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PREVALENCE OF VITAMIN A AND IRON DEFICIENCIES AMONG PRIMITIVE TRIBAL CHILDREN IN NILGIRIS DISTRICT

K.U.Pavitra Krishna* and M.Sylvia Subapriya

Department of Food Science and Nutrition, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, Tamilnadu.

*Corresponding author: ushpavi@yahoo.co.in

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ABSTRACT

India has a significant tribal population of 400 tribal groups, constituting about eight per cent of the population. The traditional life style of tribals and their lack of nutritional awareness plays a major role in determining their nutritional status. The problem of micronutrient malnutrition, particularly those of VAD and IDA have been found to have devastating effects of reported low birth weights, still births, neonatal deaths, conjunctival inflammation and koilonychia. Assess the prevalence of Vitamin A, Iron deficiencies and other micronutrient deficiencies among 1-14 years tribal children in Nilgiris district through clinical examination. Using Random sampling method, 4376 Primitive Tribal children in the age group of 1–14 years from Nilgiris were screened clinically for symptoms of VAD, IDA and other micronutrient deficiencies. Of the 4376 children, 300 children showing moderate to severe clinical symptoms of VAD and IDA were selected for the socioeconomic, dietary and anthropometry assessments. The clinical observations revealed that the prevalence of VAD is beyond the cutoff points of WHO standards and thereby making it a problem of public health significance among the screened PTG children. The prevalence of Koilonychia was seen among 0.5 per cent of the children.

Key words: VAD- Vitamin A Deficiency, IDA- Iron Deficiency Anemia, MUAC- Mid Upper Arm Circumference, RDA- Recommended Dietary Allowances, WHO- World Health Organization

INTRODUCTION

India has a significant tribal population of 400 tribal groups, constituting about eight per cent of the population (Census India, 2011). The Nilgiris has a tribal population, (known as the primitive tribal groups, PTG) of about 26,000. The traditional life style of tribals and their lack of awareness play a major role in determining their nutritional status. Among the PTG, Reddy (1988) reported that, prevalence of PCM and other nutritional deficiency signs are more among Paniya, Kurumba and Irula tribes than Toda and Kotas. There are some studies reported on the nutritional profile of women and children, but not much information is available on tribal children. Chronic Energy Deficiency (CED) and deficiency of other nutrients is common among PTG. Macronutrient malnutrition has been addressed to some extent by the ICDS and other national and nongovernmental programmes. The problem of micronutrient malnutrition, particularly those of Vitamin A Deficiency (VAD) and Iron Deficiency Anaemia (IDA) have been found to have devastating effects, of reported low birth weights, still births, neonatal deaths, conjunctival inflammation and koilonychia. The prevalence of sub-clinical VAD (< 20g/dl) was significantly high among the children belonging to ST when compared to others (V. G. Rao et al, 2004). Empowerment of the PTG and bringing them to the

national mainstream is one of the major policies of the Government and non Governmental organisations. Nutritional empowerment is fundamental to achieve this empowerment. Towards this end a multipronged strategy would be necessary for the holistic development of the tribals. For this, it is necessary to ‘catch them young’, for required health interventions and educating them of correct dietary practices.

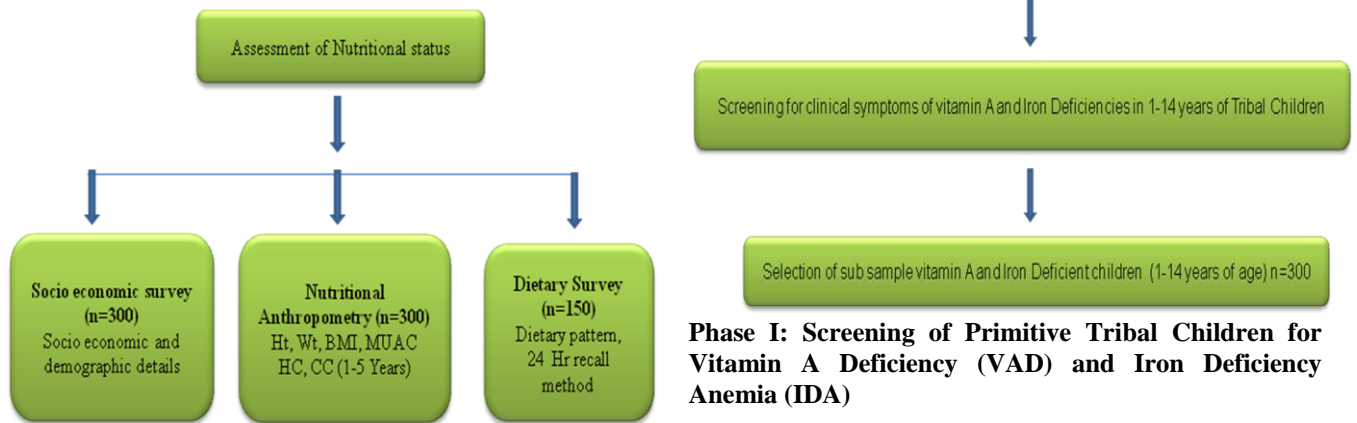
MATERIALS AND METHODS

SELECTION OF AREA AND CHILDREN

The study was conducted in the Nilgiris district which abounds in tribal population. According to 2011 census, the total population of the district is 7.35 lakhs, out of which the total population of Scheduled Tribes is 32,813, constituting 4.5 percent of the general population. Among them, 29,702 belong to Primitive Tribal Groups (PTG). The total numbers of tribal households were 8347. Hence this district was selected for the study based on purposive sampling technique. The Nilgiris District is divided into six Taluks, viz., Udhagamandalam, Gudalur, Pandalur, Coonoor, Kotagiri and Kundah. The Primitive tribe population in Nilgiris district is not evenly distributed in the six taluks - 32.08 percent live in Pandalur taluk, 24.10 percent of them live in Kotagiri Taluk, 14.33 percent

of them are in Gudalur Taluk, 13.16 percent of the tribes live in Kundah Taluk, 6.96 percent live in Coonoor Taluk. The Scheduled Tribes found in Nilgiri District are Todas, Kotas, Kurumbas, Irulas, Paniyas, and Kattunayakans. The total population of primitive tribal children in the Nilgiris is 7810, of whom, nearly 60 percent, i. e., 4376 tribal children in the age group of 1 –14 years were selected by stratified systematic sampling method in order to ensure that the selection is proportional and representative of the whole. Random sampling technique was used for the selection of individuals in order to ensure that every member in the population has an equal chance of being included in the study without any bias. Table I shows the Selection of Primitive Tribal Children.

Figure 1 represents the schematic flow chart of the methodology



Phase I: Screening of Primitive Tribal Children for Vitamin A Deficiency (VAD) and Iron Deficiency Anemia (IDA)

Figure 1- Schematic Flow chart of the methodology

Table I. Selection of primitive tribal children

Tribes	Taluks	No. of settlements	No. of households	No. of Children
Thodas	Udhagamandalam Coonoor Kotagiri	36 Munds	209	241
Kotas	Udhagamandalam Coonoor Kotagiri Gudalur	6 Kokkals	420	452
Kurumbas	Udhagamandalam Coonoor Kotagiri Gudalur Pandalur	51 Padis	1038	1070
Irulas	Udhagamandalam Coonoor Kotagiri Gudalur	42 Padis	1199	1231
Paniyas	Udhagamandalam Coonoor Kotagiri Gudalur Pandalur	62 Padis	1124	1156
Kattunaickers	Gudalur	18 Oorus	189	226
Total		215	4179	4396

SCREENING FOR CLINICAL SYMPTOMS OF VAD AND IDA

Clinical examination remains a widely used tool which is most practical as a direct method for assessing the nutritional status of an individual (Jelliffe and Jelliffe, 1990). All the children were screened clinically by the investigator (with the help of a medical practitioner) for symptoms of VAD such as Bitot's Spot, Night blindness, corneal xerosis, keratomalacia, Xerophthalmia, conjunctival Xerosis, and for symptoms of IDA such as Koilonychia, glossitis, angular cheilitis. The clinical examination proforma obtained from Walter Last. The stages of Xerophthalmia are regarded both as disorders and clinical indicators of VAD, and thus can be used to estimate an important aspect of morbidity and blinding disability as well as the prevalence of deficiency.

ASSESSMENT OF SOCIOECONOMIC STATUS

Of the 4376 children, 300 children showing moderate to severe clinical symptoms of VAD and IDA were selected for the socioeconomic, dietary and anthropometry assessments. Socio – economic factors profoundly affect nutritional status. The ethnic background and literacy state of the members in the household influences food availability and food choices. Levels of income also influence the diet. The investigator visited the tribal areas, met the families individually and in groups to collect the socio-economic details.

ASSESSMENT OF NUTRITIONAL STATUS

Assessment of nutritional status was done using a combination of methods (i.e.) through parameters like nutritional anthropometry, food and nutrient intake.

NUTRITIONAL ANTHROPOMETRY

Standing height (HAZ), ii) Body weight (WAZ) iii) BMI (BAZ) iv) Mid Upper Arm Circumference (MUAZ) v) Head Circumference and vi) Chest Circumference (for children 1-5 years of age) were recorded and analysed using WHO 2006, standards.

DIETARY SURVEY

Data regarding the diet consumed by the different categories of the population are obtained through diet surveys (Swaminathan, 2001).

FOOD FREQUENCY

Food consumption survey helps to elicit the quality and quantity of food consumed by the individual (Sharma and Prakashan, 2006). The type of various foods and the frequency consumption over a period of time was assessed using an interview schedule.

ASSESSMENT OF 24 HOUR RECALL METHOD

Food consumption is one of the important determinants of nutritional status, hence dietary assessment forms an integral part of nutrition survey. In the present study, through the 24 hour recall method, the amount of raw ingredients used for cooking, the total amount of food

consumed by the individuals were measured using the standard cups and utensils (Kapil et al, 2004) and recorded for the sub sample of 150 children. The average food intake, raw equivalents and nutrient available were calculated and compared with the suggested allowances of ICMR (2010).

RESULTS AND DISCUSSION

PREVALENCE OF VAD AND IDA AMONG PTG CHILDREN IN NILGIRIS DISTRICT

The highest prevalence of emaciation, a major symptom of Protein Energy Malnutrition, was observed among Kattunaicker children (0.9- 3.1 per cent) compared to children from other tribal groups.

The mean prevalence of Bitot's spots, an objective sign of VAD was 0.7 per cent (ranged from 0 % to 1.5 %). The prevalence of Bitot's Spot was observed among the tribes Kurumba, Irula, Paniya and Kattunaicker children and there were no symptoms among Toda and Kota children. This value is well above the cut off value indicated by WHO, 2007 standards (0.5%). However, the prevalence rate of Bitot's spot was less (0.7 per cent) than the reported NNMB value of 1.9 per cent (Tribal Survey, 2007-2009).

The mean prevalence of conjunctival xerosis was about 0.6 per cent (ranging from 0% to 3.1 %). The prevalence of conjunctival xerosis was observed among Toda, Kurumba, Irula, Paniya, Kattunaicker, while this symptom was not observed among Kota children. Taking WHO standards as the cutoff, the analysis showed that most of the tribal population has the prevalence of Bitot's spots and conjunctival xerosis beyond 0.5 per cent and this signifies that VAD is a problem of public health significance among the PTG screened in the present study.

The overall prevalence of vitamin B- complex deficiencies among all groups were glossitis 1.8 percent and angular stomatitis was 2.9 percent, while cheilosis was observed among 1.4 per cent of Irula children and 3.7 per cent of Paniya children.

Bleeding gums, a symptom of Vitamin C deficiency was observed among 0.4 per cent of Irula children and 3.7 per cent of Paniya children. Glossitis and dental caries were observed among 2.9 per cent of Irulas and Paniyas. Angular stomatitis, cheilosis, dental caries were more prevalent (3.7- 3.9 per cent). Bleeding gums and dental caries occurred as twin disorders and showed the same level of prevalence among Thodas (3.4 per cent), Kotas (8.2 per cent) and Kattunaickers (12.5 per cent).

On an average, the prevalence of Koilonychia, the most visible symptom of IDA, was seen among 0.5 per cent children (ranging from 0 per cent 3.1 per cent). The symptoms of koilonychia was seen among tribes of Toda, Irula, Paniya and Kattunaicker children while none of the children in Kurumbas and Kota tribes showed koilonychia.

Prevalence of phrynoderma was 0.6 per cent; mean prevalence of dermatitis was 1.6 per cent and was observed that 5.2 per cent of Kurumbas had dermatitis.

Figure 2 and 3 shows the Prevalence of deficiencies among Primitive Tribal children

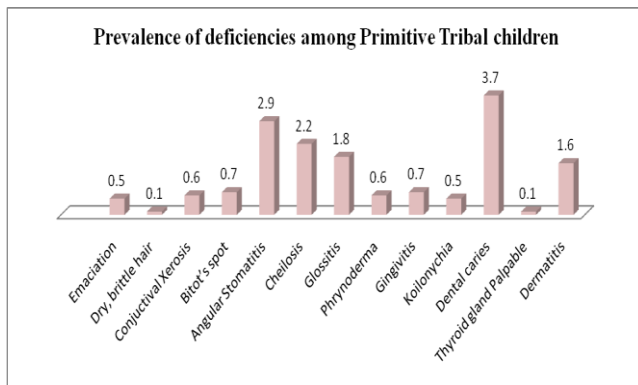


Figure 2. Overall Prevalence of Nutritional deficiencies among Primitive Tribal Children

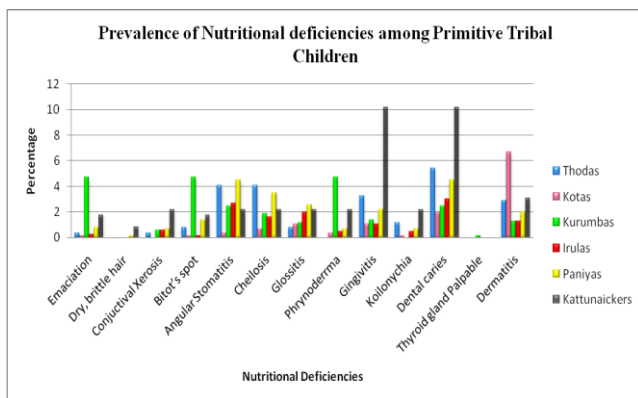


Figure 3 Prevalence of Nutritional deficiencies among Primitive Tribal Children

SOCIO ECONOMIC BACKGROUND OF PTG CHILDREN

Analysis of the type of the family showed that 24 per cent of the children were from joint and 76 per cent were from nuclear families. These findings are similar to those reported by Rao (2013) wherein 83 per cent of Chencu tribals belong to nuclear families. Thus it is evident that even in tribal areas the practice of joint family system is fast changing (Figure 4)

Regarding the number of children per household, 12 per cent were single child in their family, 19.4 percent were two, 31 percent were three, 20.3 percent were four, 11.3 percent were five 4.7 percent children were six and 1.3 percent children were seven respectively (Figure 5).

The number of boys and girls in the study were equal when all age groups are combined. On the whole, 16.7 per cent were Kurumbas, 63.3 per cent were Paniyas and 20 per cent were Kattu Naickar.

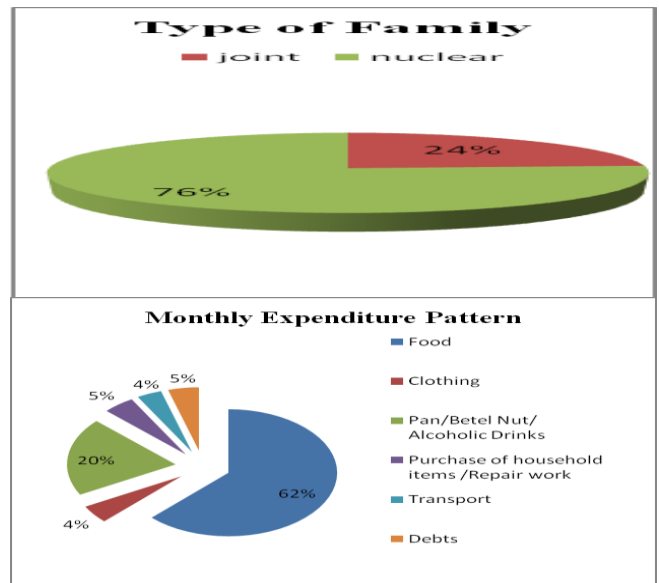


Figure 4 Type of Family and Monthly Expenditure Pattern

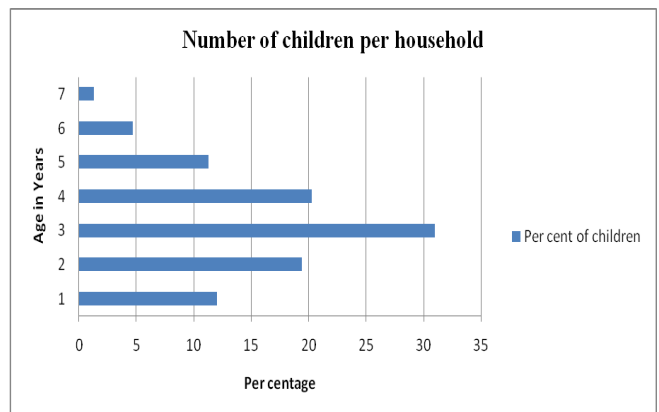


Figure 5 Number of children per household

MONTHLY INCOME AND EXPENDITURE OF THE FAMILIES

When income group is considered 97.9 per cent were from EWS (Economically Weaker Section) families. Two per cent of children in the age group of 10-12 years belonged to Low Income Group families with monthly income of Rs. 5001 to 10,000 as per the HUDCO (2010). The average monthly per capita income for Indians reported by NNMB (2012) Rs. 1356/. In the present study however, the average monthly income of the family is Rs. 3,033/-

On the whole, 62.5 per cent of the income was spent on food, 4.6 per cent was spent on clothing, 19.9 per cent was spent on pan/betel nut/alcoholic drinks, 4.7 per cent for maintenance of household/repair work, 3.7 percent on transport and 4.6 per cent of income was spent on debts. It was shocking to note that close to 20 percent of the income was spent on addictions like pan, betel nut and alcoholic drinks and both the parents in the families were addicted to this habit (Figure 4).

NUTRITIONAL ANTHROPOMETRY OF PTG CHILDREN

Height, weight, MUAC, Chest circumference and Head Circumference of the children were taken and analyzed. Z scores were calculated for height, weight and BMI and the children are grouped according to the nutritional

grades provided by WHO, 2007 standards. The gradings of the anthropometric measurements were tabulated below. Table II gives the Anthropometric grading of children from 1-5 years. Figure 6 and 7 shows the mean height and Weight of children.

Table II-Anthropometric grading of children from 1-5 years

Age (1-5 years)	Height		Weight		Wt/ht	
	Boys %	Girls %	Boys %	Girls %	Boys %	Girls %
Normally Nourished	62.5	55.7	67.5	60	87.5	87.1
Moderately Undernourished	21.3	21.4	25	27.1	11.2	7.1
Severely Undernourished	16.2	22.9	7.5	12.9	1.3	5.7

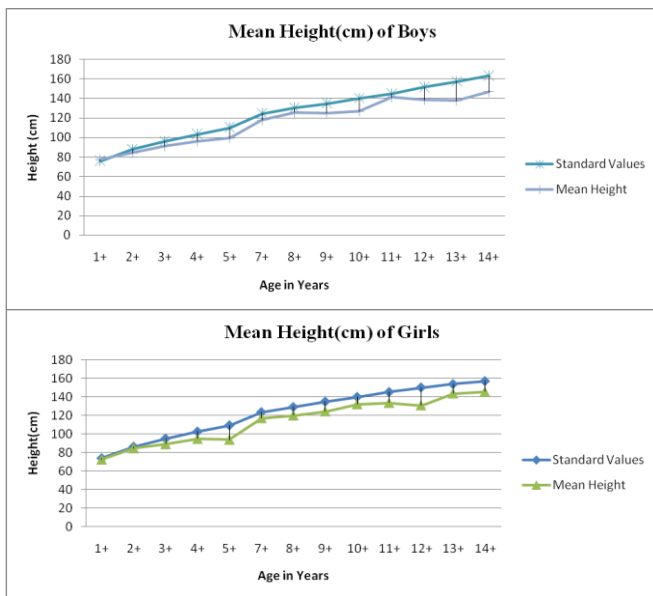


Figure 6. Mean Height (cm) of children



Figure 7 Mean Weight (kg) of children

MEAN MUAC CHEST CIRCUMFERENCE AND HEAD CIRCUMFERENCE OF CHILDREN

The Mean MUAC of children are presented in Table III. Mean MUAC of 1-5 years children were slightly higher than normal standard values of MUAC for the respective age groups. The mean MUAC of 1-2 years boys and girls were 13.73 and 13.64 which is higher than the standard values. Similarly the mean MUAC of 2-3 and 3-4 years boys and girls were 13.81 and 13.94, 14.28 and 13.85 which is more than the standard values. But in 4-5 years boys the mean MUAC is 14.05 which is less than the standard value and in girls 14.24 which is more than the standard value.

Mean chest circumference and mean head circumference of the children in all age groups were below the standard values of respective age groups.

DIETARY PATTERN OF PTG CHILDREN

DIETARY HABITS

All the families were non-vegetarians and all of them consumed three meals a day. Adults, both men and women consumed alcoholic drinks and tobacco, due to which they developed progressive neurogenic disorders and consequent crippling effect of the limbs

CONSUMPTION OF BEVERAGES

All the children consumed black tea probably because tea is relatively inexpensive and easily available in the Nilgiris and also because of the cold climatic conditions. On the whole, 6.7 percent of the children consumed black thrice daily and 93.3 per cent of the children drank black tea four times.

COOKING METHODS

The predominant method adopted for cooking all food items by the women was boiling. All the families boiled cereals, pulses, vegetables, fish, greens and meat for consumption. None of the families used steaming and pressure cooking methods. Eggs were roasted by 6.7 per cent while 93.3 percent shallow fried eggs. All the women shallow fried fish and 20 per cent cooked meat by shallow frying.

Table III. Mean MUAC, Chest Circumference and Head Circumference (cm) of children

Age Group (years)	Standard Values				Mean MUAC		Mean Chest Circumference		Mean Head Circumference	
	MUAC*		CC*	HC*	Boys(80)	Girls(70)	Boys(80)	Girls(70)	Boys(80)	Girls(70)
	Boys	Girls								
1-2	13.1	12.8	50	49	13.73±0.97	13.64±0.88	44.84±1.70	44.37±1.66	45.25±1.13	45±1.61
2-3	13.3	12.9	52	50	13.81±1.11	13.94±1.08	47.89±2.61	47.64±3.27	47.28±1.32	46.27±1.67
3-4	14.0	13.7	53	50.5	14.28±1.15	13.85±0.89	49.04±3.05	48.28±2.26	47.60±1.69	46.19±1.51
4-5	14.1	13.9	55	50.8	14.05±0.95	14.24±1.11	50.47±2.48	49.65±2.69	47.51±1.91	47.29±0.82

*Jelliffe (1966)

FREQUENCY OF CONSUMPTION OF FOOD ITEMS

Forty per cent of the tribal children consumed Jowar occasionally; maize and ragi was consumed occasionally by 33.3 and 40 percent respectively. Parboiled rice was the only cereal consumed by the children every day. 77.5 per cent of the children consumed raw rice once in month. The consumption of rice flakes was 57.3 percent on monthly basis. Forty per cent of families consumed puffed rice occasionally. Whole wheat flour was included each month by 40 per cent, while it was not at all used by the rest of the families. It was disappointing to note that all the families used refined wheat flour (maida) on a weekly basis. The women were ignorant of the benefits of dietary fibre in whole wheat flour and the health problems associated with the consumption of refined cereals. Nearly 39.3 per cent of them consumed preparations out of semolina every week. Vermicelli was used occasionally by all the families. Bread was used by 73.3 per cent occasionally.

Bengal gram dhal and black gram dhal were the predominantly consumed. The consumption of other pulses was very rare. Big onions were the only tubers consumed daily. Other roots and tubers were consumed once a week by majority of the children.

Curry leaves were included daily by all the families. Other green leafy vegetables like amaranth, manathakkali leaves, paruppukeerai, spinach and ponnanganni were consumed once a week by all the children. Agathi, coriander leaves, spinach were consumed on monthly basis. Drumstick leaves, fenugreek leaves and mint leaves were consumed occasionally. Other vegetables such as beans, bitter gourd, brinjal, drumstick, lady's finger, pumpkin were consumed by all children once a week. Cluster beans were consumed monthly once. Ash gourd, bottle gourd, cauliflower and cucumber were consumed occasionally. The intake of fruits and milk was very rare. Banana and tomato were consumed weekly. Amla, apple, grapes, guava, jack fruit, lemon, mango and papaya were consumed occasionally. Dates, pine apple and water melon were not consumed at all. Milk products like butter milk, cows milk and curd were consumed occasionally. While non-vegetarian foods like chicken, egg, fish, mutton were consumed by all the children only once a week.

Coconut was consumed weekly by 80 per cent of the families. Ground nut was consumed occasionally

while other nuts were not used at all. Refined oil was used for cooking and hence consumed daily and coconut oil weekly. Ghee and gingelly oil were not consumed at all. Sugar was used daily, while honey and jaggery were used occasionally.

MEAN FOOD INTAKE

The amount of food consumed by each group was similar. The mean intake of foodstuffs was below the recommended dietary intakes. Cereals and millets formed the bulk of dietaries, with more than 80 per cent of the suggested allowances (ICMR, 2009). Notably, inadequate intakes were observed for pulses (53 to 64%), green leafy vegetables (50 to 64%), other vegetables (44 to 76%), fruits (50 to 54%), the consumption of milk and milk products were very deficient (38 to 52.4%) as compared to the ICMR (2009) suggested allowances. Figure 8 shows the percentage adequacy of mean Food Intake.

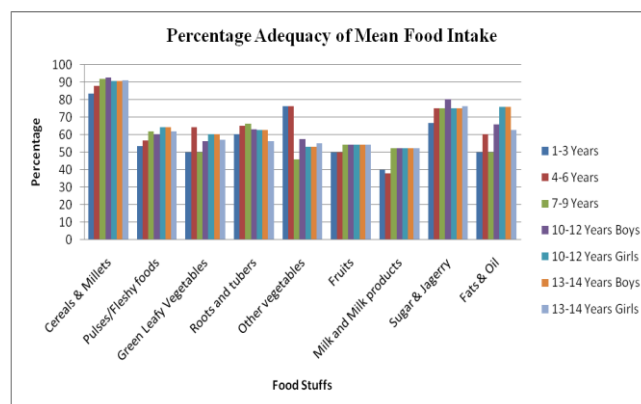


Figure 8 Percentage Adequacy of Mean Food Intake

MEAN NUTRIENT INTAKE

The intake of almost all the nutrients was below the RDA (2010), energy (90.1 to 92 %), protein (59.7 to 64.5%), fat (50 to 60%), calcium (56.3 to 75%), especially micronutrients such as Vitamin A (49.7 to 54.7%), β -Carotene (51.1 to 52.1%), iron (44.4 to 57.1%), thiamine (40 to 57.1%) and vitamin C (62.5 to 75%). Figure 9 shows the percentage adequacy of mean Nutrient Intake.

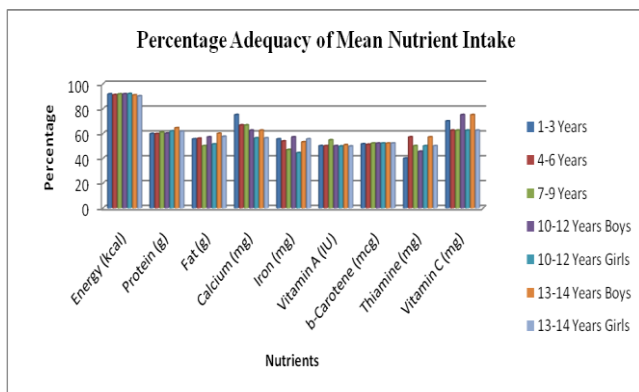


Figure 9 Percentage Adequacy of Mean Nutrient Intake

CONCLUSIONS

About 99 per cent of the families belonged to Economically Weaker Section and less than one per cent were in Low Income Group. Nearly 66 per cent of the monthly income was spent on food and 18.6 per cent was spent on alcoholic drinks, pan and betel leaves. All were non vegetarians and consumed three meals per day. All the children consumed black tea daily, especially in Paniya, Kattunaicker and Kurumba tribes. The food intake pattern was dismal. Most of the families cooked the foods by boiling. Though parboiled rice was consumed daily, yet nutrient dense foods such as pulses were not included in the daily diet. Bulk foods such as roots and tubers, life saving, protective and regulatory foods such as, green leafy vegetables and other vegetables such as beans, brinjal, lady's finger and drumstick were consumed only once a week. Intake of fruits and milk was very rare. As a result, nutritional deficiency symptoms such as angular stomatitis, bleeding gums, glossitis, cheilosis, and koilonychia were observed, especially among Kattunaickers and Paniyas when compared with Irulas, Kurumbas, Thodas and Kotas.

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