Original Article

The Nutritional Status, Dietary Habits and Nutritional Deficiency Trends Among Pre-School Children of Edamalakudy Tribal Colony

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Abstract

Background: India has the highest number of undernourished children in the world. Malnutrition among preschool children is an important indicator of a community's nutritional status. Undernutrition is a known factor strongly associated with child mortality rates. Pre-school Children belonging to the age group 3- 6 years of Edamalakudy, in Idukki district, Kerala, the first tribal panchayath in India, have been selected for the study owing to its remoteness and lack of earlier studies on the subject in the said population. The aim is to assess the nutritional status of children 3- 6 years of age by anthropometry and to find the prevalence of micro and macronutrient deficiency trends by clinical examination. This study also aims to explore the socioeconomic profile and dietary habits to create a preliminary database for the community. **Material and Methods:** This cross-sectional, descriptive, community-based survey was conducted on all settlement children in the target age group through house-to-house visits. During visits to schools and anganwadis, 82 children were clinically assessed, with clinical examinations conducted using standard-calibrated tools and questionnaires. **Results:** The prevalence of malnutrition, stunting, and wasting was 46%, 63% and 50%, respectively. The prevalence of anaemia was 73%, B-complex deficiencies were 43%, evidence of rickets was 12%, and dental caries was 15%. Vit A deficiency manifestations like Bitot's spots were not found, even though a few cases of conjunctival xerosis (2.6%) were found. The mean intakes of all the foodstuffs were below the RDI. The intake of almost all nutrients, particularly the micronutrients such as vitamin A, iron, and the B-complex vitamins, was deficient. **Conclusion:** The study provided evidence that these children were under acute and chronic nutritional stress and micronutrient deficiencies. It highlighted the need for more active intervention to improve the community's overall nutritional status. Owing to the environment and the peculiar social and cultural alienation, the tribes have an enhanced chance of dietary deficiencies. The socioeconomic profile identified in the study emphasises the contributing factors to the situation, such as the high prevalence of kutcha houses, the very low presence of sanitary latrines, and the poor educational status, and necessary corrections may be made to improve the community's health.

Keywords: Anthropometry, micronutrients, malnutrition, stunting, wasting, prevalence, anaemia.

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Introduction

Growth is the increase in the number and size of cells, which increases the body's size; it is also called quantitative growth and leads to physical maturation. In community paediatrics, the growth of children under 5 is very important because it reflects them nutritional status, and necessary early interventions would result in good outcomes for the health of the individual. It is estimated that 65%, that is, about 80 million children in India, suffer from varying degrees of malnutrition. Nutrients are classified into macronutrients and micronutrients, depending on the amounts needed per day to maintain adequate growth. Various factors contribute to the growth of these children, the ecosystem they live in being one of them. Growth is assessed by comparing the anthropometric measurements with standard charts and analysing them. Anthropometry is the gold standard for evaluating nutritional status. The measurements usually taken are weight-for-age, height-for-age, weight-for-height, mid-upper arm Circumference, BMI, and Head Circumference. The commonest forms of nutritional deficiency in India are PEM, Iron deficiency anaemia, and Vitamin A deficiency, so a study on their prevalence and analysis of their socioeconomic background would bring forth factors contributing to the situation. There is no prior data available on the community, and this study appears to be the first of its kind, serving as a preliminary database.[1-5]

This study, conducted in Edamalakudy, a first tribal panchayat in India, aims to assess the nutritional status of children aged 3-6 years. The research also focuses on identifying dietary gaps, nutritional deficiency manifestations, and anthropometric trends

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among preschool children. This study seeks to explore the Socioeconomic profile and analyze the social determinants of Preschool-Aged Tribal Children in Idukki for a preliminary database on the population.

Tribal groups suffer from social and economic disadvantages and are cut off from the outside world. The unique geographic habitat of India's tribal people is a common characteristic. They often set themselves apart from other population groupings based on their environment and eating patterns. Numerous morbidities and undernutrition are caused by a variety of factors, including poverty, sociocultural taboos, poor health-seeking behavior, geographic isolation, and antiquated farming methods. The nutritional status of the population largely depends on food consumption to meet their needs, which in turn is influenced by food availability and purchasing power. The tribal populations are at risk of undernutrition because of their dependence on primitive agricultural practices and the uncertainty of food supply. Inadequate healthcare facilities and ecological degradation further aggravate the situation. Studies carried out by the National Nutrition Monitoring Bureau (NNMB) in the rural population revealed that the prevalence of undernutrition, as assessed by weight-for-age, is about 40-50%, and that of iron-deficiency anaemia is about 70%1. More than 60% of children were underweight, and more than 25% had severe undernutrition. A high prevalence of chronic undernutrition was also observed in other studies. Due to sociocultural, socioeconomic, and environmental factors that affect food consumption and health-seeking behavior, the tribal population is more vulnerable to undernutrition (Ty 3). Additionally, a higher incidence of undernutrition was observed among them compared to youth in general.

Edamalakudy: The first tribal panchayath of Kerala

The latest census data from 2012 shows that Edamalakudy has a population of 1815, and the survey indicates a very low birth rate in the Area. They suffer from many diseases, and the women and children usually do not take treatment, whereas men may go out of the settlement to Munnar or Valparai and consult the doctor. People belong to a community called “Muthuvans” and have their own set of social and cultural customs and ways of life.

Edamalakudy is located deep inside the forest and away from the facilities of transportation, communication, and electricity in the reserve forest area, just close to the Eravikulam National Park, a wildlife sanctuary situated about 35 km from the tourist town of Munnar, in the Idukki district of Kerala, South India. Edamalakudy has around 28 settlements with houses in the range 8 to 30 each, spread over a large area in the Western Ghats, bordered by Kerala and Tamil Nadu. The entire Edamalakudy has one lower primary school (1-4th class), and most settlements have single-teacher schools operated by the state Government's tribal development department. The children have to go out of Edamalakudy for education after the primary level of schooling and have to stay in the hostels run by the Government or by the missionaries. Literacy level is very low among Muthuvans. The area doesn’t have a hospital, but there is a sub-centre for the entire area, manned by nurses and doctors visiting from

Devikolam Community Health Centre under the aegis of the Idukki DMO. There have been no similar studies in this locality. Hence, this study is carried out to make preliminary data for the community.

Materials and Methods

A Cross-sectional community-based convenience sampling survey was carried out in the Edamalakkudy tribal colony, Devikolam Taluk, Idukki district of Kerala, among children between the ages of 3 and 6 years old in the colony. The study duration was 1 year (July 2015 to July 2016), and the target population sample size was estimated at around 120. Eighty-two children were studied, which adequately represents the population. Owing to the extremely difficult terrain and getting people to consent, some children might have been left out.

Children aged 3 to 6 years in the colony are included in the study. Children whose parents did not give consent were excluded. Study Variables include Weight, Height, weight-for-height, and mid-upper arm circumference. Head circumference, BMI, features of PEM, vitamin deficiencies, and macro and micronutrient deficiencies are also analysed. A measuring tape, calibrated electronic weighing machine, and stadiometer were used to collect data. The data collection procedure included house-to-house, Anganwadi, and school visits.

Results

Earlier studies carried out by the NNMB in the rural population revealed that the prevalence of undernutrition, as assessed by weight-for-age, is about 40-50%, and that of iron deficiency anaemia is about 70% 5. The study found that 54% of the children were not malnourished, whereas 7 % were in grades 2 & 3. No stunting was observed in 37% of the children, and 3rd-degree stunting in 8%. 50 % of the children were found to have been wasted, signifying acute or chronic malnutrition. Anaemia has been found in 73 % of the children surveyed. Vitamin B complex deficiency is associated with 43% of children in the area. Evidence of rickets, including leg bowing, wrist widening, and knock knees, was found in 12% of the children examined. Cut-off values based on RDA were used to establish each group's energy/protein adequacy status. Any person who consumed less protein or calories than the mean ± 2SD of their requirements was considered to be ingesting insufficient amounts.

The dietary pattern of the study population showed that cereals accounted for the bulk of meals. Pulses & legumes were taken very minimally. Green leafy vegetables were taken sparingly, although some quantities were taken every day. Spinach was cultivated in some settlements and was consumed. Other vegetables, roots & tubers, milk and milk products,

Fats & Oils, Sugar & Jaggery, etc., were taken in very small amounts. The cultivation of these foods was not done because wild animals destroyed their crops.

The 24-hour recall approach was used to ask people about their typical daily consumption of various meals. Food consumption was inadequate for most children, as they didn’t meet the requirements for energy, protein, micronutrients, and macronutrients. Diet is grossly inadequate concerning

calorie intake and protein. Most children get only two meals,

while some get three.

The main cereal consists of rice, and ragi is used in some households. Fruits are very sparingly eaten. Food materials containing both macro- and microelements were inadequate in the diet. On average, only about 680 kcal are consumed, compared with the required 1240 kcal calculated from the standard tables, resulting in a deficit of about 500 kcal.

About 11 g of protein is consumed, against a required amount of 18 g, resulting in a protein deficit of 7 g/day.

Exploring the socio-economic profile of preschool children showed that the average family size was 3.3, with 76% of households having three children. The kind of home was seen as a measure of the household's financial standing. The majority of the families lived in kutcha homes, with around 6% residing in semi-pucca homes. Nuclear families accounted for around 93% of homes. Joint families accounted for 2% of the total and extended atomic families accounted for 5%. About 92% of the heads of the family were engaged in labour (agricultural labour). 2 % worked as forest watchers, and the rest worked on various jobs like porters and forest produce collectors. Only about 4% of houses had sanitary latrines, while the rest practised open defecation. Water was collected from common protected wells in some settlements, whereas in others, they depended on water from small collections of water from the forest. They breastfeed their children for an average of 1- 2 years and give locally available foods from the family pot.

When co-morbidities are considered in general, about 11% of the preschool-age children reportedly had one or the other morbidities. Inadequacies in immunisation, deworming, oral rehydration therapy for diarrhoea, etc, aggravate the problem of malnutrition in non-industrialised countries. The most common morbidity was fever (8.5%), followed by ARI (3.4%) and Diarrhoea (1.2%), scabies (1.1%), and one girl was found to have a grade 3.

Systolic murmur and was advised to undergo a detailed evaluation. The prevalence of morbidities was similar among boys and girls.

Table 1: Demographic and Household Characteristics of the Study Population

Category	Subcategory	Percentage (%)
Age Group (Years)	3 Years	76%
	4 Years	17%
	5 Years	3%
	6 Years	4%
Type of Family	Nuclear	93%
	Joint	2%
	Extended Nuclear	5%
Sanitary Latrine Availability	Yes	4%
	No	96%

Table 2: Prevalence of Malnutrition Stunting (Waterlow's Classification)

Stunting (Height-for-Age)	Prevalence (%)
No Stunting	37%
1st Degree Stunting	37%
2nd Degree Stunting	18%
3rd Degree Stunting	8%

Table 3: Wasting (Waterlow's Classification)

Wasting (Weight-for-Height)	Prevalence (%)
Normal	50%
1st Degree Wasting	28%
2nd Degree Wasting	20%
3rd Degree Wasting	2%

Table 4: Nutritional Indicators

Nutritional Indicator	Prevalence (%)
Underweight (Weight-for-Age)	46%
Stunting (Height-for-Age)	63%
Wasting (Weight-for-Height)	50%

Table 5: Micronutrient Deficiency Prevalence

Deficiency Type	Prevalence (%)
Anemia (Hb < 11 g/dl)	73%
Vitamin B Complex Deficiency	43%
Rickets	12%
Dental Caries	15%
Vitamin A Deficiency (Conjunctival Xerosis)	2.6%

Table 6: Dietary Intake vs Recommended Dietary Allowance (RDA)

Nutrient	Mean Intake	RDA	Deficit (%)
Energy (kcal)	680 kcal	1240 kcal	-45%
Protein (g)	11 g	18 g	-39%

Table 7: Prevalence of comorbidities

Comorbidities among pre-school children	Prevalence (%)
Any morbidity (Total)	11.0
Fever	8.5
Acute Respiratory Infection (ARI)	3.4
Diarrhoea	1.2
Scabies	1.1
Grade 3 Systolic Murmur	Single case

Discussion

Undernutrition among preschool children remains a significant public health challenge in rural and tribal areas of developing countries like India. Children aged 3–6 years, particularly those from native and vulnerable populations, are unequally affected due to a combination of dietary inadequacies, infections, low maternal literacy, and poor access to healthcare.[6,7] This study, conducted in Edamalakudy, found that protein-energy malnutrition (PEM), stunting, and wasting were alarmingly high at 46%, 63%, and 50%, respectively, indicating severe nutritional deficiency.

Well-established measures to evaluate the nutritional status of children, which include anthropometric indicators such as weight-for-age (WFA), height-for-age (HFA), and weight-for-height (WFH), were assessed using the WHO Child Growth Standards.[8] The use of additional parameters like Body Mass Index (BMI) and mid-upper arm circumference (MUAC) helped in capturing a clear picture of both acute and chronic forms of undernutrition. The present literature has also emphasised the utility of BMI in capturing undernutrition, particularly thinness among school-age children in resource-poor settings.[9]

The high rates of stunting in this study indicate long-term nutritional deficiencies and repeated infections during early childhood. Similar findings have been reported in studies conducted among Indian tribal communities, where stunting rates exceeded 50% due to generational undernutrition, lack of dietary diversity, and inadequate maternal nutrition.[10,11] Wasting mirrors acute undernutrition, which can result from sudden food scarcity or illness episodes. The prevalence of wasting in Edamalakudy is similar to the findings from tribal regions reported in NFHS-5, which showed wasting rates between 40-50% in some remote pockets.

The people's dietary and nutrient intake was evaluated using a 24-hour recall diet survey. The inadequate intake of protective foods, which are essential for micronutrient sufficiency and include fruits, milk, and green leafy vegetables, was especially alarming. The pattern observed is consistent with earlier studies reporting low intakes of vitamin A, iron, calcium, and B-complex vitamins among rural and tribal preschoolers.[12,13]

Micronutrient deficiencies can impair growth, reduce immune function, and affect cognitive development.[14]

Compared to their rural counterparts, tribal groups have been shown to have low female literacy and high rates of maternal and newborn mortality.[15] Earlier studies have shown that maternal education has a strong influence on child nutrition, as it influences feeding practices, health-seeking behaviour, and sanitation awareness.[16]

Conclusion

Prevalence of macronutrient deficiencies as indicated by malnutrition, stunting, and wasting are 46, 63, and 50%, respectively, indicating the presence of acute, chronic, and acute on chronic malnutrition in the population studied. A high prevalence of anaemia (73%) was found in the target population. The amount of dietary intake was grossly inadequate in accordance with the proximal principles. The average intake was about 640 calories, while 1,240 calories were needed. This is a preliminary survey of this population, being located in a remote area and will form baseline data for further studies.

Preventing and controlling certain infectious illnesses has been the main focus of efforts to lower child mortality in underdeveloped nations via targeted primary health care; addressing children's underlying nutritional condition has received less attention17. Kerala might reduce the rate of severe malnutrition in children to 1% due to its high literacy rate, particularly among women (85.1% compared to the national average of 51.4%); nevertheless, mild malnutrition rates remain high (18). Enabling governance structures, evidence-based decision-making institutions, skilled staff with assigned power, and local accountability are all necessary for decision-making processes that may reduce undernutrition in children 19. Earlier studies have shown that increasing awareness of health programs through improvement in interpersonal communication can minimise the prevalence of malnutrition in the community20. This study would serve as a base database for such interventions and further studies would be undertaken with this as a base.

Limitations: Although the study is comprehensive, it has certain limitations. The cross-sectional design of this study captures the nutritional status of the children at a point in time, which does not mirror the seasonal variations in food intake or the health status. In addition to this, the study utilises a 24-hour dietary recall method, which may lead to recall bias, considering the low literacy rate and lack of nutritional awareness among the respondents. Furthermore, the study did not include all eligible children due to the difficulties faced in accessing and obtaining consent in the remote, forested, and scattered terrain of Edamalakudy. Cultural barriers and language differences play a vital role in the responses received, which might have influenced the accuracy of this study.

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Conflicts of interest

There are no conflicts of interest.

References

1. National Nutrition Monitoring Bureau. (2003). Prevalence of

micronutrient deficiencies. NNMB Technical Report No. 22. National Institute of Nutrition, ICMR, Hyderabad.
2. Hossain, M. I., Yasmin, R., & Kabir, I. (1999). Nutritional and immunisation status, weaning practices and socioeconomic conditions of under-five children in three villages of Bangladesh. Indian Journal of Public Health, 43, 37–41.
3. Basu, S. K., Jindal, A., & Kshatriya, G. K. (1990). The determinants of health-seeking behaviour among tribal population of Bastar district, Madhya Pradesh. South Asian Anthropologist.
4. International Institute for Population Sciences (IIPS) and ORC Macro. (2000). National Family Health Survey (NFHS-2), 1998–99: India. Mumbai: IIPS.
5. Venkiah, K., Damayanthi, K., Nayak, M. U., & Vijayaraghavan, K. (2002). Diet and nutritional status of rural adolescents in India. European Journal of Clinical Nutrition, 56, 1119–1125.
6. Awasthi, S., & Pande, V. K. (2017). Childhood undernutrition in India: A critical public health concern. Indian Journal of Pediatrics, 84(6), 432–439.
7. Swaminathan, S., Hemalatha, R., Pandey, A., et al. (2019). Prevalence of undernutrition and micronutrient deficiencies among children in India: Insights from Comprehensive National Nutrition Survey (2016–18). The Lancet Child & Adolescent Health, 3(12), 849– 861.
8. World Health Organization. (2007). WHO Child Growth Standards: Length/height-for- age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age: Methods and development. WHO Press.
9. Khadilkar, V., Yadav, S., Agrawal, K. K., et al. (2012). Revised Indian Academy of Pediatrics 2015 growth charts for height, weight and body mass index for 5- to 18-year-old Indian children. Indian Pediatrics, 49(6), 47–55.
10. Nair, M. K. C., Augustine, L. F., & Konapur, A. (2013). Food-based interventions to modify diet quality and diversity to address multiple micronutrient deficiency. Frontiers in Public Health, 1, 29.
11. Sachdev, H. P. S. (2016). Overcoming undernutrition in India: Strategy and challenges. Annals of Nutrition and Metabolism, 68(2), 8–17.
12. Longvah, T., Ananthan, R., Bhaskarachary, K., & Venkaiah, K. (2017). Indian Food Composition Tables 2017. National Institute of Nutrition, ICMR.
13. Rao, S., Joshi, S., & Kelkar, R. (2014). Dietary diversity scores and nutritional status of urban primary school children from India. Journal of Health, Population and Nutrition, 32(3), 364–371.
14. Black, R. E., Victora, C. G., Walker, S. P., et al. (2013). Maternal and child undernutrition and overweight in low-income and middle-income countries. The Lancet, 382(9890), 427–451.
15. Prinja, S., Verma, R., & Lal, S. (2008). Role of ICDS programme in the delivery of nutritional services and functional integration between Anganwadi and health workers in north India. The Internet Journal of Nutrition and Wellness, 5(2).
16. Corsi, D. J., Mejía-Guevara, I., & Subramanian, S. V. (2016). Improving household-level nutrition data: Comparative analysis of demographic and health surveys across 58 countries. BMJ Global Health, 1(2), e000038.
17. Walsh, J. A., & Warren, K. S. (1979). Selective primary health care – an interim strategy for disease control in developing countries. New England Journal of Medicine, 301, 967–974.
18. Elizabeth, K. E. (2002). Nutrition and child development (2nd ed., pp. 148–158). India: Paras Publishers.
19. Pridmore, P., & Carr-Hill, R. (2011). Tackling the drivers of child undernutrition in developing countries: What works and how should interventions be designed? Public Health Nutrition, 14(4), 688–693.
20. National Sample Survey Organization. (1991). A report on living conditions of tribal and non-tribal areas (No. 380).