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Social Determinants of Child Undernutrition in Adivasi Population in Northern Kerala: A Study Using Syndemic Framework

Sabu Kochupurackal Ulahannan[1,2], **Prashanth N. Srinivas**[2], **Biju Soman**[1]

[1]Achutha Menon Centre for Health Science Studies, Sree Chitra Tirunal Institute for Medical Sciences and Technology, Thiruvananthapuram, Kerala, India

[2]Health Equity Cluster, Institute of Public Health Bengaluru, India

Abstract

Objectives—To understand the complex interaction of structural inequalities, co-occurring health conditions, and child under-nutrition among the Adivasi population in North Kerala, India.

Methods—A mixed-method approach was employed in this study, which combined a cross-sectional survey and a case study design. A multistage cluster sampling method was used to select 167 children aged 24 to 60 mo from the study population. The mothers of these children were interviewed using a structured questionnaire to assess individual, parental, and household-level factors associated with child undernutrition. Two *Paniya* settlements, one with a high prevalence of child undernutrition (HPS) and the other with a low prevalence (LPS), were chosen as the primary units of the case study.

Results—The study found that the absence of a kitchen garden with fruits and vegetables [adjusted odds ratio (AOR) 2.85; 95% confidence interval (CI): 1.04–7.81] and a history of cough and fever (AOR 2.93; 95% CI: 1.24–6.93) were both associated with a higher risk of undernutrition in children. The case studies revealed that Adivasi children are undernourished due to a complex set of factors that persist throughout their lives, including unequal access to social capital, healthcare, and food security, as well as differences in hygiene practices due to the lack of access to clean water and sanitation.

Correspondence to: Prashanth N. Srinivas.

✉Prashanth N. Srinivas, prashanthns@iphindia.org.

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Conclusions—The findings underscore the need for social interventions to complement the current focus almost entirely on food supplementation programmes. Equitable action on Adivasi child malnutrition requires urgent policy and programmatic attention to social inequalities and access to basic amenities in Adivasi areas.

Keywords

Adivasi; Child undernutrition; Inequity; Social determinants; Syndemic; Social capital

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Introduction

India has one of the highest proportions of child undernutrition in the world, with a prevalence of stunting and under-weight affecting one in three children under the age of five, and wasting affecting one in five [1]. Among these children, Adivasi communities, recognised as Scheduled Tribes under the Indian Constitution's affirmative action provisions, have the highest prevalence of undernutrition, poor maternal and child health outcomes, and an increasing trend of non-communicable diseases from the National Family Health Survey (NFHS) 1 (1988) to NFHS 4 (2016) [2]. Studies have consistently shown that structural inequality and social exclusion contribute to the disproportionately higher burden of child undernutrition, morbidity, mortality, and limited access to food security and health services among Adivasi communities [3–6]. These health and nutrition inequities among Adivasi communities may exacerbate existing socio-economic inequality because of their influences on reduced mental and physical capabilities and increased risk of morbidities and mortality that reduce individuals' life chances and cause an intergenerational cycle of poverty and malnutrition [7–9]. Previous studies among Adivasi communities in India have demonstrated that child undernutrition is associated with household poverty [10, 11], lack of water and sanitation facilities [12, 13], overcrowded household living conditions [12], poor educational status of the mother [10–12, 14–16], and early maternal marriage [12]. However, there is less attention to comprehensively understand how structural inequalities, environmental conditions, infectious diseases, and child undernutrition synergistically interact [17]. Therefore, this study seeks to use syndemic theory as an organizing framework to understand the complex interplay of structural inequalities, other health conditions, and child undernutrition among Adivasi children in north Kerala. In this framework, malnutrition is seen as a combination of multiple factors (including biological, social, economic, and environmental) that interact and contribute to the problem. It emphasises understanding the root causes of child under-nutrition [18, 19]. By understanding the root causes of child undernutrition and the interplay between these factors, more effective inter-sectoral health and social interventions can be designed to address the underlying factors of child undernutrition among Adivasi communities in India.

Material and Methods

This analysis is part of a larger study using a mixed-methodology approach that examined the historical pathways and social mechanisms underlying the inequality in child nutritional status between *Paniya* and *Kurichiya* Adivasi communities in the Wayanad district of Kerala. This paper uses data obtained from quantitative cross-sectional survey and qualitative case

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study conducted among *Paniya* Adivasi community. Both quantitative and qualitative data were collected between May and December 2018. All interviews were conducted at the respondent's houses by the first author.

Study Population

The study participants were individuals from *Paniya* Adivasi community in the Wayanad districts of Kerala. The *Paniya* is the largest of 11 Adivasi communities in Wayanad, making up 45.12% of the district's Adivasi population [20]. Historically, the *Paniya* people were bonded labourers of privileged non-Adivasi communities [21, 22]. Most *Paniya* people (75%) are landless agricultural labourers under economically privileged non-Adivasi communities and have suboptimal household and neighbourhood living conditions [Ramapurath Chemmencheri S. Landless in ' 'God's own country: development and perpetual struggles in Kerala [PhD Thesis]. University of Oxford; 2021, 23, 24].

Sample Size and Sampling

Detailed information on the sample size calculation in the quantitative phase of the study is published [25]. For this analysis, authors have used data from a cross-sectional survey and two settlement-level case studies conducted among the *Paniya* community. Using a multistage cluster sampling strategy, 167 children were randomly selected from 33 *Paniya* settlements from 6 Panchayats in the Wayanad district. Data were collected from mothers of children between the age of 24 and 60 mo using an interview schedule that included questions on individual, parental, and household level factors. Additionally, two *Paniya* settlements, one with a high prevalence of child undernutrition settlement (HPS) and the other with a low prevalence of undernutrition settlement (LPS) as identified by the Integrated Child Development Services (ICDS) supervisors, were selected as the primary unit of the case study.

Data Collection

Detailed information on the data collection tools and techniques used in the quantitative phase of the study is published [25]. The height and weight of the children were measured using UNICEF recommended portable scale and stadiometer, and weight-for-age Z-scores (WAZ), height-for-age Z-scores (HAZ), and weight-for-height Z-scores (WHZ) were calculated according to the 2006 WHO Child Growth Standards [26]. Data for the case study was collected using in-depth interviews with primary caregivers, community representatives, frontline service providers and a non-Adivasi person from the neighbourhood of the settlement. Additionally, observation diary notes were used as supplementary tools to understand the community-level accessibility to food and health services and water and sanitation facilities. A total of 12 in-depth interviews were conducted for both case studies: four with primary caregivers, two with community representatives, four with frontline service providers and two with non-Adivasi persons from the neighbourhood of the settlement. Seven field diary notes based on the non-participant observation were prepared for both case studies.

The data cleaning and quantitative data analysis were conducted using Statistical Package for the Social Sciences 23.0, Armonk, NY, US: IBM Corp. A descriptive analysis of

HAZ, WAZ and WHZ was conducted, and Composite Index of Anthropometric Failure (CIAF) was constructed using seven subgroups of anthropometric failures [27]. Binary logistic regression was used to determine the effect of socioeconomic factors and morbidity history on children's nutrition, and variance inflation factors (VIFs) were used to test for multicollinearity. Data from direct observation and in-depth interviews were transcribed. Nvivo 12 software for qualitative data analysis was used to analyse the data [28]. Thematic analysis was performed using inductive and deductive approaches. The initial coding was developed based on the UNICEF conceptual framework of child malnutrition [29]. Through inductive coding, themes on historical, socio-cultural, and institutional factors that shaped household and community living environments, food availability and caring practices emerged.

Ethical Considerations

The study received approval from the host institution's institutional ethics committee (IEC) (IEC Reg No. ECR/189/Inst/KL/2013). Before data collection, the participants' verbal witnessed or informed consent with a thumbprint was obtained after briefing the participants about the study's goals, purpose, and potential benefits and risks. A literate person not personally associated with the study or the investigator and known to the study participant was selected as a witness, in the case of witnessed consent. The witness completed the informed consent form by signing it or leaving their thumbprint.

Results

The socio-demographic details of the study participants in the cross-sectional survey are described in detail [25]. The results from the binary logistic regression show that not having a kitchen garden with fruits and vegetables [Adjusted odds ratio (AOR) 2.85; 95% Confidence interval (CI): 1.04 – 7.81] and a history of morbidity (cough and fever) during the last two weeks (AOR 2.93; 95% CI: 1.24 – 6.93) were identified as significant factors (p <0.05) associated with child undernutrition (CIAF) among the *Paniya*. Additionally, children with low-birth weight child had a marginally significant risk of being undernourished (AOR 2.3; 95% CI: 0.94 – 5.61) (Table 1).

Based on the qualitative analysis, a summary of the case study is presented below for discussion. There are substantial differences between the HPS and LPS settlements regarding overall prevalence and severity of undernutrition (Table 2). Among the 12 under-5 children from the HPS, nine (75%) had at least one anthropometric failure, and eight (66.7%) had at least two failures. In the LPS *Paniya* settlement, out of 10 under-5 children, 4 (40%) children had at least two anthropometric failures, and two children (20.0%) had all three anthropometric failures. Anthropometric failure among the *Paniya* community as per the CIAF index in present study was 66.9% in this cross-sectional survey, which means that the LPS and HPS settlements represent the extremes in child nutritional status among the *Paniya* people.

Case Study 1: HPS *Paniya*

Currently, the HPS *Paniya* settlement consists of 33 households on 5 acres of land. They received this land in 1982 due to an Adivasi rehabilitation project and have been marginalised due to their different cultural practices and lack of common kinship. Water scarcity has caused poor hygiene and sanitation practices, as well as an increased burden of chores on women and girls. Ecological degradation has been caused by limited land and population growth. The lack of kinship in the context of limited material resources resulted in disputes, conflicts, gang fights and damage to common properties. Stigma from non-Adivasi people resulted in early school drop-outs and low utilisation of Anganwadi services. Social exclusion has limited their livelihood opportunities, and male labour force has had to rely on seasonal labour migration for their livelihood, leaving women and girls with a difficult trade-off between family income and childcare. Mothers are forced to work despite having to care for their children. Alcohol consumption has contributed to neighbourhood violence and death, exposing mothers to unsafe living conditions. Pregnant women without partners continue their daily routine without additional support, and no special care is given after delivery. The community members' responses highlight that unhygienic living conditions, lack of medical care and intimate partner violence (IPV) increased children's risk of illness and undernutrition. The HPS *Paniya* traditionally depended on leafy vegetables, crabs and fish from the nearby paddy field. However, the community members reported that the availability of this food has decreased due to fertiliser use, shrinking paddy fields and climate change. Rice from the public distribution system (PDS) is the primary food source, but other food items are occasionally bought from the open market or provision shops. During monsoons, food insecurity increases in some households. Ten out of 12 children were fully immunised (Bacillus Calmette–Guérin, measles, three doses of polio and diphtheria, diphtheria, pertussis and tetanus), but due to the drop-out of children from Anganwadi services, growth monitoring was rarely done. Children were fed irregularly and only twice a day. The 'rice-eating ceremony' is conducted between six months to one year to initiate complementary feeding practices. Overall, the HPS *Paniya* community has faced numerous issues due to a lack of resources, social exclusion, alcohol consumption and poor living conditions. This has resulted in poor hygiene, limited access to health services, neighbourhood violence and poor dietary practices, leaving the HPS *Paniya* children vulnerable to illness and undernutrition.

Case Study 2: LPS *Paniya*

The LPS *Paniya* settlement is a 3.8-acre area with 27 households situated on a steep hillock. The ancestors of the LPS *Paniya* people resided in the same geographical area, and all the LPS households belonged to the same clan, fostering social cohesion and a supportive relationship. Though the settlement households faced acute water shortage in the earlier period, with the support of an external leader who worked as an Anganwadi worker, the settlement received a piped water connection in 1989. The availability of water considerably improved personal hygiene, social relationships and the acceptance of the LPS *Paniya* among non-Adivasi people. This enabled the cultivation of a range of vegetables, and all households had a toilet and a small pit for waste disposal. The literacy movement in the 1990s led to a transition for the LPS *Paniya* people and increased their social awareness, enabling them to claim equal social space and no longer tolerate discrimination. Most

households have television, making them more familiar with the non-Adivasi linguistic dialect, and school-going children and the young no longer speak the *Paniya* language. The increasing conformity facilitated better cultural integration for LPS *Paniya* and an increased acceptance of their culture among non-Adivasi people. The LPS people had a strong social network with non-Adivasi people in the neighbourhood, which enabled them to find employment opportunities for most households. This helped to provide income and food security, and women participated in various organisations, increasing their social awareness and enabling them to challenge discriminatory attitudes. The LPS *Paniya* had better access to nutritional services, including the Anganwadi centre (AWC), PDS, and other welfare schemes. The school-going children and youngsters had adopted the normative values and culture of the numerically dominant non-Adivasi communities. There was no reported alcohol consumption among the women, with only occasional use by men. Both men and women shared household work and child care. With access to a variety of food sources, most households ensured a minimum dietary diversity. Overall, the case demonstrated that non-discriminatory institutional services lead to better utilisation of the services, and the LPS *Paniya* community had drastically reduced their unhealthy behaviors and adopted appropriate infant and young child feeding practices, immunisation and utilisation of AWC. This has allowed them to have better breastfeeding and caring practices and seek medical care when needed. The increased access to employment opportunities and better cultural integration of the LPS *Paniya* with non-Adivasi people improved their livelihood opportunities and ensured household food insecurity.

Discussion

The synergetic relationship between child undernutrition and infectious diseases is well-recognised in syndemic literature. Undernourished children are more vulnerable to infectious diseases due to compromised immune function. Similarly, frequent contagious diseases increase the risk of undernutrition as it may cause anorexia and the body's metabolic priorities for synthesising proteins to defend against harmful pathogens [18].

The factors underlying the high prevalence of child undernutrition among HPS *Paniya* settlements are more in line with the syndemic theory. While 75% of children in HPS settlements suffered at least one anthropometric failure, it was 40% among the children from LPS settlements. The chronic disadvantages in multiple spheres of life, including poor socioeconomic cultural capital, were accumulated in a vicious interaction in the case of HPS *Paniya* people, which underlies their vulnerability to undernutrition and other health conditions. *For example*, the governmental effort to ameliorate historical injustice to the *Paniya* people through land distribution and rehabilitation resulted in geographical dislocation and disruption of their social milieus in the case of HPS. The failure to ensure basic living conditions like insufficient water supply also amplified the social disruption through the dispute and violence over the limited water resources. The frequent violence in the HPS settlement is also reported to cause fear and insecurity among women and children. The syndemic interaction between water scarcity, food insecurity, psycho-emotional stress and infectious diseases, as explained by Workman et al. (2021) was observed in this case [30].

Parental alcohol consumption, domestic violence, and other socioeconomic stresses contribute to neglected parenting practices among the HPS *Paniya,* as reported in similarly vulnerable populations [31, 32]. Nearly one-fourth of the *Paniya* mothers (23.2%) in the cross-sectional survey reported consuming alcohol, and 34.4% reported experiencing domestic violence from their intimate partner [25]. The vicious interaction of alcohol consumption, violence and social disruption is also known to cause poor mental health in other studies [33]. The significant association between the low birth weight of children and undernutrition could indicate the possible synergetic relationship between household food insecurity and maternal experience of domestic violence leading to poor maternal health and adverse birth outcome [33–35]. The HPS *Paniya* people have faced prejudice and stereotypes from the non-Adivasi people due to their history of bonded labour, socio-cultural differences, and poverty. This has caused them to face delayed treatment seeking, and poor utilisation of Anganwadi service (AWS), which could have otherwise moderated the impact of the children's illness and household food insecurity.

As explained in the paradox of embedded agency [36], the caste-based social structure constrained the ability of the *Paniya* people to challenge and transform the social system in which their agency was shaped and embedded. However, the LPS *Paniya* case study shows that the settlement level differences of geographical continuity, social capital and support of external leadership seem to have triggered a social mechanism which enabled the LPS people to exercise their agency to challenge and transform the social structure and institutions affecting their life. Ensuring the basic living conditions and empowering the community through social mobilisation in the LPS *Paniya* settlement have enabled the community to exercise their agency to act against the social and structural conditions that could have limited their opportunity to achieve better health and nutritional status. The non-discriminatory attitude of service providers and an awareness-building programme improved the utilisation of health and welfare services by LPS *Paniya* people, resulting in better social and economic capital. This helped to build resilience against social conditions and provided greater livelihood opportunities. The support of the external leadership was crucial in the LPS settlement in catalysing the community mobilisation that could challenge or mitigate the oppressive power relationship with non-Adivasi. Additionally, the work of the literacy mission and community based organisations (CBOs) in the LPS *Paniya* settlement created a community space to express the *Paniya* voice that was suppressed historically and in contemporary society in most places.

The comparison of LPS and HPS *Paniya* settlements shows how the inequality in social capital between the two settlements has resulted in inequality in other forms of capital, health-care practices, and household food security. Additionally, the availability of water resources shapes the normative values of hygiene and the ability of people to exercise their agency. This has implications for community development, as emphasised by Sen (1987), which should focus on allowing people to make choices and exercise their freedom [37].

In India, there has been recent attention to strengthening primary healthcare services under the Ayushman Bharat Program and health and wellness centres [38]. Alongside this, there has been stronger community engagement in health services [39]. These approaches and

initiatives should be optimally utilized to tackle inequities and improve the health status of populations such as Adivasi communities.

Conclusions

The syndemic approach used in this study allows research on undernutrition among Adivasi children to move beyond cross-sectional data pattern reporting to integrating systemic, structural and historical pathways. The case studies demonstrate that undernutrition among Adivasi children can be the result of a nexus of numerous factors that continue throughout the life course. Hence, policymakers should aim to improve the health and nutritional status of Adivasi children by suggesting an integrated approach that will care for their basic requirements of water, sanitation, hygiene, nutrition and health. It also indicates the importance of creating social conditions that allow community members to strive for changes to bridge the inequalities in child nutrition.

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Table 1
Socio-demographic factors associated with CIAF among *Paniya* children

Variable	CIAF		Adjusted OR (95% CI)
	No	Yes	
Total number of household members			
<=4	5 (29.4%)	12 (70.6%)	0.84 (0.21–3.37)
5 - 8.	32 (36.4%)	56 (63.6%)	0.750 (0.17–3.25)
9+	12 (26.7%)	33 (73.3%)	Ref:
Do you get any fruits or vegetables from your back yard?			
Yes	35 (38.9%)	55 (61.1%)	Ref:
No	15 (24.6%)	46 (75.4%)	**2.85 *(1.04–7.81)**
Domicile			
Non-Forest	29 (34.5%)	55 (65.5%)	Ref:
Forest	21 (31.3%)	46 (68.7%)	0.95 (0.40–2.27)
Ownership of ration card			
Yes	38 (36.2%)	67 (63.8%)	Ref:
No	12 (26.1%)	34 (73.9%)	1.07 (0.40–2.86)
Household food insecurity status			
Food secure	9 (40.9%)	13 (59.1%)	Ref:
Food insecure	41 (31.8%)	88 (68.2%)	2.04 (0.63–6.63)
Maternal experience of domestic violence			
No	35 (35.4%)	64 (64.6%)	Ref:
Yes	15 (28.8%)	37 (71.2%)	1.12 (0.45–2.80)
Sex of the child			
Female	23 (29.1)	56 (70.9)	Ref:
Male	27 (37.5)	45 (62.5)	0.63 (0.28–1.45)
Birth weight			
2.5 kg+	30 (37.5%)	50 (62.5%)	Ref:
<2.5 kg	15 (26.3%)	42 (73.7%)	**2.3 (0.94–5.61)**
History of cough and fever (last two weeks)			
No	28 (45.9%)	33 (54.1%)	Ref:
Yes	22 (24.4%)	68 (75.6%)	**2.93 *(1.24–6.93)**
Frequency of food consumption			
Four times or more	16 (47.1%)	18 (52.9%)	Ref:
Three times	20 (29.0%)	49 (71.0%)	1.5 (0.52–4.33)
Two times or less	14 (29.2%)	34 (70.8%)	1.83 (0.52–6.49)

CI Confidence interval, *CIAF* Composite index of anthropometric failure, *OR* Odds ratio

* p <0.05

Table 2

Nutritional status of children from two *Paniya* settlement

S.No	Sex	Weight for Age Z-Score	Height for Age Z-Score	Weight for Height Z-Score	Type of failure
Low Prevalence Paniya Settlement					
1.	Female	-0.95	-0.28	-1.14	Well-nourished
2	Female	-0.93	-1.76	0.2	Well-nourished
3	Female	-1.52	-1.78	-0.89	Well-nourished
4	Male	-0.21	-0.25	-0.14	Well-nourished
5	Male	-1.86	-1.34	-1.64	Well-nourished
6	Female	-1.94	-1.98	-1.13	Well-nourished
7	Male	-2.5	-2.3	-1.81	Underweight and stunted
8	Male	-2.77	-2.79	-1.8	Underweight and stunted
9	Male	-2.98	-2.8	-2.1	All three
10	Female	-3.82	-3.77	-2.15	All three two severe
Mean Z-Score		-1.948	-1.905	-1.26	
High Prevalence Paniya Settlement					
1	Female	-1.74	-1.71	-1.23	Well-nourished
2	Male	-1.45	-1.51	-0.94	Well-nourished
3	Male	-1.62	-1.92	-0.77	Well-nourished
4	Male	-1.46	-2.01	-0.35	Only stunting
5	Male	-2.73	-2.9	-1.62	Underweight and stunted
6	Female	-2.54	-2.09	-1.89	Underweight and stunted
7	Female	-2.39	-3.29	-0.52	Underweight and stunted
8	Male	-3.25	-3.52	-1.83	S. underweight and stunted
9	Female	-3.35	-3.94	-1.21	S. underweight and stunted
10	Male	-3.22	-3.18	-2.35	All three two severe
11	Female	-3.8	-3.44	-2.62	All three two severe
12	Female	-4.48	-4.27	-3.05	All three severe
Mean Z-Score		-2.669	-2.815	-1.585	