

Determinants of Nutritional Status among Under-Five Children in the Tribal Population of The Nilgiris, Southern India: A Cross-Sectional Study

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Abstract

Background: The tribal populations in The Nilgiris of Tamil Nadu are identified as particularly vulnerable tribal groups (PVTGs) and are “high risk” in terms of health and nutrition. **Objectives:** The objective of the study is, among the under-five tribal children, to determine the prevalence of undernutrition and the factors associated with it. **Materials and Methods:** This community-based cross-sectional study was conducted between March and June 2019 among 605 under-five tribal children. The prevalence of underweight, stunting, and wasting was expressed as proportion; the association with determinants was assessed using log-binomial regression model. **Results:** The prevalence of underweight, stunting, and wasting was 63% (95% confidence interval [CI] 57–70), 62% (95% CI 54–70), and 31% (95% CI 24–38), respectively. Among them, 29%, 35%, and 10% were severely underweight, stunted, and wasted, respectively. Among 605 participants, 80% utilized supplementary nutrition program of the Integrated Child Development Services; only 21% of whom utilized it as per the ICDS recommended quantities prescribed for different category of beneficiaries. Male child, age >2 years, and illiteracy of father were significantly associated with underweight. Age >2 years and illiteracy of mother were significantly associated with stunting. Male child and low family income were significantly associated with wasting. **Conclusion:** Nearly three out of four children in the community were undernourished. Poverty alleviation programs are required to combat undernutrition among backward communities.

Keywords: Integrated Child Development Services, stunting, undernutrition, wasting

INTRODUCTION

The Millennium Development Goals to halve malnutrition by 2015 and the Sustainable Development Goals to end malnutrition by 2030 were created because policymakers and clinicians alike realized that nutrition is both a maker and a marker of development. The prevalence of undernutrition manifestations in children such as stunting and wasting is >30% and 15%, respectively, in India, which is approximately 9% and 8% higher than the global average.^[1] Scheduled tribes or *Adivasis* make up 8.6% of India's population^[2] and are officially India's poorest people, with five out of 10 falling in the lowest wealth bracket. A systematic review of 41 studies across under-five tribal children of India found an average prevalence rate (PR) of underweight, stunting, and wasting to be 43%, 45%, and 23% varying from 9% to 91%, 13% to 67%, and 8% to 60%, respectively.^[3] The tribal population

studied, i.e., the Paniya, Katunayakan, Mulakurumba, and Betta kurumba tribes of The Nilgiris, are also daily-wagers working for others, grow crops on their meager pieces of land, belong to the below poverty line category,^[2] and have poor literacy levels (46%).^[4]

India's flagship program to tackle undernutrition – the Integrated Child Development Services (ICDS) – serves about 82 million children younger than 6 years. The utilization of ICDS centers has increased over the years, but studies show

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that not all the groups have benefitted equally. After 45 years of ICDS, 36% of under-five children in India are underweight, 38% stunted, and 21% wasted.^[3] The state of Tamil Nadu records >50% of the population coverage in the supplementary nutrition program of ICDS.^[5] There are few robust studies on the overall utilization of the ICDS program and its impact on undernutrition, but there are no studies among the tribal populations of Tamil Nadu. Through this study, we try to address the paucity of research existing among the PVTGs of The Nilgiris on the impact of ICDS service utilization and other determinants on under-five anthropometric indicators.

Our study objectives were to determine the prevalence of under-nutrition in the tribal community, to explore the impact of ICDS services on nutritional status, and to investigate the role of other socioeconomic, biological, and educational determinants on the nutritional status of under-five tribal children.

MATERIALS AND METHODS

This cross-sectional study was conducted among the under-five children of the Paniya, Betta kurumba, Mulakurumba, and Katunayakan tribes of The Nilgiris between April and June 2019. These four tribes have approximately 20,000 people who live in 320 hamlets of Gudalur and Pandalur in Tamil Nadu. This study was conducted by a not-for-profit organization, which has been working for the past 30 years in the region to improve health determinants of these tribal populations.

Considering the prevalence of malnutrition among the under-five tribal children as 45% (National Family Health Survey 4), a relative precision of 10%, and a confidence level of 95%, a sample size of 471 was calculated. After considering 25% nonresponse, the final sample size was calculated as 628. However, we stopped the survey at a sample size of 605 due to logistic reasons. In the first stage, purposive sampling was adopted to obtain a geographically representative list of all under-five children. In the second stage, stratified sampling technique was used to select 128 tribal hamlets from the list randomly, based on the population of the four tribes and the fact that a tribal hamlet is a home to only one tribe. All households with under-five children in the selected hamlets were surveyed, and the children present during the first visit were included in the study.

The data were collected by the tribal health workers of the organization. Written informed consent was obtained from parents or guardians before the study. A semi-structured questionnaire was used to collect information on sociodemographic characteristics and utilization of supplementary nutrition program of ICDS. The recommended quantity of supplementary nutrition provided by the ICDS services in Tamil Nadu includes mid-day meals 6 days per week, 4 kg of take-home ration (THR), 4 kg of THR (nursing mothers), and added THR to undernourished children.

The weight and height/length of the child were measured using standardized instruments, following standard protocols recommended by the WHO. Salter weighing scale was used to measure weight (in kilograms), infantometer was used to measure the length (in centimeters) of 0–2-year-old children, and stature meter was used for measuring the height (in centimeters) for children above 2 years. The height/length for age, weight for age, and weight for height/length were expressed as three Z-score indices using the WHO Anthro-2005 software as per the WHO child growth standards. Weight for age, height for age, and weight for height indices were classified as underweight, stunting, and wasting, respectively, when the indices were below 2 standard deviation (SDs) of the reference median (median <−2SD), and severe underweight, severe stunting, and severe wasting, respectively, when the indices were below the 3SD values of the reference median (median <−3SD).

The data were then entered into Microsoft Excel and exported to IBM SPSS software version 20 (Statistical Package For The Social Sciences, 2011) for analysis. The prevalence of underweight, stunting, and wasting was expressed as proportion with 95% confidence intervals (CIs). The factors associated with nutritional status were assessed using Chi-square tests, and unadjusted PRs with 95% CI were calculated. Adjusted PRs with 95% CI were calculated using log-binomial regression model.

The study was approved by the institutional review board on April 10, 2019, with the reference number 20190410-01.

RESULTS

A total of 605 children were included in the study, out of which 306 (51%) were males. The mean age of the participants was 2.4 years and 220 (37%) of them were 2 years or less. The representation of Paniya, Betta kurumba, Mulakurumba, and Katunayakan tribes in the sample was 55%, 22%, 19%, and 3%, respectively. More than half (54.5%) of the participants were from joint families, and around three-fourths (74%) belonged to lower or lower- and middle-income families. Mothers of 28% and fathers of 32% of the participants were illiterate. The utilization of ICDS services was around 80%. More than one-fifth (21%) of the children availed the services regularly and as per the recommended guidelines.

The prevalence of underweight, stunting, and wasting in children was 63% (95% CI 57–70), 62% (95% CI 54–70), and 31% (95% CI 24–38), respectively. Moreover, correspondingly, among them, severely underweight, stunted, and wasted children were 29%, 35%, and 10%, respectively.

The likelihood of being underweight was significantly associated with the age of the child, gender, and educational status of the child's father. The prevalence of underweight children was 1.19 times more for boys, 1.27 times more for those in the age group of 2–5 years, and 1.17 times more for a child with an illiterate father [Table 1].

Table 1: Sociodemographic characteristics associated with underweight among under-5 children in tribal population of Gudalur and Pandalur Taluks of The Nilgiris, Tamil Nadu, South India (n=605)

Variables	Total	Underweight	Crude PR (95% CI)	Adjusted PR (95% CI)	P
Age (years)					
<2	220	118 (53.6)	Reference	Reference	0.001*
2-5	385	263 (68.3)	1.27 (1.11-1.47)	1.27 (1.11-1.46)	
Sex					
Male	306	208 (68.0)	1.2 (1.04-1.33)	1.19 (1.06-1.35)	0.004*
Female	299	173 (57.9)	Reference	Reference	
Type of family					
Nuclear	275	180 (65.5)	1.1 (0.95-1.21)	1.05 (0.93-1.18)	0.468
Joint	330	201 (60.9)	Reference	Reference	
Number of children					
≤2	340	202 (59.4)	Reference	Reference	0.233
>2	265	179 (67.6)	1.14 (1.01-1.28)	1.08 (0.95-1.22)	
Education of father					
Illiterate	191	135 (70.7)	1.19 (1.05-1.34)	1.14 (1.01-1.29)	0.039*
Literate	414	246 (59.4)	Reference	Reference	
Education of mother					
Illiterate	167	116 (69.5)	1.15 (1.01-1.30)	1.11 (0.97-1.26)	0.119
Literate	438	265 (60.5)	Reference	Reference	
Family income					
Upper and middle	157	91 (58.0)	Reference	Reference	0.276
Lower middle or less	448	290 (64.7)	1.12 (0.96-1.30)	1.09 (0.93-1.27)	
ICDS utilization					
Yes	477	306 (63.0)	1.09 (0.93-1.29)	1.15 (0.98-1.34)	0.086
No	128	75 (58.6)	Reference	Reference	

*Significant association. PR: Prevalence ratio, CI: Confidence interval, ICDS: Integrated Child Development Services

A significant association was found between stunting and the age group of 2–5 years (1.63 times higher in children above 2 years), as well as between stunting and having an illiterate mother (1.15 times more than children of literate mothers) [Table 2]. Being wasted was significantly associated with more among boys (1.47 times higher) and those belonging to a low-income category (1.58 times higher) [Table 3].

DISCUSSION

We found 63%, 61%, and 31% of under-five children in the study population to be underweight, stunted, and wasted, respectively, as compared to 36%, 38%, and 21% in the Indian population.^[6] The nationally representative data across studies in different geographical regions of India show a variation in the nutritional status of tribal under-five children. The Kada kurumba tribe of Mysore (60%, 55%, and 44%)^[7] and Palghar tribe of Maharashtra (53%, 59%, and 20%),^[8] reported a prevalence similar to our study population for underweight, stunting, and wasting while the tribes in the Jawadhu hills of Tamil Nadu (27%, 55%, and 10%)^[9] recorded a lower prevalence of underweight but higher stunting. In the bordering district of Wayanad in Kerala, having a similar tribal population of Paniya, Kurumba, and Katunayakan, a much lower prevalence of underweight, stunting, and wasting (39%, 38%, and 20.5%)^[10] was recorded. The impact of better public health policies in Kerala is shown in the lower

prevalence of markers of undernutrition there, as compared to our study's population.

Illiteracy of the father was associated with becoming underweight, while illiteracy of the mother was associated with becoming stunted. Education level of parents has been identified through multiple studies as one of the most important determinants in the nutritional status of a child. A mother's lack of literacy or basic education in health-related issues often leads to long-term unhealthy feeding practices, leading to nutritional deficiency in the child.^[10,11] With the father typically being the decision-maker in Indian culture, his educational level has been found as a determinant of the overall health of the child.^[8] In contrast to previous studies, our study found that family income has a significant effect on wasting and not on underweight or stunting.

In this study, boys were more likely to be underweight and wasted compared to girls. This is in agreement with a few other studies^[9,12] where boys showed higher prevalence of undernutrition and contrary to the higher prevalence observed in girl children universally. Children of the age group <2 years were protected from malnutrition. This is indicative of the protective benefit of continued breastfeeding for children under 2 years and of the poor weaning practices which is an observation supported through other research studies.^[12,13]

Table 2: Sociodemographic characteristics associated with stunting among under-5 children in tribal population of Gudalur and Pandalur Taluks of The Nilgiris, Tamil Nadu, South India (n=605)

Variables	Total	Stunting	Crude PR (95% CI)	Adjusted PR (95% CI)	P
Age (years)					
<2	220	97 (44.1)	Reference	Reference	0.001*
2-5	385	279 (72.5)	1.64 (1.39-1.93)	1.63 (1.39-1.91)	
Sex					
Male	306	197 (64.4)	1.07 (0.94-1.21)	1.08 (0.96-1.22)	0.175
Female	299	179 (59.9)	Reference	Reference	
Type of family					
Nuclear	275	183 (66.5)	1.13 (1.00-1.28)	1.09 (0.97-1.23)	0.120
Joint	330	193 (58.5)	Reference	Reference	
Number of children					
≤2	340	207 (60.9)	Reference	Reference	0.775
>2	265	169 (63.8)	1.04 (0.92-1.18)	1.01 (0.90-1.15)	
Education of father					
Illiterate	191	128 (67.0)	1.11 (0.98-1.27)	1.07 (0.94-1.21)	0.271
Literate	414	248 (59.9)	Reference	Reference	
Education of mother					
Illiterate	167	116 (69.5)	1.17 (1.03-1.32)	1.15 (1.01-1.30)	0.031*
Literate	438	260 (59.4)	Reference	Reference	
Family income					
Upper and middle	157	103 (65.6)	1.07 (0.94-1.23)	1.07 (0.94-1.22)	0.282
Lower middle or less	448	273 (60.9)	Reference	Reference	
ICDS utilization					
Yes	477	298 (62.5)	1.02 (0.87-1.19)	1.07 (0.92-1.23)	0.352
No	128	78 (60.9)	Reference	Reference	

*Significant association. PR: Prevalence ratio, CI: Confidence interval, ICDS: Integrated Child Development Services

Table 3: Sociodemographic characteristics associated with wasting among under-5 children in tribal population of Gudalur and Pandalur Taluks of The Nilgiris, Tamil Nadu, South India (n=605)

Variables	Total	Wasting	Crude PR (95% CI)	Adjusted PR (95% CI)	P
Age (years)					
<2	220	78 (35.4)	1.26 (0.99-1.60)	1.24 (0.98-1.57)	0.071
2-5	385	108 (28.0)	Reference	Reference	
Sex					
Male	306	111 (36.3)	1.44 (1.13-1.84)	1.47 (1.15-1.88)	0.001*
Female	299	75 (25.1)	Reference	Reference	
Type of family					
Nuclear	275	81 (29.4)	Reference	Reference	0.516
Joint	330	105 (31.8)	1.08 (0.84-1.37)	1.08 (0.85-1.37)	
Number of children					
≤2	340	97 (28.5)	Reference	Reference	0.413
>2	265	89 (33.6)	1.17 (0.92-1.49)	1.10 (0.87-1.40)	
Education of father					
Illiterate	191	61 (31.9)	1.05 (0.82-1.36)	1.03 (0.80-1.34)	0.764
Literate	414	125 (30.2)	Reference	Reference	
Education of mother					
Illiterate	167	50 (29.9)	Reference	Reference	0.781
Literate	438	136 (31.0)	1.03 (0.79-1.35)	1.03 (0.79-1.36)	
Family income					
Upper and middle	157	33 (21.0)	Reference	Reference	0.001*
Lower middle or less	448	153 (34.1)	1.62 (1.16-2.25)	1.58 (1.13-2.21)	
ICDS utilization					
Yes	477	152 (31.9)	1.19 (0.87-1.64)	1.26 (0.92-1.72)	0.139
No	128	34 (26.6)	Reference	Reference	

*Significant association. PR: Prevalence ratio, CI: Confidence interval, ICDS: Integrated Child Development Services

The under-five beneficiaries of the ICDS program are 79%, out of which only 38% utilize it as per the government specifications. Reasons observed for inadequate utilization were many; in hamlets without ICDS centers – difficulty in accessibility, in hamlets with ICDS centers – lack of motivation among parents to send their children to the center, and among the sathumavu users – sharing of sathumavu between multiple members of the family. In most families, sathumavu was the only source of nutrition for the children and not a supplementary source as intended. We found no significant difference between undernutrition levels in children availing supplementary nutrition and children who were not availing the same. This shows that the supplementary nutrition has no significant impact on the reduction of undernutrition. This is consistent with a similar observation made in a study done in Kerala^[10] but contrary to evidence from multiple studies which suggested improved nutritional status in ICDS utilizers.^[14,15]

In this study, we did not look at risk factors such as weight at birth, anemia, initiation of breastfeeding, and weaning. An extensive study covering these is necessary to shed more light on determinants of undernutrition. The study being cross-sectional, we could not consider any seasonal variations of illness such as diarrhea or flu and also the occupation of the parents, which could impact the time spent in looking after the children. The responses were mostly self-reported, and hence, the study is vulnerable to recall bias.

CONCLUSION

Our data suggest an alarming rate of undernutrition among the tribal community. Although the coverage of ICDS services has increased over the years, awareness creation and promotion of behavioral change in family-based feeding need to be on the forefront to overcome the socioeconomic inequities among vulnerable groups for better nutritional outcomes.

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Conflicts of interest

There are no conflicts of interest.

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