencies. Conjuctival xerosis was highly prevalent among all age groups. Bitot spots was also seen. Dental carries was observed in 1.0 percent of children.

Reports of Usha and Begum (1985) state that Angular stomatitis was found to be the most prevalent nutritional symptom in all age groups. Dry or rough skin was another symptom found widely. Bitot spots was observed in 6 and 9 year old children.

Saxena and Gupta (1978) give the results of their finding as presence of clinical features of nutritional deficiency in both rural and urban children.
Prakash et al. (1973) state that 13 percent of children had signs of vitamin A deficiency and 33 percent vitamin B deficiency.

Studies conducted in Wardha reveal that the major problem in the 6 - 14 age group was vitamin deficiencies, anemia, dental carries and common infections of skin scalp, throat, eye and ear Rao et al. (1984).

D. Practical Yardsticks of Nutritional Assessment:

Physical measurements when properly taken provide an

inexpensive, non-invasive means of assessing and tracking the nutritional status Mathews (1985/86).

One of the most objective and simple methods of assessing the nutritional status of individuals and population is the utilization of anthropometric indicators. Anthropometric measurements of young children are particularly sensitive to changes in nutritional status State Fillmore and Hussain (1984).

Anthropometric indicators are a variety of body measurements used in conjunction with measurement values of a reference population Fillmore and Hussain (1984), Devadas and Easwaran (1986) are of the opinion that growth as reflected in height and weight are the most commonly used indicators of nutritional status in children.

Easwaran et al.(1972) observed that both heights and weights advanced in both sexes as age increased. Boys were taller and heavier than girls in all age groups. This study was similar to the trends observed by Gopalan and Vijayaraghavan.

Muzzo et al. (1986) found weight for age, weight for height and height for age in the representative sample of 3955 children of differing socioeconomic levels. Weight for age was inadequate in 31.8 and 34.6 percent of boys and girls. When compared with National center of Health

statistic standards as adopted by World Health Organisation. Based on weight for height 12.9 and 16.8 percent of girls were obese with prevalance increasing from 11 years, compared with 7.2 and 10.9 percent of boys.

Sastry and Vijayaraghavan (1978) state that the extent of deficit in height is much less when compared to growth deficit in weight even in instances of severe malnurishment. The relationship of height weight and weight height ratio with age shows a high positive correlation showing that with an increase in age there is a corresponding increase in height weight and weight height ratio.

Anne and Begum (1985) compared mean heights and weights with those obtained by Gopalan and Vijayaraghavan on an all India basis and Tamil Nadu and found the boys and girls were taller than their counterparts in Tamil Nadu except 8 year old girls but were shorter when compared on All India Basis. The 10 year old boys equalled all India standards and 10 year old girls were lighter. The 8 and 9 year old boys and girls were heavier than their peers in all India and Tamil Nadu.

Based on weight for age the Gomez system classified

23 percent of the sample with II or III degree malnutrition. This was the result of the studies conducted by Dorea et al. (1982).

A study was conducted on 918 children in Agra. The screening method for malnutrition was standards for weight, age ratio and armcircumference height ratio was used by Prasad et al. (1982).

Anthropometric indices height, weight were used by Babu and Chuttani (1979) for nutritional assessment in school children. Eid et al. (1986) also used the above procedure for assessment.

Nutrition surveys are seldom conducted without inclusion of some form of biochemical assessment be it only Haemeoglobin or Haematocrit measurements.

Anne and Begum (1985) state that the mean Haemoglobin levels in the Municipal and Private schools ranged between 6.5 and 7.7. The values were low. When compared to the normal values obtained by Gopalan and Vijayaraghavan.

Swaminathan (1985) states that dietary surveys constitute an essential part of any complete study of nutritional status of individuals or groups providing essential information of nutrient intake, levels, source of nutrients, food habits and attitudes.

Gupta (1980) studied on the food intake of 31 tribes. 5 of the tribes of North East Frontier Area were the best fed with a mean daily intake of 2930 - 2962 K. cal. and 53 - 81 g. of protein. Nokte tribe had 1930 K. cal. and 44 g. protein.

Study in Walgett by 24 hour recall method estimated intake, and was compared to the FAO/WHO standards. It revealed that intakes of protein, thiamine, riboflavin, Vitamin C, energy and Iron were less.

Rao and Sathyanarayana (1974) state that the consumption of milk was low and green leafy vegetables was high among tribals.

METHODOLOGY

III. METHODOLOGY

The methodology involved in eliciting the nutritional status of tribal school-going children included the following steps.

A. Selection of target area and the group.

B. Survey of Socio-economic profile.

C. Study of the dietary practices and Food habits of the tribal population.

D. Nutritional assessment of target children through

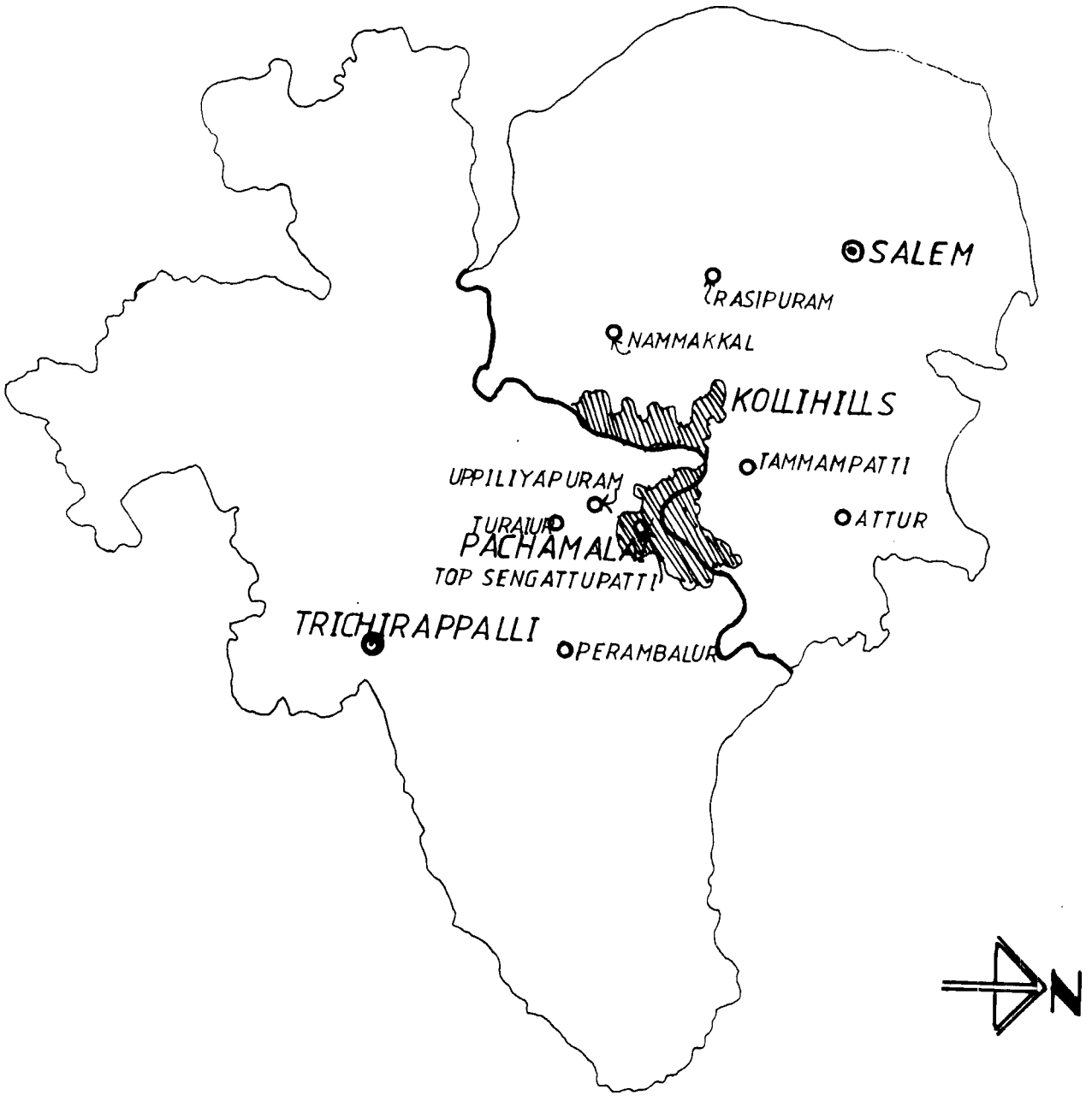
1. Nutritional anthropometry.
2. Clinical assessment.
3. Quantification of Food intake
4. Estimation of Haemoglobin levels.

A. Selection of Target Area and the Group:

Trichy and Salem districts of Tamil Nadu which account for 9.9 and 24 percent of the State's total tribal population were selected for the study (Fig. I). Pachamalai stretches over Trichy and Salem districts and consists of 5 revenue villages. The area of the hill is 458 sq.m. and altitude ranging between 1,000 - 2,500 feet. The area of Kolli hills is 388.8. sq.m. and is at an altitude of 1190 m. and it consists of 14 revenue villages of the 5 revenue villages of Pachamalai Thenparanadu

FIG 1

LOCATION MAP SHOWING KOLLIHILLS & PACHAMALAI



with a population of 5,296 and Gunduninadu of Kolli hills were chosen for the study. From Gunduninadu the following hamlets were chosen for the study. Velikattupatty, Keerakattupatty, Etadiparai, Elanangambadi and Gunduni. In Pachamalai the hamlets chosen were Chembur, Sithoor, Poothakal myalakulam and Top sengattupatty constituting Thenparanadu. These villages were selected because they were situated away from the main town thus forming a typical representative of tribal sample and the influence of urban areas has been minimal.

A random sample of 100 children in the age range of 6 - 12 years who were attending school in the two selected villages were drawn for the nutritional assessment study. A representative of the sample is shown in Figs. II, III. Age wise distribution of girls and boys is depicted in Figs. IV V.

B. Survey of the Socio-economic Profile:

A questionnaire (appendix - I) was formulated by the investigator to elicit information of the socio-economic profile of the tribal population. A questionnaire is defined as an instrument for collecting information from a number of persons by making a record of their answers to a number of questions. The salient points included the family size composition, literacy rate, occupational

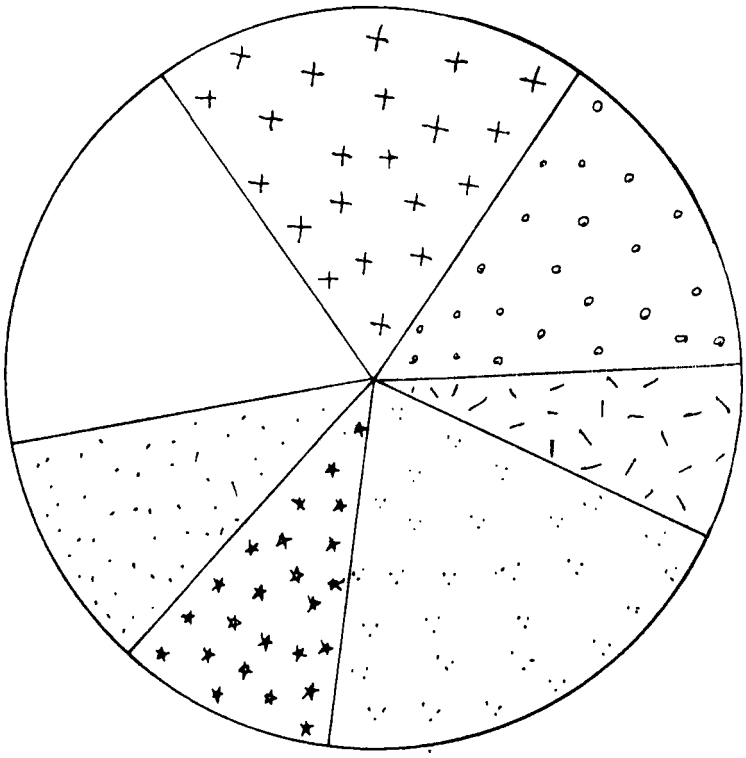
FIG II

FIG III

REPRESENTATIVE OF THE SAMPLE

FIG IV

AGE WISE DISTRIBUTION OF GIRLS

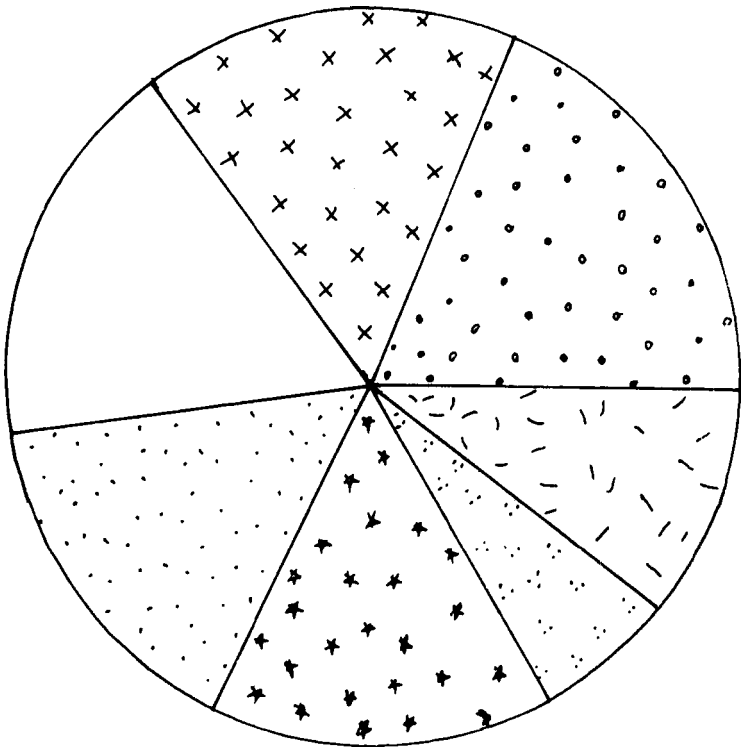


AGE IN YEARS

- 6
- 7
- 8
- 9
- 10
- 11
- 12

FIG V

AGE WISE DISTRIBUTION OF BOYS



AGE IN YEARS

- 6
- 7
- 8
- 9
- 10
- 11
- 12

pattern and total income. The above information was elicited by "Direct Personal Interview" and filled in the questionnaire. The investigator went to each house to conduct the interview. Fig. VI .

C. Study of the Dietary Practices and Food Habits of the Tribal Population:

Dietary surveys constitute an essential part of and study of nutritional status of individuals or groups providing essential information on nutrient intake, levels of nutrients, food habits and attitudes Swaminathan (1985).

With the help of questionnaire (appendix - II) and a direct interview data regarding the food habits dietary pattern, foods given and avoided under specific diseases and special conditions were collected.

D. Nutritional Assessment of Target Children:

Various parameters are used in nutritional assessment studies. On the basis of experience gained in nutrition surveys conducted in more than 20 countries by Inter-departmental committee of nutrition for National development, it is apparent that a combined approach including physical, biochemical and dietary assessments give more meaningful information than any one approach taken separately.

FIG. VI

CONDUCTING THE INTERVIEW

1. Nutritional Anthropometry:

Nutritional anthropometry is concerned with the measurements of the variations of the physical dimensions and the gross composition of the human body at different age levels and degrees of nutrition Jelliffe (1966). The following measures were done.

a. Height:

The height of an individual is made up of the sum of four components: legs, pelvis, spine and skull Jelliffe (1966). In field nutritional anthropometry only the total height is measured.

A vertical scale fixed to the wall was used to measure the height of the children. The subject stood on a flat floor by the scale with feet parallel and with heels, buttocks, shoulders and back of head touching the scale. The head was held comfortably erect with the arms hanging at the sides in a natural manner. A wooden block was gently lowered crushing the hair and making contact with the top of the hair. Height was measured to the accuracy of 0.1 cm.

b. Weight:

A spring balance which was checked for accuracy with standard weights was used is weigh the children to the accuracy of 0.5. kg.

c. Mid-Upper Arm Circumference:

The mid-upper arm circumference was measured to the nearest 0.1 cm. with a fiber glass tape which was pressed gently round the left upper limb and readings were recorded.

2. Clinical Assessment:

The nutritional status can be assessed by the presence or absence of clinical signs of deficiency or illness. A clinical assessment was conducted by the investigator using a proforma (appendix - III) developed for the presence or absence of nutritional deficiency signs.

3. Quantification of Food Intake:

A weighment survey was conducted by the investigator for three consecutive days on a sub sample of 40 school going children. Weighing the raw and cooked foods for each meal consumed by the individual child was determined. The proforma used for this survey is presented in (appendix - IV).

4. Estimation of Haemoglobin Levels:

Haemoglobin was estimated for the selected 200 school children by Cyanomethaemoglobin method.

RESULTS AND DISCUSSION

IV RESULTS AND DISCUSSION

The results and discussion pertaining to 'Assessment of Nutritional Status of tribal school-going children' is discussed under the following headings:

A. Background information of the target families.

B. Dietary practices and food habits.

C. Nutritional status of the target children.

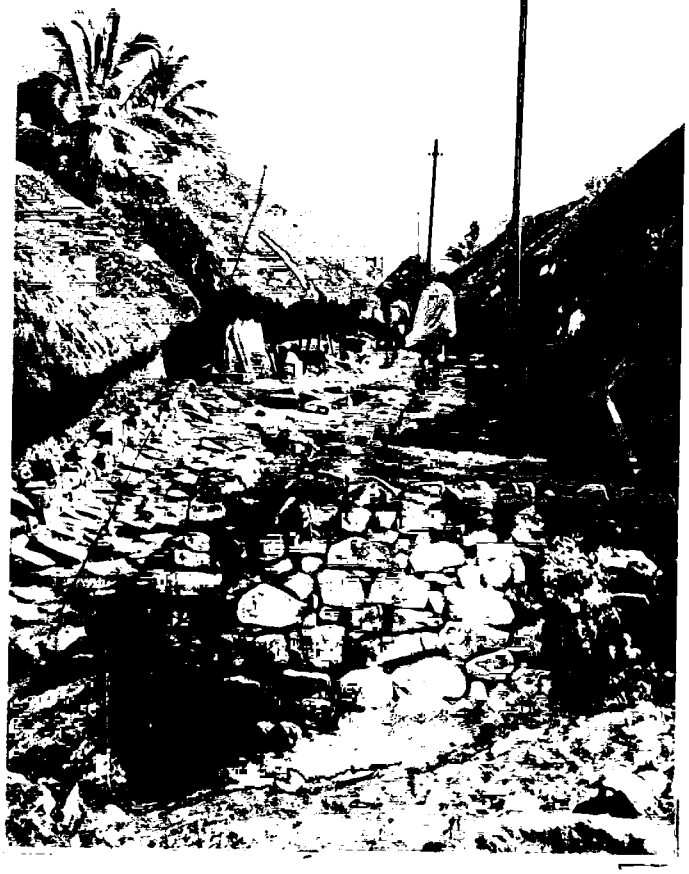
1. Measurements of height, weight and mid-upper arm circumference.
2. Clinical picture.
3. Mean days food and nutrient intake.
4. Haemoglobin levels.

A. Background Information:

From the 5 selected hamlets of Gunduninadu and Thenparanadu, 200 families were selected for the survey of their socio-economic profile. All 200 families were nuclear, and Hindus with Tamil as their mother tongue. They were Malayalis, a predominant tribal community. The word Malayali denotes inhabitant of the hills.

The Malayalis live in low-roofed huts, built of mud walls and thatched roofs. Figs. VII, VIII. There was not even a single tiled house in both the areas which indicates to the poor economic condition. Only

FIG VIII



HUTS IN THE VILLAGES OF KOLLIHILLS &
PACHAMALAI

the school buildings had granite walls with asbestos roof.

1. Family Size:

The investigator categorises the size of the family as small medium and large having 1 - 3, 4 - 6 and above six members respectively. The table I shows the size of the selected 200 families.

TABLE - I

FAMILY SIZE OF THE SELECTED 200 FAMILIES BELONGING TO KOLLI HILLS AND PACHAMALAI

Size	Kolli hills (N = 100) Number	Pachamalai (N = 100) Number
Small	21	19
Medium	71	56
Large	8	25

It was encouraging to know that 71 and 56 percent of the families in the target areas were of medium size. In Pachamalai 25 percent of families were large with more than six members as against 8 percent in Kolli hills.

This is in line with the observations made by Narayana et al. (1987), who found that the average size of the family in his studies on tribals was 6.2. Gurusamy (1988)

in his studies observed that the great majority of the households had medium sized families (4 - 6) in the tribes of Nellithurai, Kerala.

2. Family Composition:

The composition of the families in the selected households is shown in the table II.

TABLE - II

FAMILY COMPOSITION OF THE SELECTED 200 FAMILIES BELONGING TO KOLLI HILLS AND PACHAMALAI

	Kolli hills				Pachamalai			
Age	Male	Female	Total	Percentage	Male	Female	Total	Percentage
Infants	5	13	18	3.6	8	2	10	2.1
1 - 5	29	38	67	12.9	14	13	27	5.8
6 - 12	102	77	179	34.5	72	83	155	33.5
13 - 19	33	17	50	9.6	36	27	63	13.7
20 - 25	4	35	39	7.6	4	60	64	13.9
26 - 58	97	67	164	31.5	100	42	142	30.8
Above 58	-	2	2	0.3	1	-	1	0.2

In the tribal groups studied, children constituted 51 percent and 41.4 percent and the adult population was 49 percent and 58.6 percent in Kolli hills and Pachamalai respectively. The old age population was less in the target families. It may be atributed to the fact that old people live alone away from their sons or daughters. This might be the cause for the picture to be as low as 0.3 and 0.2 percent in Kolli hills and Pachamalai.

3. Literacy Level:

Literacy level above the age of 15 years revealed alarming illeteracy among women with as much as 97 and 94 percent in Kolli hills and Pachamalai respectively as against 82 and 79 percent among the men.

The results obtained are in line with those made by Mahalingam (1988), who observed percentage of literacy among tribals of all the hills in the state put together was about 20 percent. The literacy level among tribes is low and still lower in the case of female says Nagda (1988).

Agricultural labour was the main stay for all the selected target families.

4. Percapita Income:

Table III picturises the monthly percapita income of the target families.

TABLE - III

MONTHLY PERCAPITA INCOME OF THE TARGET FAMILIES OF KOLLI HILLS AND PACHAMALAI

Amount in Rupees	Kolli hills Number	Pachamalai Number
Below 50	3	-
50 - 150	81	77
150 - 250	16	23

It is evident that 15 percent of families in Kolli hills had a percapita income of Rs.150 - 250 as against 23 percent in Pachamalai. Pachamalai seems to be better off economically when compared to Kolli hills. In Pachamalai there was no family with percapita income below Rs.50.

5. Expenditure Pattern:

Major part of the income i.e. 85 - 90 percent was spent for food by all the target families, of the remaining money the amount spent for clothes was considerable Figs. IX, X. followed by recreation. Expenditure for education was nil because the tribal group received books and uniform free of cost along with the nutritious meal in school. This fact is supported by Narayana et al. (1987).

TRIBALS IN THEIR TYPICAL COSTUMES

B. Dietary Practices and Food Habits:

All the families surveyed in both areas were non-vegetarians and had three meals aday. The menu for the day was not planned, but was according to the available materials. Cooking was done twice a day, morning and night. The morning preparation was used for breakfast and lunch. Food for night was prepared after dusk.

The menu consisted of a staple cereal/millet along with sambar, rasam or buttermilk. For dinner the side-dishes prepared were sambar, kolumbu, rasam, greens or a vegetable, Non-vegetarian items were prepared for dinner only.

Table IV shows the cereal/millet consumed by the target families of Kolli hills and Pachamalai.

TABLE - IV

CEREAL/MILLET CONSUMPTION IN THE TARGET FAMILIES OF KOLLI HILLS AND PACHAMALAI

Cereal/millet	Kolli hills (N = 100)		Pachamalai (N = =00)	
	Breakfast and Lunch	Dinner	Breakfast and Lunch	Dinner
Ragi	28	15	35	2
Varagu	-	1	12	3
Samai	31	33	22	11
Thenai	34	29	13	1
Cholam	-	-	5	3
Rice	7	22	13	80

It is seen that the Malayalis of Kolli hills did not use varagu and cholam, samai and thenai were consumed by many. In the case of Pachamalai tribes ragi, samai and rice were mostly taken.

Vegetables like brinjal, ladies-finger, gourd varieties, beans, tapioca, potato were commonly used by the tribals in both the areas. Greens were in common use among the tribals.

In Kolli hills milk and milk products were not consumed. Though cows are reared they are not milked. This is supported by Rao (1982) who states that the consumption of milk was not known to the Paharias of Bihar.

Despite the fact that fruits like Jackfruits, Guavas Pomegranates, Mangoes, Plantains are cultivated in plenty they do not consume them for they are sent to market down hills for sale. In day to day use sugar and jaggery find no place.

Special and Unconventional Foods:

The unconventional foods which are used by the tribals of Kolli hills are as follows:

Unconventional green leaves

Pannakeerai

Thoyyakeerai

Eengikeerai

Kavanaikeerai

Kuppaikeerai

Kendipulichan

Tubers

Malankilangu

Mullangkilangu

Flesh of

Porcupine

Wild dogs

Deer

Grey quail

No special food was given to children because of economic constraints. During cold and fever, corriander seeds with jaggery (palm) was given. Soon after parturition the mother was given an extract from a particular type of beehive.

The Pachamalai tribals did not have unconventional foods on their list of intake. They gave certain foods that did not find a place in the normal menu, in diseased conditions. They consumed bread, bun, biscuits, idly and coffee bought from the petty shop. Kasayam for cold and fever was taken. Pomegranate was given when children suffered from diarrhea. They avoided the use of millets when feeding the sick and gave only rice.

C. Nutritional Status of Target Children:

Measurements of height, weight and mid-upper arm circumference.

Anthropometric measurements of young children are particularly sensitive to changes in nutritional status says Water-low (1976). FAO has especially recommended the use of weight for age and height for age for assessment.

The table shows the mean heights of girls in the age range of 6 - 12 years in both areas along with standard deviation and 't' values.

TABLE - V

MEAN HEIGHTS OF 6 - 12 YEAR GIRLS OF KOLLI HILLS AND PACHAMMALAI IN COMPARISON WITH VALUES OF NORMAL CHILDREN

	Kolli hills					Pachamalai				
Age	Number	Mean height in cms.	ICMR* Values	SD	't' Values.	Number	Mean height in cms.	ICMR * Values	SD	't' Values
6	7	98.0	114.0	± 5.0	8.3 **	6	94.5	114.0	± 5.3	8.9 **
7	9	101.6	119.0	± 7.9	6.6 **	8	103.1	119.0	± 8.3	5.4 **
8	4	110.0	124.0	± 3.5	7.9 **	12	118.5	124.0	± 7.3	8.8 **
9	3	116.0	130.0	± 1.4	17.2 **	6	118.8	130.0	± 6.7	4.0 **
10	7	116.8	136.0	± 5.9	8.5 **	2	122.6	136.0	± 4.0	7.4 **
11	6	120.6	141.5	± 2.6	19.5 **	12	127.0	141.5	± 3.9	12.9 **
12	2	125.5	147.5	± 5.5	5.6 **	5	130.0	147.5	± 5.0	4.9 **

* Vijayaraghavan (1981)

** 't' Values significant at one percent level.

TABLE - VI

MEAN HEIGHTS OF 6 - 12 YEAR GIRLS OF KOLLI HILLS AND PACHAMALAI IN COMPARISON WITH NORMS OF COIMBATORE AND ALL INDIA

	Kolli hills				Pachamalai			
Age	Number	Mean height in cms.	Norms of* Coimbatore	All ** India level	Number	Mean height in cms.	Norms of* Coimbatore	All ** India level
6	7	98.0	118.5	117.3	6	94.5	118.5	117.3
7	9	101.6	123.7	122.7	8	103.1	123.7	122.7
8	4	110.0	125.2	126.8	12	118.5	125.2	126.8
9	3	116.0	131.2	132.3	6	118.8	131.2	132.3
10	7	116.8	139.6	138.5	2	122.6	139.6	138.5
11	6	120.6	143.4	144.1	12	127.0	143.4	144.1
12	2	125.5	147.2	150.3	5	130.0	147.2	150.3

* Easwaran and Devadas (1981)

** ICMR (1971)

From the tables V and VI it was found that all girls of Kolli hills and Pachamalai were shorter when compared to ICMR values, Coimbatore Norms and All India Standards. The girls of all age groups except the six years of Pachamalai were taller than their counterparts of Kolli hills. The deficit ranged between 7 - 28cms. when compared with the Norms of Coimbatore.

TABLE - VII

MEAN HEIGHTS OF 6 - 12 YEAR BOYS OF KOLLI HILLS AND PACHAMALAI IN COMPARISON WITH NORMAL INDIAN CHILDREN

	Kolli hills					Pachamalai				
Age	Number	Mean height in cms	ICMR * Value	SD	't' Value	Number	Mean height in cms	ICMR * Value	SD	't' Value
6	11	99.5	114.0	± 8.3	5.8 **	10	105.0	114.0	± 7.3	3.9 **
7	9	100.2	119.5	± 4.6	12.5 **	9	107.1	119.5	± 9.5	3.8 **
8	12	106.8	124.5	± 8.6	7.0 **	7	114.1	124.5	± 8.1	3.4 **
9	9	111.1	130.0	± 4.0	14.2 **	8	117.3	130.0	± 8.9	4.0 **
10	11	115.6	135.0	± 4.9	13.0 **	6	126.7	135.0	± 5.6	4.1 **
11	5	120.0	140.0	± 3.7	11.6 **	2	122.5	140.0	± 2.5	9.8 **
12	5	125.8	145.0	± 1.5	29.3 **	7	130.0	145.0	± 5.1	7.0 **

* Vijayaraghavan (1981)

** 't' Values significant at one percent level.

TABLE - VIII

MEAN HEIGHTS OF 6 - 12 YEAR BOYS OF KOLLI HILLS AND PACHAMALAI IN COMPARISON WITH NORMS OF COIMBATORE AND ALL INDIA

	Kolli hills				Pachamalai			
Age	Number	Mean weight in cms.	Norms of * Coimbatore	All ** India level	Number	Mean height in cms.	Norms of * Coimbatore	All ** India level
6	11	99.5	119.6	118.9	10	105.0	119.5	118.9
7	9	100.0	124.3	123.3	9	107.1	124.3	123.3
8	12	106.8	127.3	127.9	7	114.1	127.3	127.9
9	9	111.1	133.3	133.6	8	117.3	133.3	133.6
10	11	115.6	138.7	138.5	6	126.7	138.7	138.5
11	5	120.0	142.0	143.4	2	122.5	142.0	143.4
12	5	125.8	146.5	148.9	7	130.0	146.5	148.9

* Easwaran and Devadas (1981)

** ICMR (1971)

The mean heights of boys in both areas did not meet the ICMR Standard, All India Standard and Coimbatore Norms. The boys of Pachamalai were taller than their peers of Kolli hills. When compared with the Coimbatore Norms the deficit ranged between 12 - 24 cms.

TABLE - IX

MEAN WEIGHT OF 6 - 12 YEAR GIRLS OF KOLLI HILLS AND PACHAMALAI IN COMPARISON WITH NORMAL INDIAN CHILDREN

	Kolli hills					Pachamalai				
Age	Number	Mean weight in kgs.	ICMR * Standard	SD	't' Value	Number	Mean weight in kgs.	ICMR * Standard	SD	't' Value
6	7	13.8	19.5	± 1.5	10.1 **	6	13.3	19.5	± 1.8	8.3 **
7	9	15.0	22.0	± 1.9	10.8 **	8	14.8	22.0	± 1.7	4.7 **
8	4	16.8	24.8	± 1.3	5.5 **	12	17.8	24.8	± 2.7	2.6 **
9	3	19.2	27.5	± 0.6	23.3 **	6	18.3	27.5	± 3.2	6.9 **
10	7	18.1	30.5	± 2.0	15.9 **	5	19.2	30.5	± 1.5	21.7 **
11	6	20.8	33.8	± 1.5	21.3 **	12	20.9	33.8	± 3.3	13.5 **
12	2	23.5	38.8	± 1.5	14.2 **	2	23.5	38.8	± 1.2	14.2 **

* Vijayaraghavan (1981)

** 't' Values significant at one percent level.

TABLE - X

MEAN WEIGHT OF 6 - 12 YEAR GIRLS OF KOLLI HILLS AND PACHAMALAI IN COMPARISON WITH NORMS OF COIMBATORE AND ALL INDIA

	Kolli hills				Pachamalai			
Age	Number	Mean weight in kgs.	Norms of * Coimbatore	All ** India	Number	Mean weight in kgs.	Norms of * Coimbatore	All ** India
6	7	13.8	19.9	21.4	6	13.3	19.9	21.4
7	9	15.0	22.4	24.8	8	14.8	22.4	24.8
8	4	16.8	24.9	26.1	12	17.8	24.9	26.1
9	3	19.2	26.6	29.7	6	18.3	26.6	29.7
10	7	18.1	31.8	33.5	5	19.2	31.8	33.5
11	6	20.8	35.4	36.1	12	20.9	35.4	36.1
12	2	23.5	39.8	42.6	2	23.5	39.8	42.6

* Easwaran and Devadas (1981)

** ICMR (1971)

The girls of both areas were lighter when compared to the ICMR Standard, All India Standard and Coimbatore Norms. 6 - 16 kgs. was the range of deficit when compared with Coimbatore Norms. The girls of Kolli hills and Pachamalai were of similar weight in the ages 11 and 12.

TABLE - XI

MEAN WEIGHT OF 6 - 12 YEAR BOYS OF KOLLI HILLSS AND PACHAMALAI IN COMPARISON WITH NORMAL INDIA CHILDREN

	Kolli hills					Pachamalai				
Age	Number	Mean weight in kgs.	ICMR * Values	SD	't' Value	Number	Mean weight in kgs.	ICMR* Values	SD	't' Value
6	11	14.1	20.5	± 1.2	18.2**	10	16.1	20.5	± 2.8	5.1 **
7	9	14.4	23.0	± 0.8	31.1**	9	16.7	23.00	± 1.7	11.3 **
8	12	16.8	25.5	± 2.4	12.4**	7	17.1	25.5	± 2.3	8.7 **
9	9	17.2	27.8	± 2.1	14.9**	8	19.0	27.8	± 1.3	18.4 **
10	11	19.5	30.0	± 0.8	41.7**	7	22.8	30.0	± 2.8	8.8 **
11	5	20.2	32.5	± 0.8	17.6**	2	16.8	32.5	± 0.8	29.4 **
12	5	22.0	35.5	± 0.6	29.3**	6	19.7	35.5	± 3.1	10.9 **

* Vijayaraghavan (1981)

** ' t' Values significant at one percent level.

TABLE - XII

MEAN WEIGHTS OF 6 - 12 YEAR BOYS OF KOLLI HILLS AND PACHAMALAI IN COMPARISON WITH NORMS OF COIMBATORE AND ALL INDIA

	Kolli hills				Pachamalai			
Age	Number	Mean weight in kgs.	Norms of * Coimbatore	All ** India	Number	Mean weight in kgs.	Norms of * Coimbatore	All ** India
6	11	14.1	20.9	22.1	10	16.1	20.9	22.1
7	9	14.4	23.2	24.5	9	16.7	23.2	24.5
8	12	16.8	25.5	26.4	7	17.1	25.5	26.4
9	9	17.2	27.8	30.0	8	19.0	27.8	30.0
10	11	19.5	30.8	32.4	7	22.8	30.8	32.4
11	5	20.2	34.6	35.3	2	16.8	34.6	35.3
12	5	22.0	36.2	38.8	6	19.7	36.2	38.8

* Easwaran and Devadas (1981)

** ICMR (1971)

Lighter were the boys of both areas when compared with ICMR Standard, All India Standard and Coimbatore Norms. The boys of ages 11 and 12 of Kolli hills were heavier than their counterparts of Pachamalai. In the other ages 6 - 10 the Pachamalai children were heavier. The weight deficit ranged between 4 - 18 kgs. when compared to the Norms of Coimbatore.

TABLE - XIII

MEAN MID-UPPER ARM CIRCUMFERENCE OF 6 - 12 YEAR GIRLS OF KOLLI HILLS AND PACHAMALAI IN COMPARISON WITH NORMS OF COIMBATORE AND ALL INDIA

	Kolli hills				Pachamalai			
Age	Number	Mean Value in cms.	Norms of * Coimbatore	All ** India	Number	Mean Value in cms.	Norms of * Coimbatore	All ** India
6	7	13.9	15.6	17.0	6	13.8	15.6	17.0
7	9	14.0	16.8	17.7	8	14.1	16.8	17.7
8	4	14.5	17.9	18.0	12	15.5	17.9	18.0
9	3	15.2	18.1	18.8	6	15.7	18.1	18.8
10	7	15.2	18.8	19.3	2	16.8	18.8	19.3
11	6	15.3	19.9	19.8	12	16.1	19.0	19.8
12	2	17.0	19.7	21.0	5	18.0	19.7	21.0

* Easwaran and Devadas (1981)

** ICMR (1971)

The girls of the two hill areas had arm circumferences less than the All India Standard and Coimbatore Norms.

TABLE - XIV

MEAN MID-UPPER ARM CIRCUMFERENCE OF 6 - 12 YEAR BOYS OF KOLLI HILLS AND PACHAMALAI, IN COMPARISON WITH NORMS OF COIMBATORE AND ALL INDIA

	Kolli hills				Pachamalai			
Age	Number	Mean value in cms.	Norms of* Coimbatore	All India**	Number	Mean value in cms.	Norms of * Coimbatore	All India **
6	11	13.7	16.0	16.7	10	14.6	16.0	16.7
7	9	13.8	16.9	17.4	9	15.2	16.9	17.4
8	12	14.3	17.4	17.7	7	15.0	17.4	17.7
9	9	14.2	18.0	18.5	8	16.1	18.0	18.5
10	11	15.0	18.4	19.0	6	16.8	18.4	19.0
11	5	15.1	18.9	19.6	2	16.3	18.9	19.6
12	5	15.3	19.5	20.3	7	17.7	19.5	20.3

* Easwaran and Devadas (1981)

** ICMR (1971)

The boys of both Kolli hills and Pachamalai had armcircumferences that was less than the values of their counterparts in comparison to the All India Standard and Coimbatore Norms. The children of Pachamalai had greater measurements than their counterparts of Kolli hills. The deficit ranged between 1.4 - 4 cms. when compared is Coimbatore Norms.

2. Clinical Picture :

Clinical examinations and assessment are important adjuncts in dietary and biochemical information as an indicator of nutritional status puts forth Rosyln et al.(1980).

Table X V gives a list of the clinical signs of deficiency diseases and number affected.

TABLE - XV

PERCENTAGE PREVALENCE OF DEFICIENCY SIGNS OF TARGET CHILDREN OF KOLLI HILLS AND PACHAMALAI

S.No.	Signs	Kolli hills (N = 100) Number	Pachamalai (N = 100) Number
1.	Absence of deficiency signs	52	53
2.	Depigmentation	10	18
3.	Pale conjuctiva	11	6
4.	Angular stematitis	10	10
5.	Mottled enamel	5	4
6.	Flurosis	8	-
7.	Bitot Spots	4	2
8.	Follicular hyperkeratosis	-	3
9.	Pellagrous dermatitis	-	3
10.	Flaky paint dermatitis	-	1

It is evident that nearly half the target, children suffered from one or other form of deficiency signs. Signs of flurosis was seen in Kolli hills and was absent in Pachamalai area. An equal number had angular stematitis. These who had depigmentation were greater in Pachamalai in contrast to Kolli hills.

The deficiency signs were also found to be common in the rural school children in the studies conducted by Rao et al. (1984). Gopalan (1978) Latham (1984) also gave the same picture.

3. Mean Days, Food and Nutrient Intake:

The mean for three days intake of food as well as nutrient is given in the tables. XVI, XVII, XVII and XIX.

TABLE - XVI

FOOD INTAKE OF THE SELECTED 20 SCHOOL GOING CHILDREN OF KOLLI HILLS

S.No.	Cereals (g)	Pulses (g)	Green leafy Vegetables (g)	Vegetables (g)	Fats (g)
1.	250	15	20	50	10
2.	240	15	-	75	10
3.	230	20	20	50	10
4.	235	15	25	50	10
5.	240	25	30	50	10
6.	225	50	-	60	10
7.	195	15	20	50	10
8.	235	15	-	50	10
9.	225	25	20	70	10
10.	210	25	20	50	10
11.	220	25	-	50	10
12.	235	30	-	65	10
13.	230	25	20	50	10
14.	190	15	10	50	10
15.	220	15	10	50	10
16.	235	25	-	50	10
17.	210	40	20	50	10
18.	215	15	20	50	10
19.	230	15	-	55	10
20.	240	15	20	50	10
R.D.A. 1 - 7 girls. 8 - 20 boys.	250	60	75	50	30

TABLE - XVII

FOOD INTAKE OF THE SELECTED 20 SCHOOL GOING CHILDREN OF PACHAMALAI

S.No.	Cereals (g)	Pulses (g)	Green leafy vegetables (g)	Vege-tables (g)	Fleshy foods (g)	Milk & milk products (g)	Fats (g)
1.	260	25	25	70	-	150	10
2.	245	20	-	75	-	100	10
3.	230	35	-	80	-	100	10
4.	245	30	-	125	-	100	10
5.	235	40	25	50	-	100	10
6.	225	40	30	50	-	100	10
7.	225	40	-	100	-	100	10
8.	245	40	-	50	-	225	10
9.	230	35	30	75	-	100	10
10.	215	30	-	75	-	250	10
11.	220	35	-	50	-	200	10
12.	230	30	30	50	50	100	10
13.	225	35	30	110	-	100	10
14.	250	40	50	50	-	100	10
15.	265	20	-	50	50	100	10
16.	245	40	-	50	-	100	10
17.	230	20	25	75	-	300	10
18.	225	45	20	50	-	150	10
19.	230	35	-	50	40	150	10
20.	230	45	-	70	-	100	10
R.D.A.	250	60	75	50	30	200	30

1 - 10 girls

11 - 20 boys

TABLE - XVIII

NUTRIENT INTAKE OF THE SELECTED 20 SCHOOL GOING CHILDREN OF KOLLI HILLS

S.No.	Energy K.Cal	Protein (g)	Fat (g)	Carbohydrates (g)	Fibre (g)	Iron (mg)
1.	1037	21.8	15.3	202.5	9.3	16.1
2.	1000	24.9	17.1	186.2	12.5	19.7
3.	988	24.9	16.7	183.0	5.7	20.7
4.	984	24.3	10.8	187.3	9.4	21.2
5.	1086	23.8	17.6	127.9	12.3	16.0
6.	1061	31.1	16.8	195.0	12.7	20.9
7.	902	19.8	17.3	166.2	5.3	15.4
8.	1020	20.9	18.9	191.2	9.0	14.5
9.	959	22.4	14.9	183.3	11.7	14.2
10.	943	21.3	16.2	177.4	10.1	13.9
11.	968	21.0	14.0	188.7	6.7	12.8
12.	1028	26.4	15.3	159.4	9.2	20.7
13.	995	29.8	16.7	183.4	12.3	23.5
14.	828	21.6	14.8	151.8	8.4	18.5
15.	927	25.3	17.0	170.1	10.8	22.4
16.	1009	25.8	16.6	187.8	12.2	19.6
17.	994	25.0	16.0	185.8	11.7	14.4
18.	907	24.7	15.9	168.0	10.4	22.2
19.	960	20.0	10.1	186.0	8.4	14.0
20.	1034	22.9	14.8	201.4	7.3	13.6

1 - 7 girls

8 - 20 boys

TABLE - XIX

NUTRIENT INTAKE OF THE SELECTED 20 SCHOOL GOING CHILDREN OF PACHAMALAI

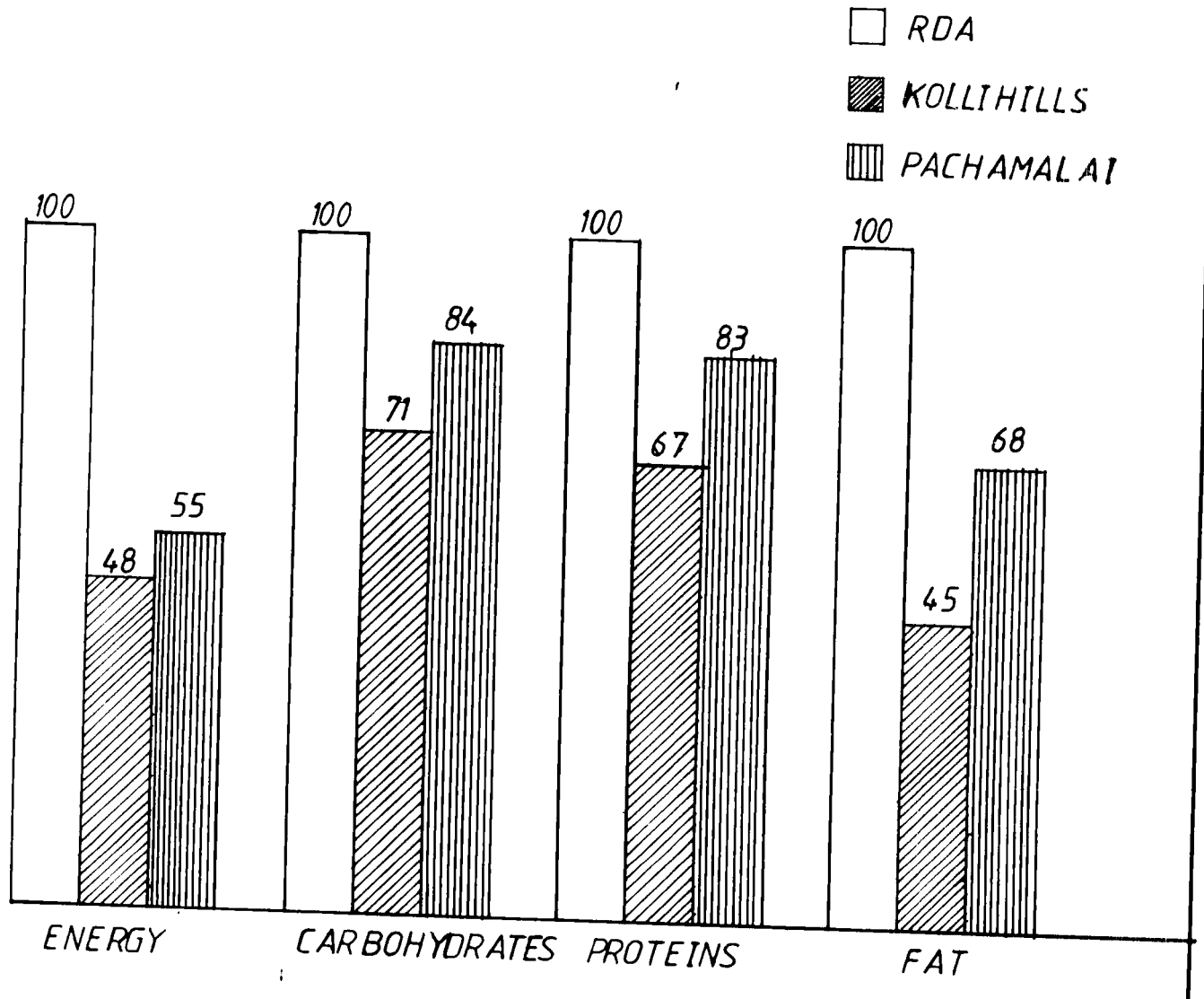
S.No.	Energy K.Cal	Protein (g)	Fat (g)	Carbohydrates (g)	Fibre (g)	Iron (mg)
1.	1256	27.4	20.6	234.1	1.9	14.1
2.	1087	22.2	18.3	219.8	7.9	12.8
3.	1120	27.0	20.2	200.6	6.4	17.4
4.	1109	23.6	21.4	201.5	9.6	15.7
5.	1127	24.4	21.2	203.7	6.4	14.1
6.	1110	24.1	18.9	209.5	7.4	14.0
7.	1124	23.6	18.7	208.2	4.3	15.1
8.	1168	25.8	22.5	208.7	7.2	13.9
9.	1139	24.8	18.8	216.0	7.7	14.7
10.	1252	22.9	22.1	224.5	6.6	12.8
11.	994	24.4	20.6	194.2	3.7	13.2
12.	1178	35.5	20.9	210.5	5.9	13.6
13.	1028	24.8	19.0	215.0	9.0	16.3
14.	1198	27.9	20.2	221.1	2.7	16.5
15.	1240	34.0	20.6	221.1	3.7	14.7
16.	1135	25.1	21.6	204.0	9.4	15.6
17.	1089	22.5	20.9	196.8	3.8	14.1
18.	1151	22.7	23.0	298.1	7.9	20.7
19.	1138	35.9	20.6	195.4	6.7	12.2
20.	1142	29.2	20.5	203.7	6.9	18.4

1 - 10 girls

11 - 20 boys

FIG XI

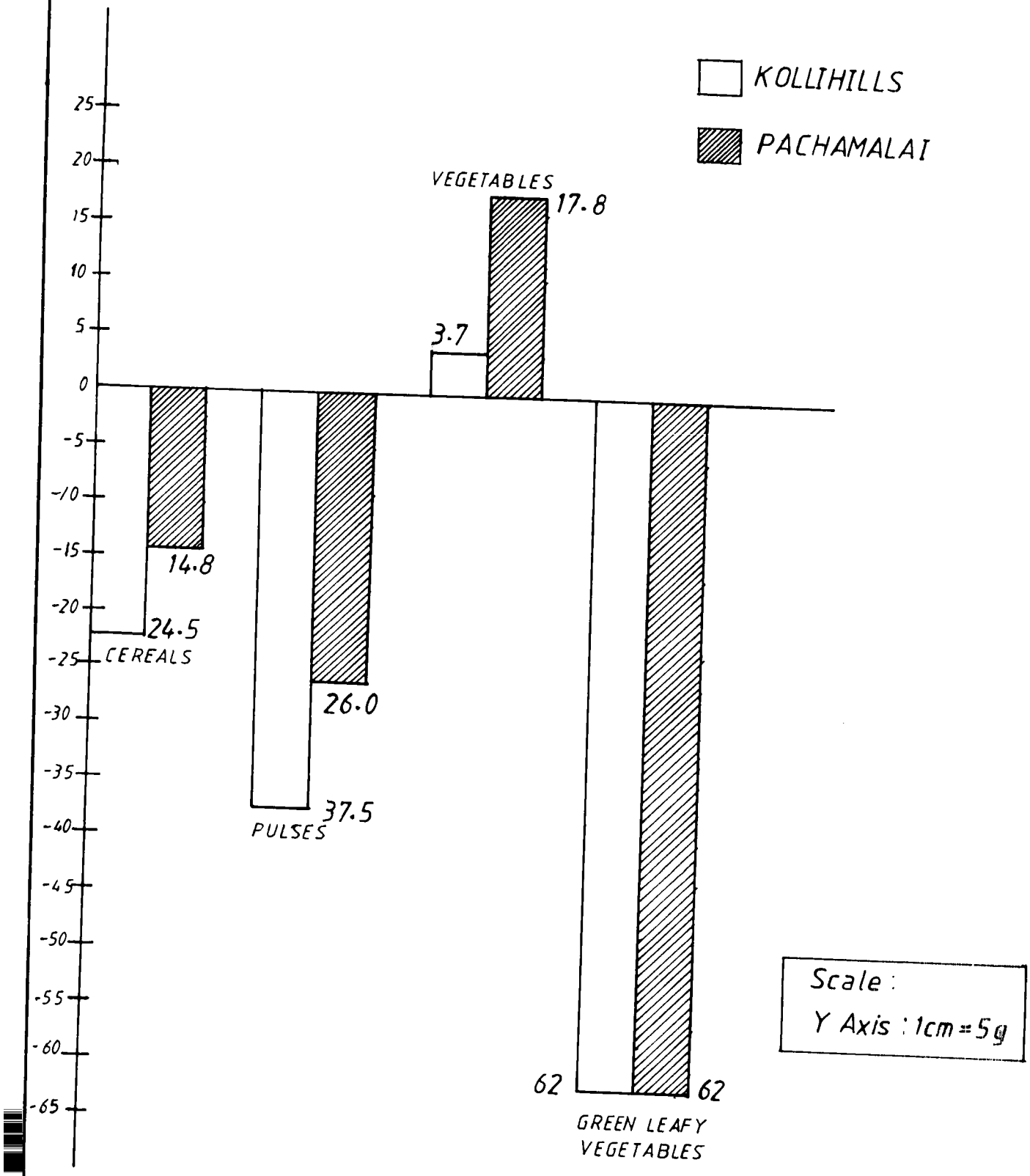
MEAN INTAKE OF NUTRIENTS IN PERCENTAGE IN COMPARISON TO RECOMMENDED DAILY ALLOWANCE



Scale:
Y Axis : 1cm = 10%

FIG XII

EXCESS & DEFICIT OF FOOD INTAKE WHEN COMPARED TO RDA



When intake was compared against the R.D.A. recommended daily allowance except vegetables all items did not meet the requirements Figs. XI XII. The intake of milk and milk products was nil in the case of children of Kolli hills. There was a glaring deficit of fat when compared to R.D.A. which might be due to the prohibitive cost of fats and oils.

4. Haemoglobin Levels:

Nutrition surveys are seldom conducted without inclusion of some form of biochemical assessment be it Haemoglobin or Haematocrit estimation Roslyn et al. (1980). Haemoglobin was estimated in all the 200 target children which is shown in Table XX.

TABLE - X X

MEAN HAEMOGLOBIN VALUES ON AGE AND SEX DIFFERENCE OF TARGET CHILDREN OF KOLLI HILLS AND PACHAMALAI

	Kolli Hills (N = 400)			Pachamalai (N = 100)	
Age	Standard value in gram percent	Mean value of boys in gram percent	Mean value of girls in gram percent	Mean value of boys in gram percent	Mean value of girls in gram percent
6	12	8.0	8.0	8.2	8.2
7	12	7.8	8.0	8.0	8.0
8	12	8.0	7.6	8.1	8.0
9	12	7.9	7.8	7.8	8.1
10	12	8.2	7.9	8.0	8.2
11	12	8.2	7.8	8.0	7.7
12	12	8.1	7.8	8.5	8.5

The table shows that the mean Haemoglobin values in all age groups was less than 12 gram percent, the value stated by WHO (1972) in the Report on Nutritional anaemia.

Anne et al. (1985) observed values ranging between 7 - 9 gram percent in children of private schools and values between 6 - 8 gram percent in children of municipal schools. These values are in line with those obtained in the present study.

SUMMARY AND CONCLUSION

V SUMMARY AND CONCLUSION

The study pertaining to the Assessment of Nutritional status of tribal school-going children was carried out with the following objectives.

A. Survey of the socioeconomic profile of the tribal population of Kolli-hills and Pachamalai.

B. Study of the dietary practices and Food habits of the tribal population. and

C. Nutritional Assessment of 200 tribal school-going children.

A survey was conducted to elicit information regarding their socioeconomic profile, dietary practices and food habits. Nutritional assessment was done through measurements of height, weight and mid-upperarm circumference. A clinical assessment was done to find out the presence or absence of deficiency signs. Food quantification was done by weighment Haemoglobin levels were also estimated.

Findings:

1 The families belonging to both areas Kolli hills and Pachamalai were nuclear and Hindus with Tamil as their mother tongue. They belonged. to the Malayali tribal community. The families were medium sized with 4 - 6 members.

2. The literacy level was as low as 3 and 6 percent in women of Kolli hills and Pachamalai. The level in men was 17 and 21 percent. Agriculture was the main source of sustenance. The percapita income fell between Rs.50 - 150 in 81 and 77 percent of the families belonging to Kolli hills and Pachamalai.

3. Expenses towards food was 85 - 90 percent of their income followed by clothing and recreation. In both areas expenditure towards education was nil.

4. All families surveyed were non-vegetarians and had three meals a day. The tribals of Kolli hills did not consume milk and milk products.

5. The uncommon foods used by tribals of Kolli hills were unconventional green leaves, tubers and fleshy foods.

6. No special food was given to children in both areas.

7. The girls and boys in both areas were shorter and lighter compared to their peers in All India and Coimbatore standards. Children of Pachamalai fared better than those of Kolli hills.

8. Nearly half the children exhibited some form or other of the deficiency signs, the major ones being depigmentation, pale conjuctiva and angular stomatitis.

9. The intake of all except vegetables was less than the recommended daily allowance.

10. Haemoglobin values of all the 200 children was between 7 - 9 gram percent.

Suggestions for upliftment of tribal groups:

1. Literacy programmes should be launched for tribal population.

2. Health care of tribals deserves attention and hence health centres should be set up in tribal areas.

3. Access through proper road is another inportant requirement.

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APPENDICES

APPENDIX - I

I. QUESTIONNAIRE TO ELICIT INFORMATION REGARDING THE SOCIO-ECONOMIC PROFILE OF THE TRIBALS.

Date of Interview:

Name of the Investigator :

Name of the village :

Name of the Panchayat/

Block :

I GENERAL INFORMATION

1. Name of the Interviewee :
2. Name of the head of the family
3. Address :
4. Caste/Tribe :
5. Religion :
6. Mothertongue :
7. Type of family : Joint ☐ Nuclear ☐
8. Size of family :

Small (1 - 4) ☐ Medium (4 - 6) ☐ Large (above 6) ☐

9. Family Composition :

Age of group in years	Male	Female
Infants		
1 - 5		
6 - 12		
13 - 19		
20 - 25		
26 - 58		
Above 58		

Educational Status and Income:

Male	Occu-pation	Literate/ Illeterate	Income	Female	Occu-pation	Literate/ Ille-terate	Income
Total		-------		Total		.....	
		-------				.....	

Total Monthly Income

Monthly total percapita Income.

EXPENDITURE:

S.No.	Items of expenditure	Amount per Month	Amount per Year
1.	Food		
2.	Housing		
3.	Clothing		
4.	Education		
5.	Health		
6.	Recreation		
7.	Transport		
8.	Others (specify)		

APPENDIX - II

II. QUESTIONNAIRE TO ELICIT INFORMATION REGARDING DIETARY PRACTICES AND FOOD HABITS OF TRIBALS.

1. Food Expenditure Pattern.

S.No.	Food Item	Amount Spent in Rupees
1.	Cereals	
2.	Pulses	
3.	Greenleafy vegetables	
4.	Other vegetables	
5.	Fruits	
6.	Oil	
7.	Milk	
8.	Condiments	
9.	Meat fish poultry	
10.	Sugar, Jaggery	
11.	Other (specify)	

2. Do you plan your meals before hand?

Yes ☐

No ☐

3. How many meals do you have per day.

4 meals (Breakfast, Lunch, Tea, Dinner) ☐

3 meals (Breakfast, Lunch, Dinner) ☐

2 meals (Lunch, Dinner) ☐

Others (specify) ☐

4. What is the eating habit followed?

Vegetarian

Non-vegetarian

Eggeterian

5. What are the Foods included and avoided in any diseased condition?

Diseased condition	Foods included	Reason	Foods Avoided	Reason
Fever				
cold				
chickenpox				
Diarrhea				
Vomiting				
Others				

6. a. Do your family members have meals together ?

Yes ☐ No ☐

b. If no give reasons.

7. a. Is any member of the family given preference to eat first?

b. Yes ☐ No ☐

b. If yes who is given the preference?

Infants ☐ Head of the family ☐ Men ☐

Women ☐

8. Do you include or avoid any special food in the diet of children? If yes give reason.

Foods	Reason

9. Do you include green leafy vegetables in your diet?

Yes ☐ No. ☐

10. Do you have any belief regarding any Food item?

Yes ☐ No ☐ If yes give reason.

Foods	Reason

11. Likes and Dislikes of children:

Foods Items	Likes	Dislikes
Greens		
Milk		
Egg		
Fruits		
Sweets		
Others(specify)		

12. a. Do your children participate in any school Lunch Programme?

Yes No.

b. If yes in which programme.

13. Daily Meal Pattern.

Day	Breakfast	Lunch	Tea	Dinner	Snacks in between meals.

APPENDIX - III

CLINICAL ASSESSMENT

Name	:	
Age in years	:	
Sex (M/F)	:	Birth Order
Height in cms.	:	
Weight in kgs.	:	
Arm circumference in cms.	:	

PRESENCE OF DEFICIENCY SIGNS:

Face	:	Depigmentation Nasolabial dyssebeccae
Eyes	:	Pale conjuctiva Bitot Spots Conjuctival Xerosis Corneal Xerosis Keratomalocia
Lips	:	Angular Stomatitis Angular Scars Cheilosis
Tongue	:	Scarlet Tongue Atropic papillae
Teeth	:	Mottled enamel Flurosis
Gums	:	Spongy bleeding gums
Glands	:	Thyroid
Skin	:	Follicular hyperkeratosis Pellagorous dermatitis Flaky paint dermatitis
Nails	:	Koilonychia
Bone	:	Beading of ribs Knock knees Bow legs.

APPENDIX - IV

INDIVIDUAL FOOD CONSUMPTION PATTERN

Name of the meal	Menu	Name of raw food	Total weight of raw ingredient used by the family (g)	Total weight of cooked food (g)	Weight of cooked food consumed by the individual (g)	Raw equivalence of the food consumed by the individual (g)

APPENDIX - V

ESTIMATION OF HAEMOGLOBIN BY CYANMETHAEMOGLOBIN METHOD:

Raghuramulu et al. (1983).

Principle:

Haemoglobin is treated with a reagent containing potassium ferricyanide and potassium dihydrogen phosphate. The ferricyanide forms methaemoglobin which is converted to Cyanomethaemoglobin by the Cyanide.

Reagent:

Drabkins Solution:

Potassium cyanide	- 50 mg.
Potassium ferricyanide	- 200 mg.
Dihydrogen Potassium phosphate	- 140 mg.
Distilled water	- 1 Litre

Dissolve 50 mg of potassium cyanide in one litre of water. The reagent should be pale yellow clear with a pH between 7.0 and 7.4. The solution does not absorb any light above 480 nm and therefore gives the same reading as the water blank.

Store in a lightly stoppered amber borosilicate glass bottle. Do not freeze discard if the solution turns turbid or has an absorbance other than zero at 540 mm.

Procedure:

1. Perform skin puncture

2. Quickly place the tip of the haemoglobin pipette over the puncture and fill upto 20 µl. level or slightly more.

3. Wipe the outside of the pipette with a white guaze. If the level of the blood is higher than 20 µl. mark. bring it to the exact 20 µl. mark by absorbing the extra blood on a wet swat

4. Deliver the blood from the haemoglobin pipette on to the What-men No.1 filter paper.

5. Allow to dry and mark filter paper with identification. Air dry and keep in an envelope.

6. Drop the filter paper into 5 ml of Drabkin's solution and allow is stand for an hour voytex it for 5 minutes and measure the optical density at 540 nm using Drabkin's solution/blank and a commercial standard.

Calculation:

Haemoglobin in gm/l is calculated as follows:

$$\text{Haemoglobin g/l} = \frac{\text{A 540 test sample}}{\text{A 540 or standard}} \times \text{concentration of standard mg/l} \times \text{dilution factor}$$

Preparation of Standard Curve:

It is desirable to construct a standard curve for Haemoglobin by using reference. HiCN calibration standard containing a known concentration of Hb in mg/l specified on the label. The results of the test sample can be reed directly from the standard curve.

APPENDIX - VI

HEIGHT, WEIGHT, ARM CIRCUMFERENCE AND HAEMOGLOBIN VALUES OF THE SELECTED 100 SAMPLES OF KOLLI HILLS:

S.No.	Age	Height in cms.	Weight in kgs.	Arm Circumference in cms.	Haemoglobin gram %
1.	2	3	4	5	6
1.	6	105	15	13.0	8.4
2.	6	90	13	13.2	7.5
3.	6	100	15	14.5	7.7
4.	6	100	15	14.0	8.2
5.	6	91	11	14.4	8.2
6.	6	100	13	13.1	8.3
7.	6	100	15	14.0	7.3
8.	6	108	15	14.9	8.5
9.	6	115	16	14.0	7.9
10.	6	104	15	14.3	6.8
11.	6	84	15	13.5	8.0
12.	6	98	14	13.5	7.9
13.	6	90	12	13.0	8.5
14.	6	105	13	14.0	8.4
15.	6	103	12.5	12.5	8.9
16.	6	95	14	14.0	8.6
17.	6	95	14	13.6	7.9
18.	6	97	15	14.5	7.5
19.	7	90	15	14.0	7.0
20.	7	110	19	14.2	7.8

1	2	3	4	5	6
21.	7	105	16	14.5	9.7
22.	7	112	15	13.3	8.1
23.	7	104	15	14.1	8.9
24.	7	87	11	13.0	7.8
25.	7	100	15	14.0	8.2
26.	7	102	14	14.5	8.9
27.	7	105	15	14.0	7.6
28.	7	100	15	14.2	7.5
29.	7	107	15	14.6	8.9
30.	7	96	13	13.0	7.5
31.	7	95	14	13.5	7.7
32.	7	98	14	13.0	8.0
33.	7	105	15	15.0	7.8
34.	7	95	14	13.0	7.9
35.	7	107	16	14.1	7.4
36.	7	99	14	14.2	7.7
37.	8	115	18	15.0	7.5
38.	8	110	16	14.0	7.8
39.	8	105	15	14.2	7.5
40.	8	110	18	15.6	8.5
41.	8	106	15	14.5	7.6
42.	8	110	16	14.0	8.5
43.	8	110	16.5	13.1	8.5
44.	8	105	15	13.0	7.2

1	2	3	4	5	6
45.	8	101	12	13.0	7.5
46.	8	95	16	14.5	8.3
47.	8	88	15	14.0	8.0
48.	8	118	20	15.2	8.5
49.	8	115	17	14.1	7.0
50.	8	115	20	14.9	8.1
51.	8	115	20	15.9	8.3
52.	8	104	19	14.0	8.1
53.	9	118	18.5	12.5	7.3
54.	9	115	19	16.0	7.8
55.	9	115	20	17.1	8.3
56.	9	110	14	14.2	7.8
57.	9	104	18	14.5	7.6
58.	9	115	19	15.0	8.2
59.	9	110	18	14.0	8.2
60.	9	118	20	14.0	8.3
61.	9	108	14	13.5	8.2
62.	9	110	15	13.0	7.0
63.	9	115	18	14.2	7.7
64.	9	110	18	15.0	7.8
65.	10	120	19	15.8	8.1
66.	10	120	20	15.0	6.9

1	2	3	4	5	6
67	10	105	15	16.1	8.3
68.	10	119	19	14.5	7.6
69.	10	122	15	15.0	8.6
70.	10	111	19	14.5	8.0
71.	10	121	20	16.0	7.6
72.	10	113	19	14.6	7.8
73.	10	115	20	15.9	8.3
74.	10	125	20	15.5	8.8
75.	10	110	19	15.0	8.3
76.	10	118	21	15.2	7.5
77.	10	118	20.5	14.5	8.9
78.	10	110	19	13.5	8.2
79.	10	120	19	14.0	8.4
80.	10	115	19	14.5	7.8
81.	10	120	20	17.0	7.9
82.	10	108	18	14.0	7.9
83.	11	120	20	14.5	8.1
84.	11	118	21	16.9	7.1
85.	11	123	24	17.0	8.0
86.	11	120	20	14.0	8.3
87.	11	118	20	15.2	7.6
88.	11	125	20	16.0	7.7

1	2	3	4	5	6
89.	11	115	20	14.5	7.6
90.	11	117	19	14.3	8.2
91.	11	120	20	15.5	8.6
92.	11	123	21	16.0	8.3
93.	11	125	21	15.0	8.5
94.	12	120	22	16.0	7.5
95.	12	131	25	18.0	7.6
96.	12	127	22	15.2	8.0
97.	12	125	22	16.8	7.5
98.	12	124	23	14.5	8.2
99.	12	128	21	14.0	9.0
100.	12	125	22	15.9	7.7

APPENDIX - VII

HEIGHT, WEIGHT, ARM CIRCUMFERENCE AND HAEMOGLOBIN VALUES OF SELECTED 100 SAMPLES OF PACHAMALAI

S.No.	Age	Height in cms.	Weight in kgs	Arm circumference in cms.	Haemoglobin gram %
1	2	3	4	5	6
1.	6	88	11	14.0	7.4
2.	6	98	13	14.0	8.3
3.	6	101	15	14.0	8.6
4.	6	100	15	13.0	9.2
5.	6	90	15	15.0	7.6
6.	6	90	11	12.5	7.8
7.	6	100	13	14.5	8.1
8.	6	115	16	14.1	9.0
9.	6	96	14	14.3	8.1
10.	6	101	19	17.0	7.8
11.	6	117	20	15.0	7.3
12.	6	98	11	13.2	7.6
13.	6	103	14	13.4	8.3
14.	6	100	19	15.5	8.7
15.	6	115	16	14.0	8.4
16.	6	105	18	14.9	9.1
17.	7	108	15	13.9	9.1

1	2	3	4	5	6
18.	7	90	12	13.0	7.3
19.	7	115	18	14.6	8.2
20.	7	99	15	13.0	8.6
21.	7	112	15	14.0	7.0
22.	7	95	14.5	14.6	7.5
23.	7	108	16	15.0	8.0
24.	7	98	13	14.5	9.3
25.	7	100	16	14.1	9.8
26.	7	122	16	16.0	7.7
27.	7	118	17	15.0	7.9
28.	7	97	15	13.5	7.0
29.	7	100	15	14.5	8.4
30.	7	102	17	15.0	8.1
31.	7	120	19	16.3	8.8
32.	7	98	15	16.1	7.2
33.	7	110	20	16.0	7.6
34.	8	127	16	16.0	8.0
35.	8	115	16	15.0	8.8
36.	8	120	19.5	17.6	8.1
37.	8	115	19.5	16.0	7.2
38.	8	118	13	15.0	7.1
39.	8	103	16	14.5	7.6
40.	8	122	18	14.0	8.3

1	2	3	4	5	6
41.	8	113	15	15.0	8.6
42.	8	118	19	14.0	7.5
43.	8	118	19	16.0	8.0
44.	8	118	19	16.8	7.9
45.	8	135	24	16.5	8.4
46.	8	120	18	14.0	8.3
47.	8	115	16	13.5	8.8
48.	8	98	16	16.0	8.5
49.	8	118	15	14.0	7.6
50.	8	118	15	15.0	7.8
51.	8	125	22	16.0	7.4
52.	8	110	18	15.1	8.2
53.	9	118	18	14.3	9.1
54.	9	115	18	15.0	8.6
55.	9	125	15	16.0	8.3
56.	9	130	25	17.1	7.7
57.	9	115	16	17.0	7.6
58.	9	110	17.5	13.5	7.3
59.	9	120	19.5	17.0	8.1
60.	9	118	20	16.0	7.9
61.	9	115	19	14.5	8.0
62.	9	120	16	15.0	7.5
63.	9	122	20	15.2	8.5
64.	9	123	20	18.0	7.1
65.	9	95	20	17.8	8.2

1	2	3	4	5	6
66.	9	123	18	16.0	7.4
67.	10	127	20	17.5	8.6
68.	10	115	19	18.5	8.2
69.	10	115	20	16.0	9.2
70.	10	124	17	17.0	8.6
71.	10	124	20	15.2	7.6
72.	10	128	18	16.5	7.8
73.	10	134	23	18.1	7.6
74.	10	120	16	16.3	7.3
75.	10	120	22	17.9	7.4
76.	10	135	24	17.0	8.3
77.	10	125	19	16.5	8.6
78.	10	125	16	15.0	8.7
79.	11	122	16	16.3	8.1
80.	11	127	17	15.0	7.2
81.	11	130	27	18.9	7.2
82.	11	123	20	15.5	8.3
83.	11	135	25	15.0	8.1
84.	11	132	25	17.0	8.2
85.	11	124	21	16.0	7.4
86.	11	125	20	15.0	7.2
87.	11	125	19	16.2	7.6
88.	11	128	23	17.0	8.2
89.	11	123	21	15.5	8.4
90.	11	130	17.5	16.0	8.7

1	2	3	4	5	6
91.	11	125	16	17.1	8.6
92.	11	120	17.5	16.0	7.5
93.	12	135	25	18.4	8.7
94.	12	125	22	17.5	8.4
95.	12	133	24	17.0	8.9
96.	12	127	20	18.2	7.9
97.	12	132	22	18.1	8.2
98.	12	135	25	19.0	8.4
99.	12	120	19	15.0	8.6
100.	12	133	27	19.0	9.3

APPENDIX - VIII

STATISTICAL APPRAISAL - HEIGHT Vs WEIGHT:

Height X	Weight Y
88	11
98	13
101	15
100	15
90	15
90	11
100	13.5
115	16
96	14
101	19
117	20
98	11
103	14
100	19
115	16
105	18

't'Test:

$$t_o = \frac{\bar{x} - \mu}{\sigma x / \sqrt{n}}$$

For Girls.

$\bar{x} = 94.5$ $\quad \sigma x = 5.28$ $\quad n = 6$ $\quad \mu = 114$

$$\frac{94.5-114}{5.28/\sqrt{6}} = \frac{19.5 \times 2.4}{5.28} = \frac{46.8}{5.28} = 8.86$$

$t_o = 8.86$

t_e at 1% = 4.03.