

**UNDERNUTRITION AMONG THE UNDER-  
FIVE TRIBAL CHILDREN IN WAYANAD  
DISTRICT OF KERALA**

**Sabu K U**

PhD THESIS

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**SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES AND  
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FIVE TRIBAL CHILDREN IN WAYANAD  
DISTRICT OF KERALA**

A THESIS SUBMITTED BY

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TO

SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES AND  
TECHNOLOGY, TRIVANDRUM.

IN PARTIAL FULFILMENT OF THE REQUIREMENTS

FOR THE AWARD OF

**DOCTOR OF PHILOSOPHY**

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## DECLARATION BY THE STUDENT

### CERTIFICATE

I, Sabu K U, hereby certify that I had personally carried out the work depicted in the thesis titled, "Undernutrition among the Under-five Tribal Children in Wayanad District of Kerala". No part of this thesis has been submitted for the award of any other degree or diploma prior to this date.



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\*Clearance was obtained from the Institutional Ethics Committee / Technical Advisory Committee for the study.

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## APPROVAL OF THE THESIS

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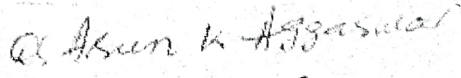
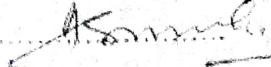
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## LIST OF ABBREVIATIONS

| SL No | Abbreviation | Full Form  |
|-------|--------------|--|
| 1     | ANC          | Antenatal care   |
| 2     | AoA          | Agreement on Agriculture                               |
| 3     | ARI          | Acute Respiratory Infection                            |
| 4     | ASHA         | Accredited Social Health Activist                      |
| 5     | AWC          | Anganwadi Centre                                       |
| 6     | AWH          | Anganwadi Helper                                       |
| 7     | AWS          | Anganwadi Service                                      |
| 8     | AWW          | Anganwadi Worker                                       |
| 9     | BMI          | Body Mass Index  |
| 10    | CBO          | Community Based Organisation                           |
| 11    | CIAF         | Composite Index of Anthropometric Failure              |
| 12    | CMD          | Common Mental Disorder                                 |
| 13    | HAZ          | Height for Age Z-score                                 |
| 14    | HFIAS        | Household Food Insecurity Access Scale                 |
| 15    | HPS          | High Prevalence Settlement                             |
| 16    | ICDS         | Integrated Child Development Services                  |
| 17    | IEC          | Institutional Ethics Committee                         |
| 18    | IPV          | Intimate Partner Violence                              |
| 19    | IYCF         | Infant and Young Child Feeding practices               |
| 20    | KI           | Key informant  |
| 21    | LBW          | Low Birth Weight                                       |
| 22    | LPS          | Low Prevalence Settlement                              |
| 23    | MGNREGA      | Mahatma Gandhi National Rural Employment Guarantee Act |
| 24    | NCHS         | National Centre for Health Statistics                  |
| 25    | NFHS         | National Family Health Survey                          |
| 26    | OBC          | Other Backward Communities                             |
| 27    | PDS          | Public Distribution System                             |
| 28    | PHC          | Primary Health Centre                                  |
| 29    | SAM          | Severe Acute Malnutrition                              |
| 30    | SAP          | Structural Adjustment Programmes                       |
| 31    | SC           | Scheduled Caste  |
| 32    | SDG          | Sustainable Development Goal                           |
| 33    | SHG          | Self Help Group  |
| 34    | ST           | Scheduled Tribe  |
| 35    | STH          | Soil-transmitted helminth                              |
| 36    | TNC          | Transnational Companies'                               |
| 37    | TP           | Tribal Promoter  |

|    |        |  |
|----|--------|--|
| 38 | UNICEF | United Nations International Children's Emergency Fund |
| 39 | VIF    | Variance Inflation Factors                             |
| 40 | WASH   | Water, sanitation and health                           |
| 41 | WAZ    | Weight for Age Z-score                                 |
| 42 | WHO    | World Health Organisation                              |
| 43 | WHZ    | Weight for Height Z-score                              |



## **SYNOPSIS**

Globally, an estimated 20% (149.2 million) of children under five are stunted, 6.7% (45.4 million) are wasted, and 12.6% are underweight, as per WHO estimates in 2022. Undernutrition among children below five years old is an important global public health challenge because it can lead to irreversible developmental delays, increased vulnerability to infectious diseases, and even death. Undernutrition also has long-term impacts, such as an increased risk of chronic diseases in adulthood and reduced educational and economic opportunities. In low- and middle-income countries, the prevalence of child undernutrition is the highest as compared to high-income countries. As per the recent National Family Health Survey 5 (NFHS 5, 2019-21), 35.5% of children are stunted, 19.3% are wasted, and 32.1% are underweight in India. Out of 194 country-level data available in the Demographic Health Survey program dashboard, India has the second-highest prevalence of wasting only after Timor-Leste and the fifth-highest underweight prevalence globally (1). Because of the highest demographic dividend, India is home to the highest number of undernourished children in the world.

While India is home to the highest number of undernourished children globally, children from Tribal communities known as Scheduled Tribe (ST) reported the highest prevalence of undernutrition as per the NFHS-5 (2019-21) report (40.9% stunted, 23.2% wasted, and 39.5% underweight). This pattern was consistently reported in all nationally representative health surveys. There are 705 ethnic groups officially recognised as ST in India. In nationally representative health and nutritional surveys, these communities were represented as Scheduled Tribes (ST). This representation does not consider the diversity within the tribal communities. Most of the nutritional inequality analysis in India that was reviewed in the literature review chapter was

conducted based on the National Family Health Survey data. Although these analyses consistently reported a higher burden of undernutrition among the tribal community, these analysis masks the nutritional inequalities within the tribal communities in India. Policies and programmes based on a such analysis view tribal communities in India as homogenous communities. The cross-sectional studies reviewed as part of this study looked at the nutritional inequalities between tribal and non-tribal children, and the other studies examined the nutritional status of children from a particular community, and very few studies were found on the nutritional inequality between the different ethnic groups in tribal communities in India.

With 23.4% of children stunted, 15.8% wasted, and 19.7% underweight, the state of Kerala reported better child nutritional status compared to other states in India. Further, child undernutrition among ST children is reported to be lower than the national average for ST children in the national survey. However, the cross-sectional studies conducted among the different tribal communities in Kerala reported a much higher prevalence of child undernutrition among several ethnic tribal groups than the national averages. In other words, although the ST children from Kerala reported better nutritional status based on the state-level averages and its central tendencies, there are several outliers ethnic groups within the ST communities who get masked within the state-level averages. To better represent the nutritional inequality within the tribal communities in Kerala, this study selected the Paniya and the Kurichiya tribal communities in the Wayanad district of Kerala. This is because several studies have reported the historical marginalisation of the Paniya community and the inequality between the Paniya and Kurichiya ST communities in the Wayanad district of Kerala on multiple factors known to be associated with undernutrition. The current literature on nutritional inequality in India usually focuses on the immediate determinant of

undernutrition at individual, parental and household level variables. Such analysis overlooks that nutritional inequality is determined by a complex mix of social, economic, and environmental factors, which interact at multiple levels, including individual, household, neighbourhood and community levels. Hence, the study aimed to examine the child nutritional inequality between the Paniya and the Kurichiya tribal communities in Kerala and to understand the pathways and mechanisms underlying the nutritional inequality within the tribal communities. The objectives framed to achieve the aim of this study were:

- To examine the child nutritional inequality between Paniya and Kurichiya tribal communities in the Wayanad district.
- To understand the historical and contextual factors (e.g. inequality of land ownership, education status, livelihood) that lead to significant differentials in child nutritional status between the Paniya and Kurichiya communities in Wayanad district, Kerala.
- To unravel the pathways of influence on differentials in child nutritional status within the Paniya and Kurichiya communities, including factors at multiple levels such as; community, neighbourhood, household, parental and individual characteristics of the child

## **Methods**

The current study used a convergent mixed-method approach to capture the pathways and mechanisms that create and sustain inequalities in undernutrition. A quantitative cross-sectional design was used to estimate the prevalence of undernutrition and its socio-demographic correlates. The qualitative case study design was used to gain deeper insight into the interaction between individual and collective identity, social

dynamics, and how people's experiences are related to the children's nutritional status. The study used data from the cross-sectional survey to address the first objective of examining the child nutritional inequality between Paniya and Kurichiya tribal communities. The data from the cross-sectional survey, settlement-level primary case studies, published studies, and grey literature were used to examine the second objective of understanding the historical and contextual factors that lead to significant differences in child nutritional status between Paniya and Kurichiya. Data from cross-sectional surveys, settlement-level primary case studies and household-level embedded case studies were used to answer the third objective. UNICEF's nutritional framework was used as the framework guiding the study. According to UNICEF's nutrition framework, undernutrition is caused by inadequate access to a healthy and balanced diet, poor utilisation of a range of foods and nutrients, inadequate care and feeding practices, and inadequate health services. This framework considers how historical events such as oppression, slavery, famine, and displacement have impacted nutrition, health, and care, as well as how historical policies, such as those relating to land ownership, food security, and access to health care, have contributed to the current situation. At the community level, this framework examines how local factors such as geographical location, environment, infrastructure, and socio-economic dynamics (including caste and gender dynamics) have shaped access to and utilisation of nutrition, health, and care services. It also examines how local cultural and social norms and practices, including food taboos, may contribute to child malnutrition. Tribal populations in India often lack access to food due to poverty, limited resources, limited availability of nutritious foods, and limited access to markets. The poor living condition also makes them vulnerable to other infectious diseases, which limit to

absorption of nutrients. Care and Feeding Practices also become compromised due to the poor and inadequate livelihood opportunities.

### ***1.1 Sample size and sampling in the cross-sectional survey***

According to a previous study, the prevalence of underweight among children in Paniya and Kurichiya was 63% and 43%, respectively (Ladish, 2005). The sample size was calculated with a 0.05 significance level, 0.80 statistical power, and a 1:1 allocation ratio. The calculated sample size was 97 for each group. With a design effect of 1.5 and a 10% nonresponse rate assumed, the sample size calculated was 165 for each community (after rounding off). For both groups combined, the sample size was 330. A multistage cluster sampling strategy was used. First, six Panchayats in Wayanad district with larger Paniya and Kurichiya populations were selected. Each settlement of the Paniya and Kurichiya communities was considered a cluster since these communities lived in settlements. A list of Paniya (198) and Kurichiya (106) settlements with 20 or more households was obtained from the Panchayat Tribal Development Extension Office. A random sample of 33 Kurichiya and 33 Paniya settlements was selected. In each of the selected Panchayats, settlements were selected proportionally to their total numbers. This study included all children between the ages of 2 and 5 from each selected settlement. Approximately five children per settlement were estimated to get the calculated sample size. Only three children were found in smaller settlements, so seven or six children were selected from larger settlements with more than 50 households to make up for it. A total of 333 children were included from both Paniya and Kurichiya communities.

### ***1.2 Sample size and sampling in the qualitative case studies***

Four counter-factual cases of Paniya and Kurichiya settlements, two with a high prevalence of child undernutrition settlement (HPS) and the other two with a low prevalence of undernutrition settlement (LPS), were selected as the primary unit of the qualitative case study, based on the secondary data available from tribal development extension offices located in the study area. Within each settlement-level case, four household-level counterfactual embedded cases of two well-nourished children and two undernourished children were selected. Thus, there were a total number of four settlement-level primary cases (two Paniya and two Kurichiya) and 16 household-level embedded cases.

Data collection and analysis of cross-sectional survey: In the cross-sectional survey, mothers were interviewed using an interview schedule that explored factors at the individual, parental, household, and community levels. The household food-insecurity assessment scale (HFIAS) based on four frequency responses over a 4-week period was used to assess household food availability. Nutritional status was assessed using 1995 WHO Expert Committee recommendations. The weight was measured using a lightweight SECA 803 flat-scale with a digital monitor designed and monitored by UNICEF (SECA Medical Scales and Measuring Systems, Birmingham, UK). At the start of each working day, the scale was calibrated. UNICEF-designed and monitored SECA stadiometer was used to accurately measure the height (SECA Medical Scales and Measuring Systems, Birmingham, UK). Following the new WHO Child Growth Standards, weight-for-age, height-for-age, and weight-for-height Z-scores were calculated using WHO Anthro Software. For data collection and data entry, the Open Data Kit (ODK) Collective v1.18.2 was used on a mobile tablet and exported to Statistical Package for the Social Sciences 23.0, Armonk, NY, US: IBM Corp. The HAZ, WAZ, and WHZ were descriptively analysed. Composite Index of

Anthropometric Failure (CIAF) was constructed using seven subgroups of failures, namely A - no failure, B - only wasted, C - underweight and wasted, D - stunted, wasted, and underweight, E - stunted and underweight, F - only stunted, and Y - only underweight. To test the significance of the differences in CIAF between children from Paniya and Kurichiya communities, Chi-square tests were performed. For further analysis of the relationship between CIAF and community-specific socio-demographic variables, binary logistic regression was performed separately for Paniya and Kurichiya communities.

### ***1.3 Data collection and data analysis of case studies***

Data for the case study was collected using in-depth interviews, observation diary notes, and document reviews. In-depth interviews were conducted with primary caretakers (mothers and fathers of two to five-year-old children), community representatives, older adult women in the settlement, (community leaders), other frontline community workers (Anganwadi workers (AWW), Accredited Social Health Activist (ASHA), Tribal Promoters) and a non-tribal person from the neighbourhood of settlement. Document review of Anganwadi records, medical prescriptions, and other published and unpublished grey literature on the Paniya and Kurichiya community was conducted as a supplementary method to gain an understanding of the community history on factors that affects the livelihood, food security and child nutrition status of tribal children in the selected settlement. An observation checklist containing 16 items was used for non-participant observation. These items aimed to understand the community-level accessibility to food and health services and water and sanitation facilities available in the community. The in-depth interviews were conducted in Malayalam. Using a digital audio recorder, data from interviews were audio-recorded, transcribed, and translated into English by the first author. Data from

direct observation and participant observation were also transcribed into word format. Nvivo 12, a software for qualitative data analysis, was used to analyse the data (2). Thematic analysis was performed using inductive and deductive approaches. The initial coding was developed based on the UNICEF conceptual framework of child malnutrition, such as household and neighbourhood environmental conditions, access to food, sources of livelihood, child caring and dietary practices. Through the inductive coding, themes on the historical, socio-cultural, and institutional factors that shaped the household and community living environments, food availability and caring practices emerged. To explain the pathways and mechanisms that perpetuated or moderated nutritional inequality at community, neighbourhood, household, and individual level, cross-case synthesis was performed across the case studies to determine the commonalities and differences across the high and low prevalence settlement. Ethical clearance from the Institutional Ethics Committee (IEC) of Sree Chitra Tirunal Institute for Medical Sciences and Technology was obtained. Written informed consent was obtained from the participants prior to data collection. Confidentiality and participants' right to withdraw from the study were maintained throughout the study. Privacy was maintained in all interactions with the respondents, and the confidentiality of the information was protected under all circumstances.

## **RESULT**

The section examined the child nutritional inequality between Paniya and Kurichiya communities. The survey looked at 333 mothers and children and found significant differences between Paniya and Kurichiya households. Among the *Paniya* community, a higher proportion of children were moderately wasted (22.5%), underweight (40.4%), and stunted (35.8%) as compared with children of the *Kurichiya* community

(11% wasted, 27% underweight, 21.5% stunted). Indeed, there was a widening inequality in severe anthropometric failures between *Paniya* and *Kurichiya* children. A much higher proportion of *Paniya* children had severe stunting (18.5%) and were underweight (16.6%) as compared to *Kurichiya* children: 3.1% severely stunted, and 6.7% were severely underweight. Interestingly, severe wasting was found in only 2.6% of *Paniya* and 1.2% of the *Kurichiya* community. All these differences were statistically significant. A similar pattern was observed when the nutritional disparity was examined using CIAF. While 66.9% of children from the *Paniya* community reported at least one anthropometric failure, it was only 41.1% among *Kurichiya* children. The children who suffered all three anthropometric failures were 16.6% among *Paniya* children and 4.3% among *Kurichiya* children. Similarly, two simultaneous failures of underweight and stunting were 29.1% among *Paniya* and 14.1% among *Kurichiya*. The disparity between *Paniya* and *Kurichiy* in three simultaneous failures and two simultaneous failures of underweight and stunting was significant. However, in the only failure categories (only stunting, only wasting, and only underweight) and two simultaneous failures of underweight and wasting, there were no significant differences between *Paniya* and *Kurichiya*.

### **The historical and contextual factors that contributed to the inequality in the determinants of child nutritional status**

**Paniya historical factors:** The *Paniya* community in Wayanad has traditionally been bonded labourers of upper-caste landlords. The history of bonded labour underlies the land alienation and economic marginalisation of the *Paniya* people. When *Paniya* were freed from the bonded labour system, the land available to the *Paniya* people was inadequate to meet their livelihood needs, so they relied on non-tribal people for livelihood. The non-tribal people used alcohol as an enticement to the *Paniya* people

to keep engaging the Paniya people in harsh and hazardous jobs. The Kerala land reform in 1963 did little justice to the landless Paniya as the bulk of the land transfer was in favour of the non-tribal population, and many Paniya households were forcibly removed from the land. Consequently, the Paniya community was rehabilitated in new places under a government tribal land rehabilitation project, resulting in the merger and unproductive landholding of the Paniya community. Additionally, the rehabilitation of the landless Paniya people weakened their traditional leadership, leading to the breakdown of community ties and norms. The numerical majority of non-tribal people treated the Paniya people and their lifestyle as inferior, leading to the exclusion of Paniya from schools and other health and welfare services. The poorer educational achievement resulted in their exclusion from the formal labour market. Agriculture labour opportunities became unviable due to a shift in agriculture, so the Paniya people adopted seasonal labour migration and domestic work. Traditionally, the Paniya people depended on indigenous food from the surrounding ecosystem. This traditional food source was disrupted with the arrival of non-tribal migrant settlers who owned the majority of the land in the neighbourhood. While the traditional advantages disappeared with the arrival of non-tribal migrant settlers, they also introduced brewing alcohol which was used to attract the Paniya people to work.

**Kurichiya historical factors:** Kurichiya people were associated with Kerala Varma Pazhassi Raja, who fought against colonial rulers in the 1790s. They received a large area of land from the king as a reward for their military services and enjoyed a higher social status than other tribal communities in Wayanad. The Kurichiya people could maintain a close connection with the upper caste Nair community, and in many respects, the Kurichiya lifestyle and culture resembled that of the Nair community. The *Kurichiya* practised untouchability against other marginalised tribal communities and

followed the joint family system under the leadership of the household's eldest member, known as '*karanavar*'. Under the leadership of the community leader, the community continued its cultural celebrations fostering community cohesion. In later 1960, their land was divided among individual households to protect the land against the land ceiling Kerala land reform act. This land division among individual households marked a shift from food crop cultivation to cash crop cultivation. Many elderly people from the Kurichiya community were secondary or higher secondary school educated and could work as public servants in different state and central government departments. When Panchayath Raj Act 1994 was implemented in Kerala, Kurichiy people with better socio-economic status in the district represented the majority of the seats reserved for the tribal people in Wayanad districts. The early socio-economic advantages of Kurichiya accumulated incrementally over time.

**Inequalities in the determinants of child undernutrition:** The impact of historical disadvantages of Paniya due to their bonded labour history, land alienation, exclusion from schools, and introduction of alcohol by non-tribal as means of labour exploitation is reflected in the inequality in social determinants of child nutrition between Paniya and Kurichiya.

The result of the survey revealed a stark disparity in the distribution of land resources between the Paniya and Kurichiya communities which is reflective of multiple historical disadvantages of the Paniya community. Most Paniya households (71.5%) only owned less than 5 cents of land, compared to 25.8% of Kurichiya households. This inequality was even more pronounced in households with more than 50 cents of land, with only 1.3% of Paniya households and 33.7% of Kurichiya households owning it. This disparity had further implications for nutrition and hygiene status in both communities, as those with more land were more likely to grow fruit and

vegetables and have access to better sanitation. This study found that the amount of land available to the Paniya people in two settlements was inadequate to meet their livelihood needs, forcing them to rely on non-tribal people. The land was infertile and had limited water sources, leading to poor hygiene, sanitation, and food options. These issues were exacerbated by the increasing population and limited household space, leading to garbage and refuse accumulation. The Kurichiya settlements in the case studies are inherited land with an average of 1.2 acres in HPS Kurichiya and 2.9 acres in LPS Kurichiya. Most households practice agriculture and other occupations, and the land is used for both dry land and wetland cultivation. Cash crops are grown on dry land, and banana cultivation has replaced most of the wetland rice cultivation. Rice is still cultivated for community rituals.

The survey revealed that Paniya mothers were mostly illiterate (35.8%) or had received no formal education (20.5%), whereas only 0.6% of the Kurichiya mothers were illiterate. Similarly, Paniya fathers had mostly not received any formal education (58.9%), while most Kurichiya fathers had received up to secondary education. The lower educational status of Paniya communities reflects their exclusion from the schools run by non-tribal. The Paniya children of the case study settlement were observed not attending school, likely because of the perception of the service providers at school and AWCs to view them as primitive and uncivilised. The educational backwardness limited their knowledge of appropriate health and nutrition behaviour and their livelihood opportunities. The lower academic status limited the Paniya people's access to the formal labour market. As Paniya people are landless and economically marginalised, they rely on domestic agriculture employment opportunities in their neighbourhood and seasonal labour migration to a neighbouring state for income. The women have to engage in income-generating activities to support

the household, but this has compromised childcare and not improved child nutrition. On the other hand, the Kurichiya people shifted from food crops to cash crops on their land and diversified their livelihoods to cope with the uncertain effects of climate change and market fluctuations. In recent years, women have also entered the workforce under the MGNREGA, providing a safety net for households.

The study found unequal access to social welfare and nutritional services between the Paniya and Kurichiya communities. Only half of the Paniya children accessed Anganwadi services regularly, while a higher proportion of Kurichiya households could access PDS services. The case study finding unravelled how the inequality in educational status contributed to the disparity in the utilisation of welfare and nutritional services as well. This has caused a lack of community representation from frontline workers, leading to a victim-blaming attitude from public servants. The response of the frontline workers in the Paniya settlement reflected their negative stereotype of the Paniya people as primitive, thieves, liars and lazy. This stereotyped perception of public servants also shaped the way services were delivered to the Paniya people, often characterised by rude and discriminatory behaviour. The stigma and discrimination experienced by the Paniya people are other factors that contributed to the poor service utilisation by the Paniya people.

Kurichiya people's historical advantages of land ownership and better educational status, political participation, and representation in government jobs contributed to their ability to access public welfare and nutritional programmes. The Anganwadi centres in the Kurichiya study were located on the community's land. Both the Anganwadi helpers and the tribal promoter were from the Kurichiya community. The Anganwadi helper from the Kurichiya settlement was observed escorting their children to Anganwadi from their home. The better utilisation of welfare services,

mainly nutrition-based, improved children's household food security and dietary diversity. The exposure to new media seems to have influenced the Kurichiya people's dietary practices. However, they have still been able to preserve important cultural knowledge and practices, including traditional knowledge of their ecosystem and resource management. They have also maintained community festivals, and their skill in archery has won them national and regional accolades. These cultural advantages have enabled them to leverage their social acceptance and interact more with non-tribal people.

The Kurichiya settlements reported a recent increase in alcohol consumption among men as part of the social gathering. The survey found that while 23.2% of Paniya mothers and 75.5% of Paniya fathers consume alcohol, only 1.2% of Kurichiya mothers and 58.9% of Kurichiya fathers do. The higher prevalence of alcohol use among the Paniya parents is rooted in their historical labour exploitation. They spend a lot of this money on alcohol to cope with the poor living condition and the pain of hard physical labour. When they return home, they buy alcohol for family and friends and food for their children. This has resulted in other health and social problems of neighbourhood violence, crime, accidental fall and death, and violence against women and children. This is reflected in the much higher proportion of *Paniya* mothers who reported having experienced domestic violence (34.4%) compared with that of *Kurichiya* mothers (5.5%) in the cross-sectional survey. Regarding sanitation behaviour, 81.5% of the Paniya households have toilet facilities, but only 67.5% of mothers reported their children to use them. As reported in the previous section, water scarcity in the settlement was the critical factor that determined the poor sanitation and hygiene practices in the Paniya settlement. While more than a third (37.8%) of *Paniya* households were severely food insecure, it was only 11.04% among the *Kurichiya*

community. The shrinking traditional sources of food, along with the Paniya people's limited access to food from the open market because of economic precarity, forced them to depend on the cereals received through the Public Distribution System (PDS) and other services as their primary source of food. This has already compromised the food diversity of the Paniya people. However, Kurichiya people could grow fruits and vegetables on their land and access food from open markets because of their better economic position. A higher proportion of Kurichiya people could access PDS and Anganwadi services than the Paniya people. These multiple food sources could ensure food diversity and quantity to ensure food security in most Kurichiya households.

Paniya people's marginalisation on multiple fronts affected the Paniya mothers unequally. The women bear a higher burden of household work. In water scarcity, Paniya women's work burden increased compared to their male counterparts. The labour migration of Paniya men to cope with the shrinking livelihood opportunity put additional responsibility of income generation on the Paniya mothers to meet their daily life requirements. When both parents were away from home during the day for their daily wage labour, the children were given inadequate attention, which increased their exposure to unhealthy environmental conditions, increasing their vulnerability to illness. This is reflected in the higher burden of morbidity history of Paniya children (51.6%) compared to Kurichiya children (44.2%). Additionally, the Kurichiya parents could provide prompt medical care to their children in the case of illness. However, the Paniya people's economic precarity and the anxiety due to their past experience of being treated unfairly by the health service provided prevented them from seeking immediate care for their children when they were ill.

In the Kurichiya community, pregnant women are now sent to their parental homes in the seventh month and are not assigned any heavy work. The community has

traditional rituals related to childbirth, such as feeding the child with semi-solid food, but these have been largely replaced with advice from doctors. Nursing mothers are not usually engaged in remunerated work outside the house and take hygienic care of their children. Once admitted to the Anganwadi, mothers often engage in remunerated work. However, multiple community-level disadvantages of a higher proportion of household food insecurity, the experience of domestic violence, multiple household work, and economic precarity seem to be adversely affecting both the mental and physical health of Paniya mothers. Anecdotal evidence based on the report of a healthcare provider in a mobile health clinic showed anaemia and low BMI among Paniya women are pervasive. Poor maternal mental and physical health limits mothers' ability to provide adequate care to their children and could lead to poor birth outcomes. A greater proportion of Paniya children (41.6%) were born with low birth weight (<2.5 kg) compared to 29.1% of Kurichiya children.

**Pathways and mechanisms at the community level:** The third objective of unravelling the pathways of influence on differentials in child nutritional status within the Paniya and Kurichiya communities, including factors at multiple levels such as; community, neighbourhood, household, parental and individual characteristics of the child has been addressed using the binary logistic analysis of cross-sectional survey data and cross-case comparison. In the Paniya community, the children from a household without a kitchen garden reported 2.85 (95% CI: 1.04 - 7.81) times higher risk than the children from households with a kitchen garden. Children with a morbidity history of cough and fever during the previous two weeks were at 2.93 (95% CI: 1.24 – 6.93) times higher risk of undernutrition. The low-birthweight child's risk of being undernourished was observed to be marginally significant (AOR 2.3; 95% CI: .94 – 5.61). In the Kurichiya community, the children from a household without a

kitchen garden reported Adjusted OR=12.02; 1.13 - 128.01 times higher risk than the children from households with a kitchen garden. The male children from the Kurichiya community had a 2.17 (95% CI: 1.04 - 4.50) higher risk of CIAF compared with their female counterparts.

Neighbourhood level inequality: The study found that the prevalence and severity of undernutrition among Paniya people varied between the two settlements. In the HPS settlement, 75% of the 12 children surveyed had at least one anthropometric failure, and 66.7% had at least two failures. In the LPS settlement, 40% of the ten children surveyed had at least two anthropometric failures, and 20% had all three failures. Overall, the LPS settlement was better off in terms of child nutritional status than the HPS settlement.

### **Case Study 1: HPS Paniya**

In the HPS settlement, 33 households live on five acres of land. The households in this settlement are descendants of five households who received this land in 1982 under a tribal rehabilitation project. The households in the settlement did not have a common kinship, weakening community cohesion. The households in this settlement lacked basic living conditions, such as adequate water sources and sanitation facilities from the very beginning. The population growth in limited land space, with inadequate water and sanitation facilities, has caused ecological degradation. This, combined with poor social cohesion, has led to disputes, conflicts, gang fights and damage to common properties. This is further compounded by negative stereotypes about the settlement that have driven early school drop-outs and low AWC utilisation. HPS people have a poor social network outside their settlement, leaving the male labour force to rely on seasonal labour migration for their livelihood. Although livelihood safety net schemes

like MGNREGA work are available, the households in this settlement cannot work under this scheme as payments are frequently delayed. Men who migrate typically send remittances in a month or so, but a large portion is spent on alcohol. Single mothers whose partners migrated for work were forced to work despite having to care for their children, leaving them exposed to unsafe living conditions. Alcohol consumption among both men and women is a major problem in the settlement, causing Intimate Partner Violence (IPV), neighbourhood violence, death and injuries, and neglected child care. Maternal work burden is compounded due to the arrest and imprisonment of men involved in crimes, while increasing crime creates a sense of fear and insecurity among women and children.

Typically, the pregnant women continued with their daily routine with no additional support from their partner, and no special care was given after delivery. Mothers were hesitant to receive antenatal care, and some home deliveries were reported. All the mothers who took part in the study reported they followed exclusive breastfeeding of the child for six months. However, the initiation of complementary feeding practices was associated with the community's cultural practice called 'the rice-eating ceremony, which is often conducted between six months to one year, depending on the household's financial status. Most of the children were immunised, but growth monitoring was rarely done. The water scarcity in the settlement limited the community member's ability to grow fruits and vegetables on their land. The community could collect different leafy vegetables, crabs, and fish from the nearby paddy fields of non-tribal people, though the number of crabs and fish has decreased because of fertiliser use. The rice from the Public Distribution System (PDS) is the primary food source. Other food items, such as beef, pork, chicken, and bakery food, are occasionally bought from the open market or provision shops. During monsoons,

when alternate food sources are scarce, food insecurity increases in some households. Most households cook only at night and consume leftover rice in the morning. Children were fed irregularly, and food was only consumed twice a day.

### **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 lived in the same geographical area, and all the LPS households belonged to the same clan. The kinship among the LPS *Paniya* fostered social cohesion and a supportive relationship. However, the settlement household faced acute water shortage and faced labour exploitation and discrimination from the non-tribal people in the immediate neighbourhood in the earlier period. The support of an external leader who worked in the settlement in the capacity of an Anganwadi worker (AWW) was a critical advantage that addressed some of the root causes of household food insecurity and child nutrition in the settlement. With the support of the community leader, the settlement received a piped water connection in 1986. This increased water availability significantly improved personal and environmental hygiene. This has enabled the cultivation of a range of vegetables, and all households have a toilet and a small pit for waste disposal. The Anganwadi teacher facilitated a local community-based movement against alcohol brewing and selling in the village, reducing its availability in the neighbourhood. Consequently, alcohol use among the LPS household has decreased drastically over the years, although not eliminated.

Besides this, LPS people benefitted from the literacy movement in the 1990s. The women in the settlement participated in various organisations, which increased their social awareness and enabled them to challenge the discriminatory attitude of non-

tribal people in the neighbourhood. This has allowed them to claim equal social space and no longer tolerate discrimination. This has resulted in more social connections, employment opportunities, and the diversification of livelihood options for the LPS Paniya households. Women took part in MGNREGA work, while men worked in traditional agriculture and masonry. The women's participation in work improved their decision-making capacity and confidence. Though the death or illness of the earning members of some households caused a financial crisis, kinship and social cohesion provided support, allowing households to share resources and ensure adequate diet and health for children. Currently, most of the LPS Paniya children attend the AWC regularly. Men and women share household work and childcare equally and seek medical care when needed. Households have access to a variety of food sources, including kitchen gardens, purchased vegetables from the market, food from the Public Distribution System, mid-day meals from schools, and occasional food supplies from the tribal department, ensuring a minimum dietary diversity. Families typically prepare food twice a day, and children consume it three to five times per day.

### **Within Kurichiya inequalities**

In the LPS, only 30% of children reported at least one form of anthropometric failure, while in the HPS, it was 55.5%. The overall prevalence of undernutrition among Kurichiya children was 41.1%. The major difference between the two settlements was land ownership, with the LPS Kurichiya owning almost twice more land than the HPS.

**LPS Kurichiya:** Currently, 34 households live in the LPS Kurichiya settlement and own 100 acres of land together. Until the land reform act of 1963, the LPS households lived together in a joint family and shared the land, but the act required households that owned over 15 acres to return it to the government. As a result, the land was

divided among individual families. The better economic position enabled the LPS Kurichiya people to invest in the education of the community members. This early education opportunity further translated to better employment opportunities in government services. The LPS Kurichiya community leader was a retired employee from central government service who got wider social exposure and experiences. The experience he received outside the community was a crucial external trigger factor to developing critical thinking and leadership skills for social entrepreneurship. Currently, the settlement grows cash crops for their livelihood and food crops for household use. They practised co-operate farming and employed non-tribal people during peak season. The common lineage among LPS Kurichiya fostered community norms of reciprocity, trust and engagement which have been maintained through community leadership. This has resulted in bringing favourable social changes in the LPS settlement. The women in the settlement share equal social space with men in education, employment and social activism. Child-caring is now seen as a shared responsibility. The better educational status of the community and the social capital translated to the political empowerment of the LPS Kurichiya. The LPS Kurichiya people could win local body elections and could achieve higher political positions. This could ensure better living conditions in the settlement. Most homes now have electric gardening tools, vehicles, computers, fridges and washing machines. They have access to financial credit loans from banks and SHGs, which buffered the financial shock due to crop failure. The communities' political representation provided them with better access to welfare schemes. The accumulation of multiple advantages puts LPS Kurichiya people in a better position to ensure a healthy and balanced diet and protection from the impact of illness.

**HPS Kurichiya:** In the HPS Kurichiya settlement, 28 households live now. Though the settlement is spread across 36 acres of land, more than one-third of the land is currently owned by the traditional ancestral home called '*tharavad*'. The remaining 22 acres of land are shared among the 28 households. Barring the ancestral home, none of them had title deeds to the property, which limited the household's ability to access financial credit from Banks. While all the households in the settlement shared kinship relationships, the lack of democratic leadership at the settlement level resulted in resentment against the *karanavar*. The Kurichiya community's traditional celebrations have declined due to the alcohol consumption and profane language used by the *karanavar*. Consequently, the community members elected a new community leader to represent the community, creating a polarisation between the households in the settlement. This has led to a decrease in community cohesion, participation, and cooperation. Additionally, alcohol consumption is reported to have increased in the settlement leading to physical and verbal conflict and insecurity among women and children. Domestic violence because of alcoholism has also been reported in a few households. Non-tribal communities in the past respected the HPS Kurichiya, but their cooperation is now limited. The land available to the household did not meet their livelihood needs, and many people had to work for non-tribal people for their livelihood. Although a few households leased land for banana cultivation, this was unsuccessful because of flooding. The community now engages in a variety of manual labour, and only a few women are involved in MGNREGA work due to inadequate wages. Parents who are engaged in income-generating activities outside the settlement leave children over three years old at the Anganwadi centre or leave them with family members who do not work. Sometimes, catastrophic health expenditure for adults has led to the neglect of maternal and children's health. Though limited varieties of

vegetables and tubers are grown in their homestead, dice from the Public Distribution System are now the main staple food. Access to food supplies from the open market varies between households. The inequality in land distribution, lack of social cohesion and increasing alcohol consumption in HPS settlements dampen the other community-level advantages.

### **Household, Parental and Individual level factors**

While the settlement-level factors shaped a conducive or constraining condition for the child, the household-level embedded case studies indicate that settlement-level factors work through the choices that the individuals in each household make. The household-level factors include economic and social capital, food security, and hygiene. The parental level attributes involve employment status, education, the mother's experience of IPV, health status and health behaviour, and parental involvement in household work and child care. The household and parental factors primarily shaped the parental ability to ensure a healthy and balanced diet and children's health protection. In the LPS settlement, though most of the households could take advantage of the settlement level conditions, the catastrophic health expenditure or the caring needs for the illness or disability of close family members had a dampening effect on the settlement level advantages in undernourished case households 3,4, 11 and 12. These houses also reported a lack of disposable income needed to access food from the open market. In all these cases, the child's mother took the main caring responsibility of the diseased family members, which limited the mothers' ability to care for the children and to ensure a healthy household environment. Baring case no 3, the other cases reported poor social network with the other households, poor household hygiene, and lack of paternal involvement in household chores. At the individual level, irregular utilisation of Anganwadi service was reported

in all three undernourished cases barring case no 12. Similarly, all these undernourished cases reported a recent history of illness in the past two months. Barring case no 11, in all other cases, the treatment was delayed.

In contrast to the undernourished cases from LPS settlements, well-nourished cases from HPS settlement indicates how individual households could build resilience against the settlement-level disadvantages. The commonality in all the well-nourished cases from the HPS settlement was the index child's minimum dietary diversity and frequency. However, this was achieved through diverse pathways in each of these cases. In case eight from HPS Paniya and case 16 from HPS Kurichiya, at least one of the child's parents was brought up elsewhere and has internalised different social norms and practices. While both two cases were excluded from the settlement households, these two households' exposure and contact with communities outside the settlement could build resilience to overcome the settlement-level disadvantages and ensure regular employment opportunities and access to food from the open market. In case no 7, though the child shared the household and parental level disadvantages with other undernourished children, being born as an elder child with a slightly higher birth weight in a twin birth provided an early advantage which accumulated other advantages of better milestone development, food consumption, protection from illness.

The absence of financial and emotional constraints because of the adverse health condition of the family members positioned the households in the well-nourished cases to catalyse the settlement-level advantages of social and cultural capitals. All the well-nourished cases from LPS settlements reported active social and organisational participation, which translated into better employment opportunities, knowledge and awareness regarding appropriate child-caring practices. This social network could

buffer the economic shock because of the failure of the crops, as in case number 10. Though children in the case of three and nine reported a recent history of illness, the children were given immediate medical treatment, which could minimise the risk of undernutrition. Similarly, though case number 10 reported low birth weight, better household-level resources and parental ability to protect the child from illness and feeding practices and health care protection catalysed better child growth. The HPS undernourished cases (5, 6, 13 and 14) shared several characteristics. However, these varied from community to community. These included social discrimination, limited domestic employment opportunities and an intersection of household, parental and individual disadvantages. These compounded the impact of settlement-level disadvantages and limited individual-level choices and exercises of their agency. Poor social cohesion at the settlement level was also seen at the household level, with an impact on employment opportunities. Catastrophic health expenditure, water scarcity, unequal gender norms and alcohol consumption and domestic violence were all experienced more severely by the undernourished cases. These factors, combined with frequent infections and delayed treatment, resulted in children suffering from a lack of nourishment.

**Discussion:** This study shows that the Paniya children suffer from higher levels of undernutrition than the Kurichiya children, with wider disparities in severe cases. Data from the NFHS-4 (2015-16) reveals that tribal children in Kerala have better nutritional status than the national average. However, this average masks inequality between tribal communities, with Paniya children suffering more than Kurichiya children. The Paniya people are excluded from the state's successful development stories. Previous studies have highlighted that more advantaged tribal groups receive most constitutional benefits, while the most marginalised are left without. This has

important implications for advancing health equity in Kerala. It suggests that health and nutrition initiatives should be tailored to the specific needs of these communities and that the most vulnerable ethnic groups should be specifically targeted to ensure that aid reaches those who need it most.

The Diderichsen framework on the mechanism of social inequality in health provides a useful framework to explain the Paniya and Kurichiya inequality in child nutritional status. First, the social stratification within the tribal, based on the inequality in socio-economic and cultural capitals, is the primary mechanism of the nutritional inequality between the Paniya and Kurichiya communities. This has meant that the Paniya people have suffered from a history of bonded labour, land appropriation, and exclusion from development reforms, resulting in their poverty and meagre land holdings. Whereas the Kurichiya people's historical connection with the rulers and the land they received in return for their military services positioned them as an elite within the tribal communities in Wayanad and could enjoy a higher share of public welfare schemes and education opportunities. This historical process created a context of social stratification within the tribal communities in Wayanad, where the Paniya's historical disadvantages pushed them to the bottom of the stratification, and the historical privileges of Kurichiya positioned them higher in their social ladder.

Second, socio-economic and cultural capital inequality causes differential exposure to the risk factors of child undernutrition, such as exposure to unhealthy environmental conditions and poor dietary practices. The population growth in a congested area with inadequate water and sanitation facilities underlies the poor and unhealthy environmental conditions of the Paniya. Similarly, the Paniya people's land alienation, livelihood precarity, and lack of freedom of choice and bargaining power forced them to adopt coping strategies such as seasonal labour migration and NREGA by both

parents to survive. Both increased the exposure of Paniya children to unhealthy surroundings causing frequent infections. Their lack of land ownership has prevented them from accessing diverse food baskets and growing their own fruits and vegetables, contributing to their food insecurity. Their lack of education has hindered their ability to provide adequate care and nutrition to their children. These factors show how social inequality has adversely impacted the health and nutrition of the Paniya people. Kurichiya people with better land ownership could grow diverse fruits and vegetables on their own land, and with a better economic position, they could access food from open markets. Multiple sources of food could ensure household food insecurity. Access to better water and sanitation facilities, neighbourhood environmental hygiene, and parental care protected the Kurichiya children from unhealthy environmental conditions.

The third mechanism that underlies the nutritional inequality between the Paniya and the Kurichiya communities is their vulnerability differential. Children who suffer foetal growth retardation is known to be more vulnerable to infection. This vulnerability is exacerbated by exposure to a pathogenic environmental condition in which they live and grow. The impact of the exposure to pathogenic environmental conditions and household food insecurity of Paniya children is exacerbated by another health risk, including low birth weight. The higher rate of morbidity among the Paniya also interacts with other institutionalised stereotypes and economic precarity, both of which increase the vulnerability to undernutrition. This study highlighted that non-tribal people had institutionalised cultural stereotypes such as "thieves", "liars", and "lazy" towards the Paniya. This has led to discrimination and stigma against Paniya children when accessing services, thus further contributing to delay in treatment-seeking when children are ill, which increases the Paniya children's risk of

undernutrition from illness. Whereas the prevalence of low birth weight is lower among Kurichiya, they provide immediate medical care to their children when they are ill and could minimise the impact of illness on the nutritional outcome.

The fourth mechanism is through unequal social consequences of illness and undernutrition. While undernutrition and infection are known to interact viciously, the economic and livelihood precarity and poor social network of the Paniya people amplify its impact on the household's food security and mental health. Whereas the better livelihood opportunities and the social capital of Kurichiya people buffer the social impact of illness. As Paniya men mostly depend on labour migration, the children's illness burdens the mothers. As financial support from the men who migrate is limited in most cases, Paniya mothers have to work for income. The illness of the children put her into a difficult trade-off between her wage and household food security and the treatment of the child. Treatment of the child causes loss of wage for her, which again worsen the food insecurity in the household, thus creating a downward spiral of food insecurity, undernutrition and illness.

**Pathways and mechanism of nutritional inequality within Paniya and Kurichiya communities:** The factors underlying the high prevalence of child undernutrition among HPS Paniya settlements are more in line with the syndemic theory. Though the Paniya people in both case studies shared the common historical disadvantages of bonded labour history and land alienation leading to their current economic marginalisation, the basic differences between the two Paniya settlements were in terms of their social capital. The chronic disadvantages in multiple spheres of life, including socio-economic 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 economic marginalisation of the Paniya

people, in general, is rooted in their historical exploitation and structural violence. However, 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 Paniya. The cross-case comparison of settlement-level Paniya case studies explains how adverse social conditions of oppressive social relationships, poor livelihood opportunity, food insecurity and unhealthy living conditions lead to the high burden of undernutrition and other comorbidities, and their interaction varies across the Paniya settlement, why some people fall into the structurally shaped social vulnerability to the syndemic interaction between undernutrition, infectious disease, food insecurity and unhealthy living conditions and behaviours, while others could build resilience against this.

This HPS Paniya case study explained the impacts of water insecurity on the HPS Paniya people, such as social disruption, neighbourhood violence, and food insecurity. It explains how this water insecurity is linked to poor living conditions, child undernutrition and an increased risk of infectious diseases. Additionally, it highlights how limited access to safe water impacts food preparation, making people more vulnerable to contamination. Alcohol and tobacco use among the HPS Paniya has been linked to a range of adverse interactions between resource scarcity, violence, food insecurity, infectious diseases and social cohesion. Previous studies have found that these consumption habits are rooted in exploitation, inequality and poverty. It is also known to cause violence both within and between households, accidental falls, injuries and death. Furthermore, it is known to cause poor mental health and affects their ability to access food from the open market, leading to food insecurity. It has been linked to neglected parenting practices. The HPS case study also explains how prejudice and stereotypes against HPS Paniya people, based on their history of bonded labour, socio-

cultural differences and poverty, have contributed to child undernutrition, infection and household food insecurity. Service providers' perception of them as primitive, drunkards, criminals and sexual offenders has perpetuated discriminatory attitudes and behaviour, which has led to delayed treatment seeking and poor utilisation of AWS. Stereotypes have also limited their livelihood opportunities and exclusion from educational institutions, further marginalising them economically and culturally.

The LPS Paniya people were able to exercise their agency to challenge oppressive social conditions and improve their health and nutrition status due to a combination of geographical continuity, support from external leadership and social mobilisation. This enabled them to reduce alcohol and tobacco use, improve their social networks and gain more acceptance, leading to improved livelihoods. This, in turn, helped to build resilience against adverse social conditions. The LPS Paniya people had better access to resources and leadership support, enabling them to improve their hygienic practices and domestic livelihood. Comparatively, the HPS Paniya people faced adverse social conditions, and their behaviour was shaped by their settlement's limited resources and normative rules. A comparison of both settlements showed that water availability influenced the normative rules of hygienic practices. This case study highlights the importance of creating an environment that allows communities to work towards improving child nutrition. Various initiatives, such as providing water supplies, community mobilisation and alcohol prevention programmes, have enabled the LPS Paniya people to challenge discrimination and exploitation, while the HPS Paniya people had limited water supply and stereotyped views, which inhibited their ability to take action. This allowed the LPS Paniya people to take control of their health and nutrition and make choices for their health and well-being. Sen (1999) argued that community development should focus on allowing people to exercise their freedom of

choice. However, economic deprivation has resulted in inequalities in social capital and health care practices and food security.

The Kurichiya people in settlement-level case studies have a shared history of socio-economic and cultural capital. However, they are not homogenous in their power. There are complex dynamics of power and privileges between their settlements in terms of socio-economic and political power, creating a social hierarchy. Those with better capital could acquire an elite position and control resources to maximise their benefit. The LPS Kurichiya had better economic and social capital from the start, which allowed them to accumulate further advantages across the generations. This included better land availability and multiple sources of income, which allowed them to gain political privileges and access and control economic and cultural resources. This enabled them to acquire social mobility, increased educational opportunities, and better livelihoods, which challenged traditional social norms and allowed more women to acquire education and take part in social forums. The community leader with entrepreneurial thinking could use these advantages to address community-level constraints and progress the community. The LPS Kurichiya people could acquire control over the determinants that shaped the proximate determinants of child undernutrition because of a critical political position. This enabled them to influence the selection of frontline health and nutritional service workers, leading to better service delivery. Their cultural capital and access to financial institutions improved their access to healthcare practices and food sources, improving their children's nutritional status. Furthermore, they could avail of PDS, AWS and open markets, with better financial capability, leading to increased household food security. The early inequality in land ownership appears to have had a lasting impact on the HPS Kurichiya people, limiting their ability to take advantage of the land and leading to

crop failure and debt. This was compounded by undemocratic leadership, the use of alcohol and a lack of social cohesion, resulting in weakened political representation and an inability to translate educational achievement into improved livelihoods. All these factors have contributed to an accumulation of multiple disadvantages among the HPS Kurichiya, leading to increased inequality between HPS and LPS Kurichiya, the translation of economic and cultural capital to positive health behaviour and dietary practices. The comparison of LPS settlements from Paniya and Kurichiya shows that the mobilisation of the community members was done through democratic leadership, allowing them to express their voices. This participatory engagement enabled the community members to challenge structural constraints, such as non-tribal discrimination and exploitative relationships. In both settlements, the community was actively involved in the CBOs and SHGs to participate in the transformation process.

The household-level embedded case studies highlighted the multi-level nature of the inequality in the social determinants of child undernutrition by looking at how different the household, parental and individual-level attributes are intertwined. The combination of multiple advantages and disadvantages at each level intersect to create unique experiences and effects that lead to a child's nutritional outcomes. The undernourished cases in LPS case studies show that in a favourable settlement level context, where an individual household stands with its socio-economic and cultural capital in relation to the other households in the neighbourhood matters in shaping the parental ability and household condition to provide protection and care to their child for nourishment. While settlement level advantages favoured better livelihood opportunities and safe and healthy living conditions, the parental capacity to provide enough care for their children in such a favourable context is limited by factors such as catastrophic health expenditure and physical and psychological disabilities. This has

resulted in an increased maternal care burden and poor hygiene and social capital, which have all contributed to the undernutrition of children in LPS settlements. This means that the financial and psychological strain caused by catastrophic health expenditure dampens the neighbourhood-level advantages. In contrast to the undernourished cases from the LPS settlement, the well-nourished cases from the HPS settlements give valuable lessons on how some households build resilience against adverse neighbourhood-level conditions and promote their children's nourishment. Parental exposure and social networks outside the settlement is observed as critical household-level protective resource that breaks out adverse neighbourhood-level factors. However, that alone does not tell the whole story. The individual biological advantages of being born with better birthweight in relation to the other child in twin birth buffered the household, neighbourhood and community level disadvantages in case no 7. Better household share of land holding in case no 15 counteracted the settlement level disadvantages. Meaning that the multi-level nature of the determinants of child undernutrition can combine to shape the child's vulnerability to undernutrition or resilience against it. Understanding the interconnectedness of multi-level factors such as community, neighbourhood, household, parental and individual levels is critical to formulating interventions targeting various levels to ensure that children have the nutrition they need to grow and develop properly.

# 1. INTRODUCTION

## *1.1 Background*

Undernutrition is the outcome of insufficient food intake and repeated infectious diseases. It includes being underweight for one's age, too short for one's age (stunted), and dangerously thin for one's height (wasted) (Unicef, 2006). It is estimated that globally 20% (149.2 million) of children under five are stunted, 6.7% (45.4 million) are wasted, and 12.6% are underweight as per the latest estimate (UNICEF, WHO, World Bank, 2022). The 2030 Agenda for Sustainable Development has set the target of ending all forms of malnutrition by the end of the decade and cutting down the prevalence of stunted growth in children by 40%, as well as reducing the prevalence of wasting in children to less than 5% (Hawkes, 2017). The 2021 Global Nutrition Report indicates that data availability and progress toward global nutrition targets differ significantly across 194 nations (Cesare et al., 2021). As per the latest WHO report, the worst levels of stunting were seen in Burundi, with 55.9%, and the highest levels of underweight and wasting were in Timor-Leste, with 40.4 and 24%, respectively. On the other hand, the United States had the lowest prevalence of all three forms of undernutrition, with only 2.1%, 0.5% and 0.5%, respectively. These conditions were mostly seen in low-income and lower-and-middle-income countries (UNICEF, WHO, World Bank, 2022). The research, which utilized data from 80 nations, pointed out that countries with greater socioeconomic disparities usually have a greater rate of child malnourishment (Bredenkamp et al., 2014). Out of 194 country-level data available in the Demographic Health Survey program dashboard, India has

the second-highest prevalence of wasting only after Timor-Leste, sixth highest in the prevalence of underweight after Timor-Leste (40.4%), Yemen (39%), Niger (36.4%), and Madagascar (36.2%), and Eritrea (33.8%) and is in 17<sup>th</sup> position in the prevalence of stunting (USAID, 2021). The economic progress India has achieved over the last two decades has not been translated into improving the child's nutritional status, and undernutrition continues to be unacceptably high in India.

## ***1.2 Statement of the problem***

Given that India contributes to the most considerable global burden of undernutrition, tribal communities in India, known as Scheduled Tribes<sup>1</sup> (ST) have the highest proportion of undernourished children. One-third of the global tribal and indigenous people live in India, constituting 8.6% of the country's total population (Census, 2011). In general, tribal communities have low nutritional and health status globally (Anderson et al., 2016) and in India as well (Bisai and Bose, 2008; Haddad et al., 2012, 2012; Rao et al., 2018; Rizwan et al., 2014; Subramanian et al., 2006). With 40% of stunting, 23.2% of wasting, and 39% of underweight children from tribal communities in India have the highest undernutrition prevalence as per the latest estimate (NFHS-5, 2021). While 55.6% of children are undernourished by the Composite Index of Anthropometric Failure (CIAF) in India, among the tribal communities, 64% of children are undernourished by CIAF (NFHS 4, 2015-15). Studies conducted among the tribal communities in the Indian states of Orissa (Jena, 2008; Patel, 2016), West Bengal (Mukhopadhyay and Biswas, 2011; Yasmin et al.,

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According to Article 336 (25) of the Constitution, the term "Scheduled Tribes" refers to those tribes, tribal communities, or parts of or groups within such tribes or communities that are designated as Scheduled Tribes under Article 342 of the Constitution.

2018), Karnataka (Akash and Mahesh, 2017), Nagaland (Sahu et al., 2017), Maharashtra (Bhagat et al., 2010), and Andhra Pradesh (Ramakrishna et al., 2014) reported a higher proportion of food insecurity that ranged from 43% in Maharashtra (Bhagat et al., 2010) and 64% in West Bengal (Yasmin et al., 2018) and Karnataka (Akash and Mahesh, 2017). Several media reports of starvation deaths among tribal communities in Maharashtra (Katakam, 2016), Jharkhand (Bhatnagar, 2019; Choudhury, 2019), West Bengal (Bagchi, 2019), Odisha (Kumar and Mitra, 2015; Tah, 2016) and Madhya Pradesh (Sharma, 2016) for last few years underscores the severity of the problems. The report of the National Conclave on nourishing India's tribal children accounts that poor market accessibility, purchasing power, utilisation of PDS, low awareness of entitlements, culturally insensitive vocational training programmes, restriction to forest accessibility, reliance on rain-fed agriculture, depletion of natural resources and distress migration are the main challenges to achieving food and nutritional security to the tribal regions (UNICEF and GoI, 2015).

While ST communities in India bear the highest child undernutrition burden, this is not uniformly distributed among the different sub-groups of ST communities in India. A systematic review on the undernutrition among tribal children in India reported that the prevalence of wasting among tribal children ranged from 60.4% (95% CI 44.1- 75.1) among tribal children in Maharashtra to 7.6% (95% CI 5.6 – 10.1) to 7.6% (95% CI: 5.6% to 10.1%) among the Sabhar tribal children in Orissa. Underweight ranged from 90.3% (95% CI 90.6 – 96.3) among Kamars of Chattisgarh to 9.3 (95% CI 3.8 – 18.3) among the tribal children in Kerala, stunting from 66.6% (95% CI 61.1 – 71.9) among Kamars of Chhattisgarh to 12.9% (95% CI 10.5 – 15.6) among tribal children in Maharashtra (Dey and Bisai, 2019a). Given this wide child

nutritional inequality within India's ST communities, this study focuses on child nutritional inequality within the tribal communities.

### ***1.3 The rationale for the study***

The current study focuses on child nutritional inequality within tribal communities. This is primarily because of two reasons. Firstly, the nutritional programmes for the tribal communities in India consider tribal communities as a homogenous group in their practices, and the existing nutritional inequality among the tribal communities in India indicates that the single universal approach to the nutritional program among the ST communities does not alleviate the problems faced by those who need it the most. Hence, to bridge the inequity of child nutritional status among the tribal communities, it is critical to characterise the nature and extent of nutritional inequity in the tribal communities in India and unpack the factors and mechanisms that perpetuate and sustain this inequality. Secondly, nutritional inequality perpetuates other forms of inequality because it influences reduced mental and physical capabilities and increased risk of morbidities and mortality that reduce individuals' life chances. Without improving the most marginalised tribal communities' nutritional status, achieving the nutritional target for SDG goals will not be possible.

Although Kerala has reported the lowest prevalence of undernutrition among children under five in India, a recent estimate shows an increasing trend in child undernutrition over the last five years. Underweight among children has increased from 16.1% to 19.7%, stunting from 19.7 % to 23.4%, and wasting from 15.7% to 15.8% (NFHS-4, 2015; NFHS-5, 2021). The disaggregated data shows that this

increasing burden of child undernutrition is concentrated more among the tribal communities in Kerala. As per the NFHS-4 (2015-16), 23.9% child from Scheduled Tribes (ST), 19.1% of children from Scheduled Caste (SC), 22% of children from Other Backward Castes (OBC) and 15.9% of children from General community suffered stunting. However, as per the NFHS-5 (2019-21), this has increased to 36.9%, 30.4%, 22.4%, and 22.2% among children from ST, SC, OBC and General communities, respectively (NFHS-5, 2021). This trend is much steeper in severe stunting (Fig: 1). This trend indicates the nutritional inequality already reported in several cross-sectional studies (Gangadharan, 2011; Gangadharan and Kumar, 2014; Ladish, 2005; Philip et al., 2015) and previous rounds of NFHS surveys has widened between tribal and other communities.

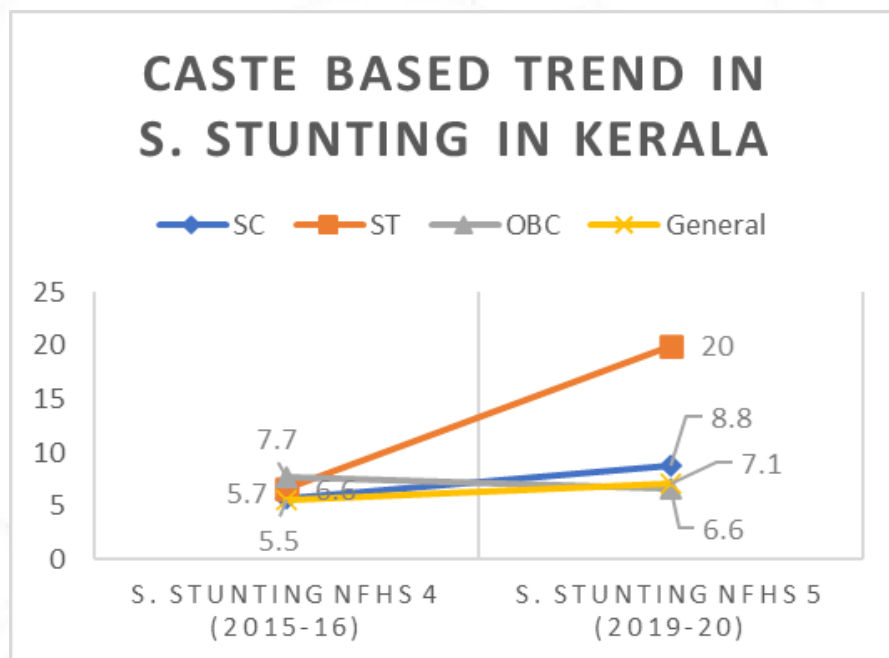


Figure 1: Caste based trend in severe stunting in Kerala between 2015-16 to 2019-20 (SC: Scheduled Caste, ST: Scheduled Tribe, OBC: Other Backward Communities)

While the tribal population bears the highest undernutrition burden in Kerala, this is not uniformly distributed among all the ethnic groups within the tribal

community. The prevalence of stunting among ST children under five ranged from 20.2% to 85.1%, underweight ranged from 31% to 87.72% and wasting ranged from 31% to 79.56% (Gangadharan and Kumar, 2014; Philip et al., 2015). This means severe inequality in children's nutritional status among the ST communities in Kerala. The Kurichiya and Paniya tribal communities in the Wayanad district of Kerala represent this nutritional inequality within the tribal communities in Kerala. A study that examined the child nutritional inequality among the tribal children in Wayanad districts reported that 82.9% of stunting, 83.6% of underweight, and 82% of wasting among the children Paniya community bear the highest burden of undernutrition among the tribal communities. With 20.2% of stunting, 31% of underweight, and 31% wasting among children, the Kurichiya community reported the lowest burden of child undernutrition in the Wayanad district of Kerala (Gangadhar, 2015).

Several studies have reported the historical marginalisation of the Paniya community and the inequality between the Paniya and Kurichiya ST communities in the Wayanad district of Kerala on multiple factors that are known to be associated with undernutrition. Hence, the proposed study aims to understand the historical and community-level factors that contributed to and sustained the inequality between Paniya and Kurichiya communities. Furthermore, the current study hypothesises that although Paniyas are worse off than Kurichiyas in terms of the nutritional status of their children, the differences in parental, household and community-level factors such as; ownership of land, educational status, livelihood strategies, alcoholic consumption and geographical location to the forest area give rise to varying degrees of advantages and disadvantages within both Paniya and Kurichiya communities. Further, the specific advantages and disadvantages give rise to within-group inequalities in child

undernutrition among Paniya and Kurichiya communities. Hence, the proposed study aims to explore the answers to the following questions:

#### ***1.4 Research Questions***

1. Are there differences in nutritional status among tribal children of two to five years belonging to the Paniya and Kurichiya communities in the Wayanad district of Kerala, India?
2. What historical and contextual factors lead to the inequality in children's nutritional status between the Paniya and Kurichiya tribal communities in the Wayanad District of Kerala, India?
3. How and through what process do community-level factors, household social and economic status, and individual characteristics influence the differentials in the nutritional outcome of the tribal children of the Paniya and Kurichiya communities in Wayanad District of Kerala, India?

#### ***1.5 Objectives of the Study***

- To examine the child nutritional inequality between Paniya and Kurichiya tribal communities in the Wayanad district.
- To understand the historical and contextual factors (e.g. inequality of land ownership, education status, livelihood) that lead to significant differentials in child nutritional status between the Paniya and Kurichiya communities in Wayanad district, Kerala.
- To unravel the pathways of influence on differentials in child nutritional status within the Paniya and Kurichiya communities, including factors at multiple levels such as; community, neighbourhood, household, parental and individual characteristics of the child

## ***1.6 Organisation of the thesis***

Following this introductory chapter, I have organised this thesis into four additional chapters. In the second chapter (Review of Literature), I have discussed the insights drawn from the literature to arrive at our specific research problem. In the third chapter (Materials and Methods), I discuss the research materials and methods used in this study. This includes the study design, study setting regarding the geographical location and people involved, sample size estimation and justification, sample selection process, tools used in data collection, and plan for data collection and analysis in the quantitative and qualitative phases. The fourth chapter of the dissertation (Results) details the findings of the two phases (qualitative and quantitative phases) three phases of the study in seven major sub-sections. Subsequently, I describe the study's conceptual framework and the ethical consideration of each phase. In the final chapter (Discussion and Conclusion), I discussed the study's findings and their relevance in the light of national and international literature.

## **2. LITERATURE REVIEW**

In this chapter, I review why undernutrition is an important public health problem and discuss the distinction between the three commonly used indicators of child undernutrition: stunting, wasting and being underweight. I then review the literature to characterise the pattern and extent of child nutritional inequality in India along the intersectional axis of economic position, caste, gender, and residence place. Subsequently, I have discussed the multi-level determinants and the risk factors of child undernutrition broadly categorised as an individual, maternal, household, and community and laid out how these factors are similar and different for tribal and non-tribal communities. Finally, I discuss multiple pathways through which macro-level factors, including globalisation, climate change, water hygiene and sanitation, agriculture practices and structural inequality, contribute to the differential in child nutritional outcomes.

### ***2.1 Undernutrition among children***

As discussed in the previous chapter, economically poorer or developing countries bear a higher burden of childhood undernutrition. The higher burden of undernutrition has both short-term and long-term adverse impacts on the affected individuals and societies. As a short-term and individual-level impact, childhood undernutrition causes an estimated 2.2 million deaths among children and 21% of disability-adjusted life years (Black et al., 2008). Recent evidence shows that 68% of mortality among under-five children in India is attributable to childhood undernutrition (Swaminathan et al., 2019). Undernutrition increases the risk of infections and mortality from common

infectious diseases (Ginsburg et al., 2015; Khan and Das, 2020; Tomkins, 2000). As a long-term impact, childhood undernutrition cause reduced economic productivity in adulthood (Horton and Steckel, 2013; Shekar et al., 2006). Undernutrition in childhood adversely affects brain structure development and increases the risk of poor cognitive ability and learning outcomes (Daniels and Adair, 2004; Haywood and Pienaar, 2021; Mendez and Adair, 1999). Studies have consistently shown that poor childhood nourishment is associated the early school dropout (Adair et al., 2013; Behrman et al., 2009; Martorell et al., 2010). Undernutrition among female children can lead to short maternal stature, leading to low birthweight babies' birth. Thus, it can cause an intergenerational cycle of undernutrition and poverty (Khatun et al., 2018, 2019; Martorell and Zongrone, 2012). At the societal or country level, childhood undernutrition can adversely affect the gross domestic product and lead to persistent poverty because of its association with reduced human capability (Hoddinott et al., 2008, 2011). Because of its association with morbidity, mortality, and educational and learning outcome, undernutrition is an important public health problem that can perpetuate and sustain inequity in other dimensions of health and well-being of a community.

### **2.1.1 Differences in the biological manifestation of nutritional indicators**

The most used indices of child undernutrition are anthropometric measures such as:

- Weight for height: an index used for measuring wasting
- Weight for age: an index used for measuring underweight
- Height for age: an index used for measuring stunting.

Among the two sets of reference standards: the National Centre for Health Statistics (NCHS) international reference (1978) and the WHO growth standards (2006), the current study will adopt the WHO growth standard (2006) of multicentre growth reference study (WHO, 2006). The cut-off of  $<-2$  Z scores of the reference median of the WHO growth standard will be used for these indices to classify children as moderately undernourished, and the cut-off of  $<-3$  Z scores of the reference median of the WHO growth standard will be used for these indices for classifying children as severely undernourished.

The three indicators represent different biological manifestations of growth deficit. Wasting indicates failure in the growth of tissues and fat mass compared with a Well-nourished child of the same height. Wasting is caused by inadequate dietary intake and/or due to infection. In unfavourable conditions, wasting can develop faster, and in favourable conditions wasting is restored rapidly (WHO Working Group, 1986). Studies have consistently shown that wasting is associated with increased mortality risk compared with the other two nutritional indicators and is considered the acute form of undernutrition (Robert E. Black et al., 2013; Dipasquale et al., 2020; Lenters et al., 2013). Stunting represents a failure in skeletal growth. Stunting is considered the consequence of accumulated growth deficit over a period due to repeated infection and dietary deficit over time. Stunting is a slow process than wasting. Hence, stunting is considered a chronic condition. While wasting is associated with a higher risk of mortality, the more frequently cited impact of stunting is on the physical and cognitive developmental deficit leading to reduced earning in adulthood (DeIy and Begum, 2011; Leroy and Frongillo, 2019; Raiten and Bremer, 2020). Studies have consistently shown that a wasted child is more likely to become stunted. During the period of wasting, a child's height growth may slow down to cope with the weight loss and can

lead to stunted growth (Briend et al., 2015; Khara, 2016). The age-wise trend shows that children aged 12 to 24 months have a higher risk of wasting. Children aged 24 to 36 have a higher risk of stunting (WHO Working Group, 1986). Being underweight results from low body fat due to long-term dietary deficit. While wasting is a short-term loss of muscle mass, being underweight results from long-term failure of body fat (Mak and Tan, 2012).

## 2.2 Undernutrition in India

### 2.2.1 Prevalence and Trends

The problem of child undernutrition has been an enduring problem in India for many decades. The prevalence and trends from NFHS-1 (1992-93) to NFHS-5 (2019-21) show that stunting and underweight declined from NFHS-1 (1992-93) to NFHS-5 (2019-21), and the prevalence of wasting almost stagnated during this period (Fig 2).

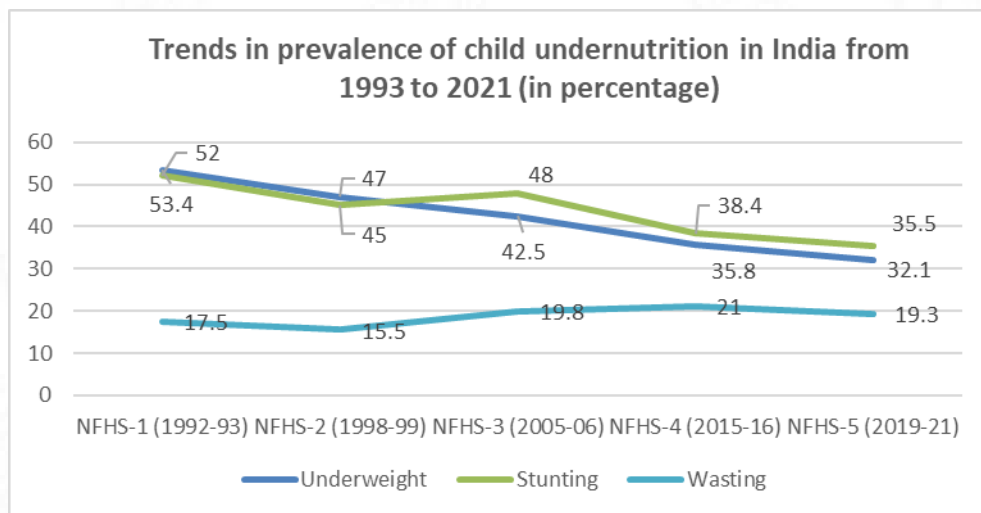


Figure 2: Trend in child undernutrition between NFHS-1 (1992-93) to NFHS-5 (2019-21)

The overall trends from NFHS-1(1992-93) to NFHS-5 (2019-21) show that the underweight declined consistently from 53.4% in 1992-93 to 32.1% in 2019-20, approximately 0.8% per year. However, the stunting prevalence showed a less

consistent decline during the same period. After a marginal increase from 45% to 48% during NFHS-2 (1998-99) to NFHS-3 (2005-06), stunting prevalence declined consistently to 35.5%. The average decline in stunting prevalence between 1993 to 2020 was about .66% per year.

Over the last five years, severe forms of anthropometric failures stagnated in India. Though the trend in severe stunting and severe underweight followed an almost similar pattern of stunting and underweight, severe wasting showed an alarming increase from 3.2% in NFHS-1 (1992-93) to 7.7% in NFHS-5 (2019-21) (See Fig 3).

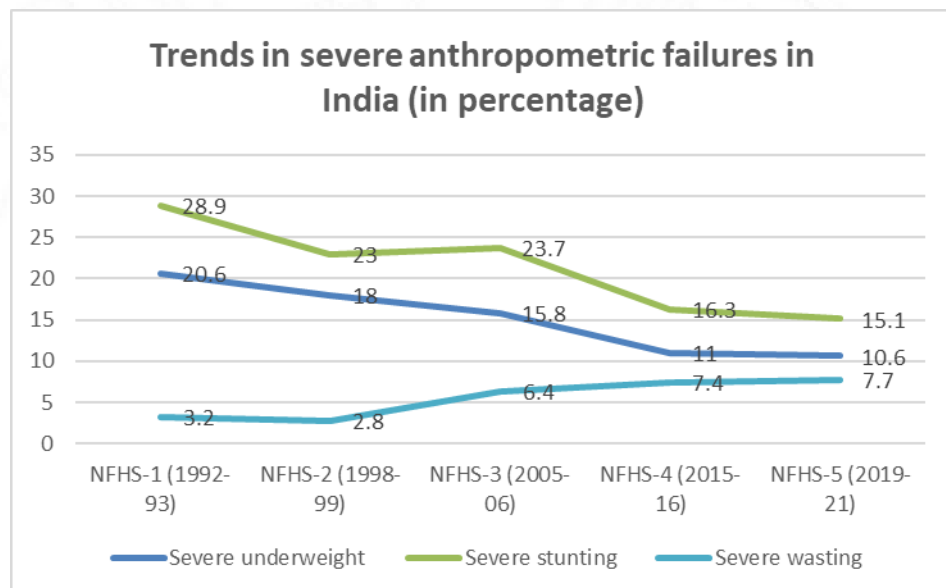


Figure 3: Trends in severe anthropometric failures in India between 1992 to 2021

Children suffering from severe wasting are at 9-11 times higher risk of mortality and morbidity than Well-nourished children and need urgent policy intervention (Robert E. Black et al., 2013; Lenters et al., 2013). SAM children getting hospital care according to WHO protocol (WHO, 2013) had a case fatality rate ranging from 3.4% to 35% (Lenters et al., 2013). According to an estimate based on NFHS-4 analysis, approximately ten million children in India are affected by SAM (Mohan and Mohan,

2017), meaning that the case fatality rate of 3.4%–35% would translate into 340 000 to 3.5 million deaths among under-five children in India.

### **2.2.2 Inequality in child undernutrition in India**

In addition to the high burden of child undernutrition, inequality within undernutrition in India is nuanced on multiple axes, such as caste, economic class, and geographical location. (Chalasani and Rutstein, 2014; Joe et al., 2013; Mukhopadhyay, 2016).

#### *2.2.2.1 Child nutritional inequality by Economic class*

The prevalence of undernutrition across the economic groups shows a disproportionate concentration of undernutrition among the poor economic group as per NFHS-4 (2015-16). There was a significant disparity between children from the highest Wealth quintile and the poorest Wealth quintile in 2019-21 (**Figure 4**). The prevalence in all three indicators showed an increasing trend from richest to poorest Wealth quintiles. While nearly half of the children from the poorest wealth quintiles reported stunting and being underweight ( 46.1% and 43.1% ), only about one-fifth of children (22.9% and 20.1%) from the wealthiest quintiles reported it. However, this disparity was much less in the case of wasting (16.2% among the richest and 22.5% among the poorest). Analysis conducted using National Family Health Survey (NFHS) data observed a similar gradient across the four rounds of NFHS surveys conducted between 1992-93 and 2015-16 (Asif and Akbar, 2021; Chalasani, 2012; Chalasani and Rutstein, 2014; Kumar and Singh, 2013; Nie et al., 2019; Pathak and Singh, 2011; Prakash et al., 2016). Further analysis revealed that class-based economic inequality in child undernutrition is relatively lesser among children below the age of 24 months and increases over time after 24 months of age (Rajpal, Kim, Joe, et al., 2020).

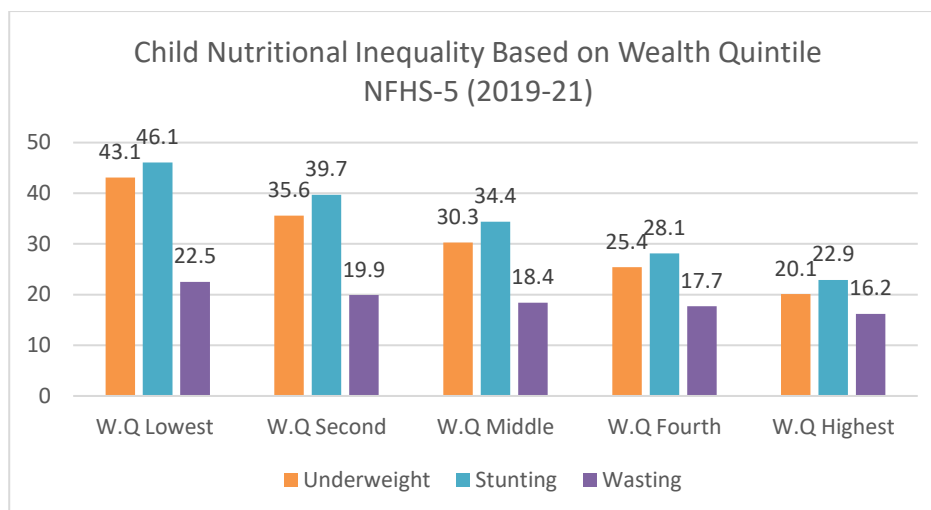


Figure 4: Economic class based inequality in child nutritional status (in %) (source: NFHS 5, 2019-21)

The slow reduction in undernutrition that India witnessed from 1992 to 2016 is not uniformly spread across all the country's socio-economic groups. In 1992 children from the poorest Wealth quintiles had a higher 27% points differences in underweight, 21% points difference in stunting and 11% points difference in wasting from the children from the richest quintiles. While the inequality between the richest and poorest children remained almost stagnant in underweight and wasting, this inequality has further widened in the case of stunting by 2016 (Karlsson et al., 2021).

The inequality between rich and poor also varied between states (Karlsson et al., 2021; Rajpal, Kim, Sankar, et al., 2020). In general, the states with a higher burden of stunting and underweight also have a wider rich and poor disparity. However, such a trend was not reported in the case of wasting (Rajpal, Kim, Sankar, et al., 2020). Similarly, though male children have a slightly higher prevalence of child undernutrition in India, the declining rate of undernutrition from NFHS 1 (1992-93) to NFHS 3 (2005-06) was slower among female children compared to the male children

(Chalasanani and Rutstein, 2014). Analysis based on NFHS-4 (2015-16) pointed out that female advantages in nutritional status disappeared after age two. After the age of two, both male and female children reported an almost similar prevalence of stunting (Alderman et al., 2021). Children from Scheduled Tribes and Scheduled Castes and children from rural and slum areas had a consistently higher risk of undernutrition across all the surveys from NFHS 1 (1993-93) to NFHS 4 (2015-16).

#### 2.2.2.2 Child nutritional inequality by caste and ethnic status

By caste and ethnic status, there is a substantial disparity between Scheduled Caste (SC), Scheduled Tribe (ST), Other Backward Class (OBC) and Others, where the ST community is the most vulnerable group with the highest prevalence of undernutrition as per the recently published National Family Health Survey 5 (2019-20). Cross-sectional studies conducted among ST and Non-ST communities using primary data also consistently reported that the children from the ST communities had a higher risk of undernutrition compared with the Non-ST in different parts of India (Chatterjee et al., 2016; Mohan et al., 2015; Sen and Mondal, 2012).

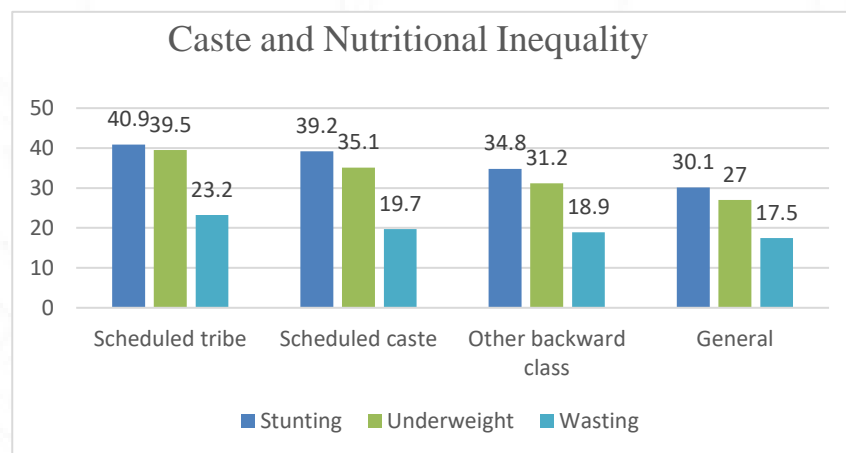


Figure 5: Nutritional status by caste groups (Source: NFHS-5 2019-21)

Although caste-based nutritional inequality patterns consistently reported that children from ST communities bear the highest burden of undernutrition both in

national surveys and cross-sectional studies, the tribal communities in India are not homogenous. There are 705 ethnically diverse tribal communities with different social systems and cultural practices (Census, 2011). The analysis based on the nationally representative samples did not adequately capture the nutritional inequality within the tribal community. ST children from poor households suffer a much higher undernutrition prevalence than their non-poor counterparts (Table 1). A similar pattern was observed in all other caste groups.

Table 1: Economic class-based nutritional inequality within caste and ethnic groups

|          | <b>SC</b>   | <b>ST</b>   | <b>OBC</b>  | <b>General</b> |
|----------|-------------|-------------|-------------|----------------|
|          | Stunted     | Stunted     | Stunted     | Stunted        |
| Poor     | 49.70%      | 47.10%      | 48.50%      | 43.20%         |
| Non-Poor | 33.80%      | 34.80%      | 30.80%      | 25.50%         |
|          | underweight | underweight | underweight | underweight    |
| Poor     | 46.20%      | 48.90%      | 44.60%      | 40.10%         |
| Non-Poor | 30.30%      | 34.10%      | 28.40%      | 23.90%         |
|          | Wasted      | Wasted      | Wasted      | Wasted         |
| Poor     | 22.50%      | 28.40%      | 22.10%      | 21.70%         |
| Non-Poor | 19.60%      | 23.20%      | 19.40%      | 18.10%         |

Source: Tabulated using NFHS-4 (2015-16) data

In the case of severe undernutrition (simultaneous three anthropometric failures), Economic class-based nutritional inequality within caste and ethnic groups is reported to be on the rise. An analysis using the Composite Index of Anthropometric Failures (CIAF) reveals consistently higher economic position inequality in the simultaneous three failures than aggregate CIAF index across all caste groups, implying relatively more unfair clustering of simultaneous three failures across caste groups than with CIAF (See figure: 6). The ST community experienced the highest rate of three

simultaneous failures among children but also reported the lowest degree of inequality in nutrition based on wealth status. This is because, due to the limited economic progress in the ST community, it is difficult to determine the effect of financial stability on the nutritional status of ST children. The disparity between the rich and the poor is greater in OBC and General Category households than in those of Scheduled Tribes and Scheduled Castes. Across all economic positions, this disparity is visible in both categories.

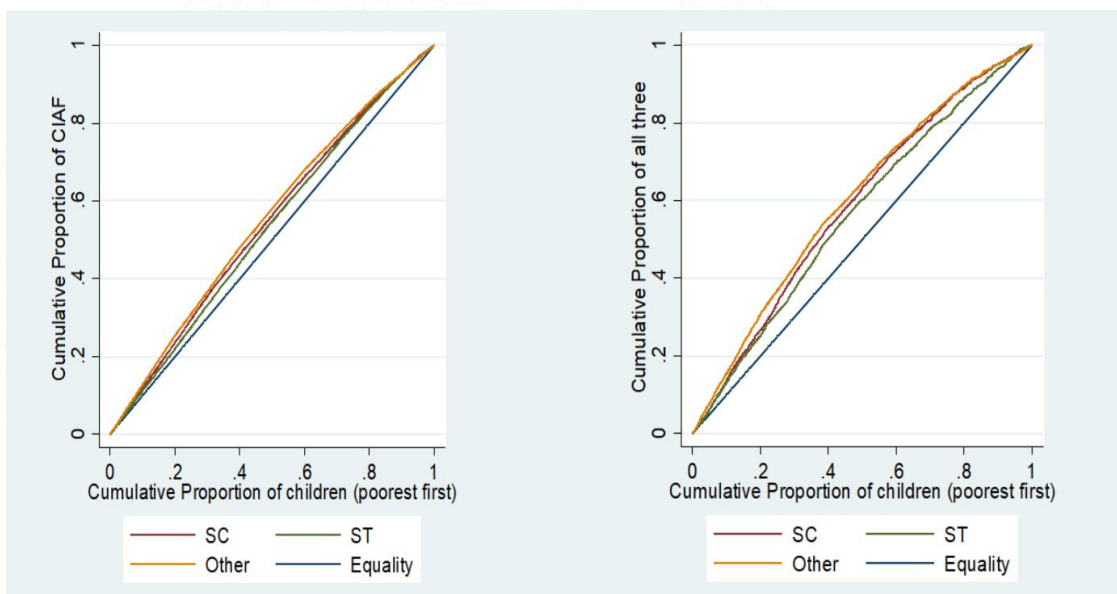


Figure 6: Concentration Curve (CC) for CIAF by Caste Category

The CC of SC showed a shifting tendency. On the contrary, the poorest wealth quintiles of both SC and ST groups had higher economic positions than the others. The SC group, however, deviated from this pattern and showed rising inequality and overlap with OBC and general categories. This implies that the inequality of child nutrition among the poorest wealthy quintiles of SC is similar to that of the ST population. In contrast, inequality rises further among the richer wealth quintiles, showing that economic improvement has a different effect within the SC group (Sabu et al., 2021).

### 2.2.2.3 Gender, Economic position, Caste and Urban/Rural Inequality

A cross-tabulation of CIAF and all three failures showed substantial variations in economic status, caste, gender, and place of residence (Table 2). Nonetheless, our analysis which evaluated the differences between these categories through intersectional sub-groups of caste, economic status, place of residence, and gender, showed that these differences did not have a consistent pattern. In fact, the intersectional sub-group comparison indicated that the economic status disparity in all three failures in ST children was only significant in rural areas. In comparison, this variance vanished regardless of gender in urban areas. With the exception of urban male children, the financial status-based divergence among SC children was

Table 2: Inequality in the prevalence of CIAF and all three failures by economic position, caste, gender, and place of residence

|                    | CIAF<br>% | 95% CI |       | Three failure<br>% | 95% CI |       |
|--------------------|-----------|--------|-------|--------------------|--------|-------|
|                    |           | LCI    | UCI   |                    | LCI    | UCI   |
| Place of residence |           |        |       |                    |        |       |
| Urban              | 48.32     | 47.92  | 48.72 | 5.09               | 4.91   | 5.26  |
| Rural              | 58.03     | 57.78  | 58.27 | 7.21               | 7.08   | 7.34  |
| Sex of child       |           |        |       |                    |        |       |
| Male               | 55.65     | 55.36  | 55.94 | 7.42               | 7.27   | 7.58  |
| Female             | 54.98     | 54.68  | 55.28 | 5.76               | 5.62   | 5.9   |
| Caste              |           |        |       |                    |        |       |
| SC                 | 59.28     | 58.84  | 59.73 | 7.38               | 7.14   | 7.62  |
| ST                 | 63.99     | 63.35  | 64.61 | 9.97               | 9.58   | 10.37 |
| Other              | 52.93     | 52.66  | 53.19 | 5.92               | 5.8    | 6.05  |
| Wealth Index       |           |        |       |                    |        |       |
| Poorest            | 68.48     | 68.09  | 68.87 | 9.91               | 9.66   | 10.17 |
| Poorer             | 60.48     | 60.04  | 60.92 | 7.61               | 7.38   | 7.85  |
| Middle             | 53.4      | 52.92  | 53.87 | 5.83               | 5.61   | 6.05  |
| Richer             | 46.35     | 45.86  | 46.84 | 4.54               | 4.34   | 4.75  |
| Richest            | 38.88     | 38.35  | 39.42 | 3.16               | 2.98   | 3.36  |

remarkable in all other groups. For the rest of the caste groups (OBC and General combined), the economic status-based disparity is always important regardless of

gender and place of residence. In CIAF, aside from ST Female Urban, the financial position contrast is constantly considerable across all caste categories irrespective of gender and place of residence. Several cross-sectional studies conducted among the tribal communities in different parts of the country further added the nutritional inequality between the tribal communities across and within the Indian states (**Table 3**). The prevalence of stunting among tribal communities ranged from 30.4% in Assam (Islam et al., 2014) to 66.1% in Maharashtra (Dani et al., 2015), wasting ranged from 13% in Telangana (Rao et al., 2015) to 43% in Karnataka (Manjunath et al., 2014). Similarly, the underweight ranged from 29% in Assam (Islam et al., 2014) to 65.2% in Ist Bengal (Bisai, 2014). In line with intersectional sub-group analysis, the findings from the cross-sectional studies confirm that while tribal communities bear a disproportionately higher burden of undernutrition, this is not uniform across the country. Some ethnic groups within the tribal community bear a higher burden of undernutrition than the other communities.

Table 3: Nutritional Inequality Within ST by States

| Author  | State                     | Type of Study | Stunting | Wasting | Under-weight | Age      | Social-group |
|---|---------------------------|---------------|----------|---------|--------------|----------|--------------|
| (Bisai, 2014)   | West Bengal               | CBCSS         | 54.20%   | 20.10%  | 65.20%       | <60      | ST           |
| (Dani et al., 2015)   | Maharashtra               | CBCSS         | 66.10%   | 25.90%  | 58.40%       | <60      | ST           |
| (Manjunath, Jagadish Kumar, Kulkarni, Begum, & Gangadhar, 2014) | Karnataka                 | CBCSS         | 55.40%   | 43%     | 60.40%       | <60      | ST           |
| (Rao et al., 2015)  | Telangana & Andra Pradesh | CBCSS         | 53%      | 13%     | 42%          | <60      | ST           |
| (Gangadharan & KV, 2014)  | Kerala                    | CBCSS         | 54%      | 15.40%  | 44%          | 12 to 60 | ST           |
| (Philip et al., 2015)   | Kerala                    | CBCSS         | 38%      | 20.50%  | 39%          | <72      | ST           |
| (Renuka, Rakesh, Babu, & Santosh, 2011)                         | Karnataka                 | CBCSS         | 36.80%   | 18.60%  | 38.60%       | 12 to 60 | ST           |
| (Manjunath et al., 2014)  | Karnataka                 | CBCSS         | 55.40%   | 43%     | 60.40%       | <60      | ST           |
| (Ghosh-Jerath et al., 2013)                                     | Madhya Pradesh            | CBCSS         | 57.30%   | 28%     | 59.10%       | <60      | ST           |
| (Islam, Mahanta, Sarma, & Hiranya, 2014)                        | Assam                     | CBCSS         | 30.40%   | 21.60%  | 29%          | <60      | ST           |
| (Chatterjee et al., 2016)                                       | Jharkhand                 | CBCSS         |          |         | 54%          | <60      | ST           |
| (Meshram et al., 2012)  | ITDA Areas **             | CBCSS         | 51%      | 22%     | 49%          | <60      | ST           |

\*\* (Andhra Pradesh, Gujarat, Kerala, Karnataka, Maharashtra, Madhya Pradesh, Orissa, Tamil Nadu and Ist Bengal)

CBCSS = Community Based Cross-Sectional Studies

## 2.3 Risk Factors for Child Undernutrition

From the literature review, child undernutrition risk factors are categorised as individual, maternal, household, and community-level factors (Figure 7). The combinations of risk factors that influence child undernutrition vary across caste, economic position, gender and rural and urban domicile in India and cause inequality in undernutrition.

| Individual Level  | Maternal Level   | Household Level  | Community Level   |
|---|--|--|---|
| <ul style="list-style-type: none"><li>• Age</li><li>• Gender</li><li>• Low Birth Weight</li><li>• Birth Order</li><li>• Low Birth Interval</li><li>• Child Morbidity</li><li>• Lesser duration Breast-feeding</li><li>• Dietary diversity</li></ul> | <ul style="list-style-type: none"><li>• Low Maternal age</li><li>• Low Education Status</li><li>• Poor nutritional status</li><li>• Experience of intimate partner violence</li><li>• Maternal occupation</li><li>• Maternal mental health</li></ul> | <ul style="list-style-type: none"><li>• Family size</li><li>• Household food security</li><li>• Socio-economic status</li><li>• Access to water and sanitation</li></ul> | <ul style="list-style-type: none"><li>• Availability of Healthcare facilities</li><li>• Geographical location</li><li>• Climate change</li><li>• Social Capital</li></ul> |

Figure 7: Risk Factors of Child Undernutrition

### 2.3.1 Individual Level factors

The major individual-level risk factors of child undernutrition reported in cross-country studies and the studies conducted in India are age, gender, low birth weight, birth order, low birth interval, history of child morbidity and poor Infant and Young Child Feeding practices (IYCF).

#### 2.3.1.1 Age

Several studies worldwide reported that 24 months or more of age was significantly associated with an increased risk of stunting. The prevalence of stunting rises considerably after 12 months, peaks between 24 to 35 months, and then slightly decreases. Gaurav et al. also report that severe stunting also is found to be significantly high among this age group (Adekanmbi et al., 2013; Gaurav et al., 2015; Kinyoki et al., 2016a; Rahman, 2015; Zhou et al., 2012). However, this pattern is inconsistent in the case of being underweight and wasting.

#### 2.3.1.2 Sex

UNICEF (2013) report on Improving Child Nutrition report that globally, boys and girls are equally stunted, but in Sub-Saharan Africa, boys are more at risk of being stunted than girls. Black et al. (2013) Study using data from 81 countries shows that stunting prevalence is slightly higher among male children than female children. The other studies conducted in Guatemala, Sri Lanka, Nigeria, Tanzania, Sub-Saharan Africa and two studies from India all showed the consistent result that male children were more at risk of stunting (Adekanmbi et al., 2013; Robert E Black et al., 2013; Chirande et al., 2015; Gewa and Yandell, 2012a; Jawaregowda and Angadi, 2015; Khan et al., 2015; Martorell and Young, 2012; Rannan-Eliya et al., 2013; UNICEF, 2013; Wamani et al., 2007). Being male was significantly associated with increased odds of being undernourished in all three indicators in most of the studies globally.

### 2.3.1.3 *Birth order*

Though sufficient studies show the association between stunting and being underweight with birth order, only a few studies show this association with wasting. Studies conducted in Ethiopia, Pakistan, Bangladesh, Uganda, Tanzania and India reported that higher birth order is associated with an increased risk of undernutrition, particularly in stunting and underweight (Chirande et al., 2015; Chowdhury et al., 2016; Degarege et al., 2015; Gribble et al., 2009; Habaasa, 2015; Rahman, 2015; Subramanyam et al., 2010a, 2010b: 2, 2011). However, the study by Habaasa (2015) reported that children of birth order 1–4 have the highest risk of undernutrition than those of birth order five and above. The plausible explanation could be that as the birth order reaches high, the elder sibling in the family takes up parental roles, supplements the family income, and reduces the risk of undernutrition.

### 2.3.1.4 *Low Birthweight*

Low birth weight is associated with an increased risk of undernutrition. A multi-country study conducted in 17 developing countries and studies born in Ethiopia, El Salvador, Nigeria and India reported that low birth interval is associated with an increased risk of stunting and underweight (Egata et al., 2014; Gribble et al., 2009; Rutstein, 2005; Sengupta et al., 2010; Yimer and others, 2000). However, an inconsistent relationship is shown between the wasting and birth interval. The smaller birth interval is also associated with low birth weight and increased mortality risk. One of the primary reasons for the low birth weight is maternal undernutrition, which increases the risk of child undernutrition (Ehrenberg et al., 2003). Several multi-country studies and studies conducted in India also reported that the low birth Weight (birth Weight <2500 gm) significantly increased the risk of being stunted and of being

underweight (Bhutta and Salam, 2012; Chakraborty and Anderson, 2011; HUNGaMA, 2011; Kumar and Singh, 2013; Petrou and Kupek, 2010; Ramachandran, 2014). A similar pattern was observed in Kenya, Bangladesh, China, and Tanzania (Gewa and Yandell, 2012a; McDonald et al., 2012; Nguyen et al., 2014; Rahman, 2015; Zhang et al., 2011).

#### *2.3.1.5 Feeding Practices*

Several studies conducted across the world consistently reported that non-adherence to exclusive breastfeeding for six months and delayed initiation of breastfeeding were significant risk factors for child undernutrition (AbdElAziz and Hegazy, 2012; Corsi et al., 2016; Singh et al., 2015; Zhou et al., 2012). Complementary feeding at six months of age and the diversity of a non-breast-milk diet are also essential for children's adequate growth. A multi-country study and several studies conducted in India reported that minimum dietary diversity is associated with a lower risk of stunting (Arimond and Ruel, 2004; Corsi et al., 2016; Menon et al., 2018). Moreover, deprivation of this dietary diversity also leads to an adverse nutritional outcome.

#### *2.3.1.6 Morbidity History*

Morbidity history of having infectious diseases such as; diarrhoea, ARI (Acute Respiratory Infection), fever, cough, measles and vomiting were associated with an increased risk of all three indices of undernutrition (Gewa and Yandell, 2012b; Hamel et al., 2015; Kinyoki et al., 2016b; Meshram et al., 2012; Nguyen et al., 2014; Owoaje et al., 2014). Diarrhoea is the most reported disease associated with the increasing risk of undernutrition. Nel (2010) explained a bidirectional relationship between diarrhoea and child malnutrition. Diarrhoea causes undernutrition due to maldigestion,

malabsorption, increased nutrient losses, and the effects of the inflammatory response. High-volume stool losses (greater than 30 ml/kg/day) are associated with a negative protein, fat, and sugar absorption balance. Ahmed et al. (2015) also pointed out that infectious diseases such as diarrhoea and measles can cause damage the child's digestive system, which prevents adequate nutrient absorption into the body and increases the risk of undernutrition.

### **2.3.2 Maternal Level Factors**

Maternal level factors include education, work status, maternal social support, maternal autonomy, nutritional status, the experience of intimate partner violence, maternal age, and maternal mental health.

#### *2.3.2.1 Maternal education*

Several cross-country studies and global nutritional reports consistently reported that low maternal education is associated with an increased risk of all three forms of undernutrition (Phalkey et al., 2015a; Thompson, 2010). Studies have reported multiple pathways connecting maternal educational status with child nutritional outcomes. Better maternal education contributes to better infant and young child feeding practices (Imdad et al., 2011). Similarly, maternal education also contributes to better health-seeking behaviour, reproductive health behaviour, and maternal autonomy leading to better child-caring practices (Frost et al., 2005). Studies conducted in India, Bangladesh and Congo consistently reported that maternal exposure to mass media and the internet is positively associated with child nutritional outcomes (Huo et al., 2022; Rahman, 2016; Rajaram et al., 2007). This is because mass media exposure increases maternal knowledge about nutrition and childcare practices

(Parvez et al., 2018), improving hygiene and sanitation behaviour (Hanson et al., 2020).

#### 2.3.2.2 *Maternal occupation*

Maternal occupation is associated with inconsistent child nutritional outcomes. While the studies conducted in Egypt, Nigeria and Tanzania reported that maternal occupation for cash is associated with a reduced risk of undernutrition among under-five children (AbdElAziz and Hegazy, 2012; Adekanmbi et al., 2013; Victor et al., 2014), the study conducted by Nordang et al., (2015) in Tanzania reported that children were more likely to be stunted if their mothers spent more days farming in the last agricultural season. Similarly, the study conducted in Ghana reported that the odds of malnutrition were higher in children whose mothers took them to work or stayed at home with them compared with mothers who left their children at a crèche or nursery (Tette et al., 2016). Similarly, qualitative studies from India reported that excessive maternal work burden, including household chores, seasonal migration of mothers and involvement in other income-generating activities and lack of support from other family members force them to compromise on breastfeeding and caring for their children leading to the poor nutritional status of children (Jose et al., 2020; Shirisha, 2019; Sonowal, 2010). Poverty and food insecurity push tribal women to carry out laborious work without consuming adequate calories leading to poor birth outcomes (Shirisha, 2019).

#### 2.3.2.3 *Maternal social support*

Systematic review on maternal empowerment and child nutritional outcomes report that maternal social support for child-caring practices, information sharing and emotional support leads to improved child-caring practices and nutritional outcomes

(Cunningham et al., 2015). Better social networks and neighbourhood support groups for mothers also buffer economic shock through sharing of food (Lee et al., 2022).

#### 2.3.2.4 *Maternal autonomy*

Maternal autonomy in terms of maternal control over household resources and decision-making power was consistently reported positively associated with child nutritional outcome (Carlson et al., 2015; Cunningham et al., 2015; Richards et al., 2013). Maternal decision-making power and control over the household resources ensure dietary diversity for children, early treatment-seeking of child morbidities, and improved nutritional outcomes (Richards et al., 2013).

#### 2.3.2.5 *Maternal experience of domestic violence*

A cross-country study conducted in Egypt, Honduras, Kenya, Malawi and Rwanda, and several cross-sectional studies conducted in India, Bangladesh, and Liberia consistently reported that maternal experience of domestic violence is significantly associated with an increased risk of all three forms of undernutrition (Aasling-Monemi et al., 2009; Ackerson and Subramanian, 2008; Rahman, 2015; Rico et al., 2011; Sobkoviak et al., 2012, 2012; Ziaei et al., 2014). Maternal experience of domestic violence is an important factor affecting the mental and physical health of the mother and adverse birth outcomes, which are known risk factors for child undernutrition (Devries et al., 2011; Goli et al., 2020). Similarly, two cross-country studies conducted in Bangladesh, Vietnam and Ethiopia, India and Peru and a systematic review reported that compared with children of mothers with low Common Mental Disorder (CMD), children of mothers with high CMD had a higher risk of all three indices of child undernutrition (Harpham et al., 2005; Nguyen et al., 2019; Surkan et al., 2011).

#### 2.3.2.6 *Maternal age*

Studies conducted in India, Ethiopia, Nigeria, and Somalia reported that lower maternal age was a risk factor for child undernutrition (Adekanmbi et al., 2013; Chauhan and Navodaya, 2015; Degarege et al., 2015; Kinyoki et al., 2016b; Prusty et al., 2014).

#### 2.3.2.7 *Maternal nutrition*

Global Hunger Index 2010 report says that low maternal BMI is the primary cause of child undernutrition in South Asia and Sub-Saharan African regions. The women in these regions have low social status, are often the last ones in their household to eat, and do not receive the care they need, particularly during their childbearing years. Thus, poor nutrition in women throughout their life cycle extends through the generations (Thompson, 2010). Multi-country studies conducted in Bangladesh, Vietnam and Ethiopia and other studies conducted in Ghana, Kenyan, Bangladesh, Nigeria, Tanzania and Brazil also reported that low maternal BMI was associated with an increased risk of child undernutrition (Chirande et al., 2015; Choudhary and Parthasarathy, 2009; Gewa and Yandell, 2012b; Miglioli et al., 2015; Nguyen et al., 2014; Subramanyam et al., 2010a). Similarly, studies conducted in India also reported that low maternal BMI is associated with an increased risk of all three indices of undernutrition (Fenske et al., 2013; Menon et al., 2018: 2015–16; Subramanyam et al., 2010a).

### **2.3.3 Household Level Factors**

Household-level factors include family size, economic status, household food security, accessibility and availability of water and sanitation.

#### 2.3.3.1 *Family size*

A multi-country study conducted in Pakistan, Peru, South Africa, Tanzania, Bangladesh, Brazil, India and Nepal and other studies conducted in Ethiopia, Egypt, Nigeria, Somalia, and Sri Lanka consistently reported that a higher number of household members is associated with increased risk of undernutrition among children under-five (AbdElAziz and Hegazy, 2012; Degarege et al., 2015; Kinyoki et al., 2016b; Miglioli et al., 2015; Psaki, Bhutta, Ahmed, Ahmed, Bessong, Islam, John, Kosek, Lima, Nesamvuni, and others, 2012; Rannan-Eliya et al., 2013; Wong et al., 2015). As the family size increases, the family resources are shared among more family members, which leads to inadequate care and nutrition for the children (Blake, 1981).

#### 2.3.3.2 *Economic position*

Studies have consistently shown a significant association between the economic status of the family and child undernutrition. A cross-country study conducted in Ethiopia, India, Peru and Vietnam showed that improvement in economic condition was associated with decreased undernutrition in all four countries and stunting was more strongly associated with the increased economic condition of the family (Petrou and Kupek, 2010). Similarly, the study conducted in India and Guatemala showed that though there was a significant association between economic status and stunting and wasting, the strongest association was between economic status and stunting.

#### 2.3.3.3 *Household food insecurity*

Household food insecurity is another risk factor reported by numerous studies to be significantly associated with an increased risk of child undernutrition (Nandy et al., 2016; Nguyen et al., 2014; Nordang et al., 2015; Psaki, Bhutta, Ahmed, Ahmed,

Bessong, Islam, John, Kosek, Lima, Nesamvuni, Shrestha, et al., 2012). While most studies reported a significant association between household food insecurity and child nutrition, studies conducted in Vietnam (Nguyen et al., 2014) reported a non-significant association between household food security and child nutrition. Similarly, another study conducted in Bangladesh (Chowdhury et al., 2016) reported that household food insecurity was not significantly associated with child nutritional status as elderly household members absorb the poverty shocks and protect the children from food insecurity. However, the positive association between household food security would depend on how resources are allocated between food and non-food items, food quality, and food distribution within households (Vollmer et al., 2014). Additionally, seasonal variation in employment opportunity, crop failure and household debt trap is associated with household food insecurity and child nutritional status (Shirisha, 2019; Sonowal, 2010; Yasmin et al., 2018).

### **2.3.4 Community level factors**

#### *2.3.4.1 Geographical location*

Studies, in general, reported that children from rural areas are more at risk of undernutrition than the urban population. A systematic analysis of population-representative data from 141 low-income and middle-income countries between 1985-2011 reported that the children who lived in urban areas had a lower risk of undernutrition compared with their rural counterparts in almost all low-income and middle-income countries (Paciorek et al., 2013). The geographical remoteness limits market access in rural areas, limiting food diversity (Darcy et al., 2022; Stifel and Minten, 2017). Similarly, geographical remoteness is associated with reduced healthcare seeking for maternal and child illnesses (Kenny et al., 2015), which is

known to be associated with child nutritional outcomes. The geographical location of the tribal communities in flood-prone areas and remote or hilly areas increases the household's vulnerability to food insecurity and child undernutrition. The climate changes pose multiple challenges, including crop damage during the monsoon flood and crop failure due to drought. Households get disconnected from other essential services like Public Distribution System (PDS) and Integrated Child Development Services (ICDS) during the monsoon season. Additionally, ICDS and PDS services' poor functioning, poor accessibility, and service providers' discrimination against tribal communities lead to excluding tribal communities from these services (Shirisha, 2019).

#### 2.3.4.2 *Water and Sanitation*

Poor access to safe water resources affects child nutrition through direct and indirect pathways. Unprotected water sources contribute to children's water-borne diseases and affect their nutritional status. Water sources available far from home lead to compromised hygiene practices, food preparation leading to faecal contamination of the home environment and low food intake for children, which are immediate risk factors for child undernutrition (Chitty, 2015). Poor sanitation is linked to child nutrition through three direct pathways. Firstly, poor sanitation practices contribute to households and environments contaminated with pathogen-ridden human faeces (Curtis et al., 2000). This can cause diarrhoeal diseases when this is passed through the faecal-oral transmission route (Alam et al., 1989; Aulia et al., 1994; Olorunfoba et al., 2014). Repeated episodes of diarrhoeal diseases inhibit intestinal absorption of nutrients and are strongly correlated with stunting (Spears et al., 2013). The environmental enteropathy pathway suggests that faecal contamination results in

increased gut permeability and malabsorption of nutrients in the small intestines (Spears et al., 2013). The third pathway is through soil-transmitted helminth (STH) infections due to poor sanitation. Most worm-related infections are transmitted through contact with or consumption of soil contaminated with human faeces containing worm eggs (Strunz et al., 2014; Ziegelbauer et al., 2012). These infections result in the malabsorption of nutrients and contribute to the poor nutritional outcome. Further to this, an unsanitary environment (e.g., with poor drainage, sewage and solid waste systems) provides a rich breeding ground for several vectors (such as mosquitoes and sandflies) spreading vector-borne infections like malaria, dengue, leishmaniasis (kala-azar), which divert essential nutrients from food to fight infections and contributes to growth failure (Saravanan, 2013; Wilson et al., 2019).

#### 2.3.4.3 *Social Capital*

Membership in social networks boosts community members' resilience and lessens their vulnerability against food inflation and climate shock, hence strengthening the food system's stability (Nosratabadi et al., 2020). Studies conducted in India, South Africa, and Uganda reports that neighbourhood-level social capital, including the presence of community support groups, community-level organisation, and adequate neighbourhood infrastructure, are associated with household food security and improved child nutritional outcome (Misselhorn, 2009; Sseguya, 2009; Vikram, 2018). A systematic review that examined the association between neighbourhood-level social capital and household food security reports that the neighbourhood-level social network among community members results in food products and information sharing among community members, facilitating food availability and access.

### 2.4 2.4 Conceptual framework of child undernutrition

The conceptual framework of child nutrition proposed by UNICEF (1990) explained the multi-layered drivers of child undernutrition (**Figure 8**). In order to expand our understanding of how multi-layered factors and pathways interact with each other, I have reviewed six nutritional frameworks to unravel the multi-layered pathways of socio-economic inequalities interacting with the macro and micro level factors to expose some population groups more vulnerable to the risk of child undernutrition.

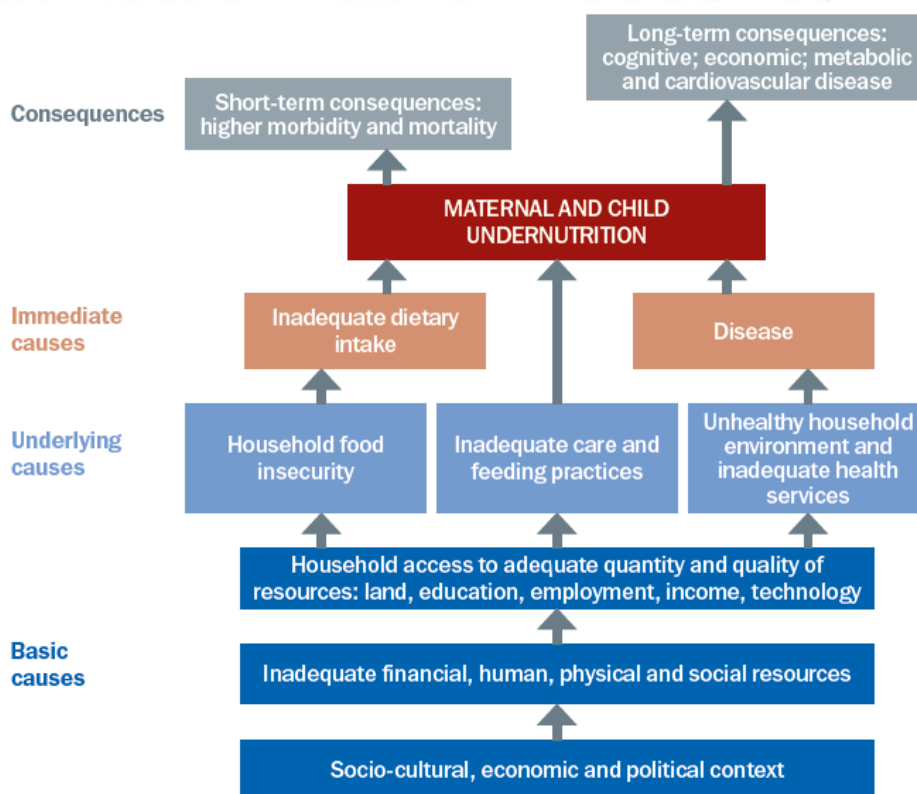


Figure 8: UNICEF conceptual framework of the determinants of child undernutrition (UNICEF, 2013)

Four comprehensive frameworks that discussed the macro, meso and micro-level factors associated with child nutrition have been purposively selected and reviewed. The factors that affect the determinants of food security and nutrition at the national or international level are considered macro-level factors. The factors that affect the

food security and nutritional status at the community or village level are considered meso level, and at the household or individual level, are considered micro-level (Table 4).

| Table 4: Multi-level factors affecting the child nutritional status |                     |                                    |                        |                           |
|---|---------------------|------------------------------------|------------------------|---------------------------|
| Levels of factors   | (Neff et al., 2009) | (Gillespie and van den Bold, 2017) | (Stewart et al., 2013) | (Chaturvedi et al., 2016) |
| <b>Macro-Level Factors</b>  |                     |                                    |                        |                           |
| Agriculture Policy  | ✓                   | ✓                                  |                        |                           |
| Climate Change  | ✓                   | ✓                                  | ✓                      |                           |
| Land Degradation  | ✓                   |                                    |                        |                           |
| Food Policy   | ✓                   |                                    |                        | ✓                         |
| Globalisation   |                     | ✓                                  |                        |                           |
| Food Industry   |                     |                                    | ✓                      |                           |
| <b>Messo level factors</b>  |                     |                                    |                        |                           |
| Agriculture practices   |                     | ✓                                  |                        |                           |
| Local Market  | ✓                   |                                    | ✓                      | ✓                         |
| Community access  | ✓                   |                                    |                        | ✓                         |
| Infrastructure and technology                                       | ✓                   |                                    | ✓                      |                           |
| Gender norms  | ✓                   | ✓                                  | ✓                      |                           |
| Culture   | ✓                   | ✓                                  | ✓                      |                           |
| Health system   |                     |                                    | ✓                      | ✓                         |
| Water and sanitation  |                     |                                    | ✓                      |                           |
| Community level social capital                                      |                     |                                    | ✓                      |                           |
| <b>Micro level factors</b>  |                     |                                    |                        |                           |
| Household economic status   | ✓                   |                                    | ✓                      |                           |
| Household environment   |                     | ✓                                  | ✓                      |                           |
| Household agriculture practices                                     |                     | ✓                                  |                        |                           |
| Household food security   |                     | ✓                                  | ✓                      | ✓                         |
| Labour migration  | ✓                   |                                    |                        |                           |
| Non-food expenditure  |                     |                                    |                        | ✓                         |
| Maternal time constraints   |                     | ✓                                  | ✓                      | ✓                         |
| Parental education  |                     |                                    | ✓                      | ✓                         |
| Maternal health   |                     | ✓                                  | ✓                      |                           |
| Maternal social capital   |                     |                                    | ✓                      |                           |
| Breast feeding practices  |                     |                                    | ✓                      |                           |
| Complementary feeding practices                                     |                     |                                    | ✓                      | ✓                         |
| Illness   |                     |                                    | ✓                      |                           |

The paper by Gillipe and Bold discussed the multiple pathways agriculture at the macro, meso, and micro levels connect to child nutrition. Also discussed is how globalisation shaped agriculture policies at the macro level and impacted child nutrition. The paper by Neff describes the disparity in access to healthy food using the food system approach at the macro, meso and micro levels to amplify the nutritional disparity.

#### **2.4.1 Macro-level factors**

##### *2.4.1.1 Globalisation*

The globalisation framework focuses on the multiple pathways the trades-related policies have shaped household food availability, health and caring practices which are the immediate determinants of child nutrition.

##### *1.1.1.1.1 Globalisation and Agriculture*

Gillespie's (2017) framework discussed how global political forces and institutions, including globalisation and liberalisation policies, have shaped the agricultural practices and food system. Following the second world war, countries worldwide focused on increasing food production to compact the widespread famine. While policies adopted during this time could substantially reduce poverty and economic growth, the agriculture policies under the green revolution focused primarily on producing cereals and nutrient-dense crops like pulses. However, vegetable and fruit cultivation has been neglected (Gillespie and van den Bold, 2017). Agriculture systems interact with a country's political economy and shape the food system. Agriculture and food policies determine the supply, nutrient quality, and affordability

of the food commodity in the market (Gillespie and van den Bold, 2017). Liberalisation policies have further shaped the agriculture and food system at the macro level. Under Structural Adjustment Programmes (SAP) and Agreement on Agriculture (AoA), developing countries worldwide had to make several changes in their agricultural and food policies. This included removing the barriers to import and export, foreign direct investment, trade in services and other measures facilitating the business activity. Cheap grains were imported to low-income and lower and middle-income countries, which undermined the domestic market of food grains produced by local farmers' leading to poor farmers' impoverishment and food insecurity (Blouin et al., 2010).

Additionally, many governments prioritised cash crop cultivation over food crop cultivation. The farmers' incentives for cash crop cultivation led to a substantial decline in food diversity, production, and food security among low-income domestic households (Siddiqui, 2019). Industrial cultivation of mono-crop also caused a decline in agriculture diversity, groundwater level and the diversity in other species in the agro-eco system, which has finally resulted in a decrease in dietary diversity (Gillespie and van den Bold, 2017; Pieters et al., 2013). Additionally, under the liberalisation policies, the food system imposed new standardisation rules on the food crops, which ultimately benefitted the largescale cultivators, retailers, and supermarkets (Gillespie and van den Bold, 2017).

#### 1.1.1.1.2 Globalisation and Food Industry

The trade liberalisation policies made a favourable condition for Transnational Companies' entry (TNC) into the food industries, accelerating the availability of ultra-processed food, vegetable oil, and meat leading to a significant dietary shift across the

globe. The marketing strategies based on false nutrient claims adopted by many TNCs in the baby food industries proved detrimental to infants' healthy diets (Granheim et al., 2017; Neff et al., 2009). Gillespie and van den Bold (2017) have further pointed out that the increasing number of supermarket and fast-food outlets and the aggressive marketing strategies resulted in a shift in dietary patterns with ultra-processed and energy-dense food with low nutritional quality. This trend is observed more in low- and lower- and middle-income countries than in high-income countries. Similarly, the baby food industry influences the IYCF (Infant and Young Child Feeding Practices). The aggressive marketing strategies followed by the sectors to promote commercial baby food breast milk substitutes for infants and young children adversely affect the public health interventions for appropriate IYCF (Stewart et al., 2013).

#### 1.1.1.1.3 Globalisation and economic impact

Evidence around the world consistently reported that household-level poverty is a significant risk factor for child undernutrition. The financial austerity on health, education, and other basic needs services in countries worldwide further amplified the poor people's woes (Bambra et al., 2015). This has increased food insecurity and school dropout, particularly among female children. In desperation for survival, women from poor households started working in unorganised sectors, often with meagre remuneration. This has adversely affected women's health and caring time for young children (Chaturvedi et al., 2016; Rajeev, 2009; Sanyal and Bhattacharyya, 2009). Overall, studies have reported that globally, the neo-liberal economic policies have amplified the pre-existing socio-economic inequality in high-income and low- and middle-income countries worldwide to shape disparities in child undernutrition's underlying and immediate determinants (Stiglitz, 2012).

#### **2.4.2 Climate Change**

Climate change is "*the change in the average Weather patterns that have come to define earth's local, regional and global climate*" that affects child nutritional status through direct and indirect pathways. Climate change includes heat stress and extreme weather events like floods and storms. The framework (2013) proposes that climate change can cause damage to crops or reduced yields, which can increase the price volatility for food crops at the global level. A systematic review conducted by (Phalkey et al., 2015b) reported that 53% of the reviewed studies had shown a significant association between rainfall variability and undernutrition of under-five children. Other studies have reported that children exposed to heatwaves are at increased health risk, including dehydration, electrolyte imbalances, heat stroke and exhaustion, fever and gastroenteritis, which are important risk factors for undernutrition (Bennett and Friel, 2014). Neff (2009) points out that climate change can aggravate low agriculture productivity when it converges with soil quality degradation and fossil fuel depletion. Heat stress also contributes to lower crop yields, increased crop losses and damages due to pests, pathogens, fungi and weeds, and reduced protein, vitamin and mineral concentrations in the edible part of the crop. This, in turn, aggravates local and regional food inflation and food insecurity among the poor household who cannot afford the higher price (Tuomisto et al., 2017).

While children are particularly vulnerable to the impact of climate change, studies have shown that children from poor households are among the most susceptible to the impact of climate change (Akachi et al., 2009). Further, heat stress also diminishes water availability forcing people to depend on low-quality water sources, leading to waterborne diseases and affecting the child's nutritional status (Akachi et al., 2009). On the other hand, extreme weather events like floods and storms disrupt the water

supply, sanitation, and sewage system and increase the risk of waterborne diseases. It also challenges the households' livelihood conditions and increases resource scarcity, leading to household food insecurity. Furthermore, the mental health impact of extreme weather events, livelihood challenges, and disease burden also adversely affect primary caregivers' childcaring capacity, leading to poor nutritional outcomes for children (Bennett and Friel, 2014).

Again, women's ownership of agricultural land is a mediating factor in agriculture and nutrition pathways. Women's asset ownership and participation in agriculture activity reported a positive association between women's decision-making power and household dietary diversity (Kadiyala et al., 2014). Maternal employment in agriculture can also contribute to compromised feeding and caring of children in the absence of childcaring support or low wages from agricultural labour (Das et al., 2018).

### **2.4.3 Meso-level impact of globalisation**

Furthermore, financial liberalisation also contributed to the decline in financial services available to marginal farmers from public sector banks, pushing them into the debt trap of local money lenders. Cuts in agriculture subsidies and increasing crop volatility have amplified farmers' woes in many counties. Agriculture cultivation became an unprofitable enterprise for small and marginal farmers with the rising cost of farm inputs, including seeds, fertilisers and pesticides, leading to financial impoverishment and food insecurity among the small and marginal farmers (Siddiqui, 2019). The increasing volatility in food prices, coupled with a decrease in purchasing power of poor people, forced them to compromise on essential resources to remain healthy, including a healthy diet (Ravindran, Gaitonde and Srinivas, 2018). Liberalising the laws for foreign direct investment in large infrastructure projects,

including mining, oil and gas extraction, logging and plantation, has worsened the livelihood and living conditions of the most marginalised communities globally. In this process, indigenous communities worldwide were disproportionately affected and lost their livelihood and the traditional food source (Kalshian, 2007; Moody, 2007; Nathan et al., 2004).

#### **2.4.4 Water, Sanitation and Hygiene (WASH)**

Children living in unsanitary environments consume significant levels of faecal bacteria, which colonise the small intestine causing tropical enteropathy via a T-cell-driven process. The increased permeability of the gut allows for the transmission of microbes, resulting in the metabolic changes of an immune response. These changes, combined with poor dietary intake, reduced nutrient absorption due to atrophied villi, and high growth demands of the first two years of life, lead to stunted growth. Spears (2013) further attributes tropical enteropathy to the phenomenon called Asian enigma. Though South Asian countries, India in particular, have made significant economic advancements compared to the African countries, people in India are shorter than those in sub-Saharan Africa. One of the reasons for this is the poor sanitation in India, where over half of the households defecate openly without using a toilet or latrine, which is a much larger proportion compared to other countries with similar income. The studies conducted by (Correia et al., 2014; Malapit et al., 2013) and Global Hunger Index 2010 also report that poor water quality is an essential determinant of undernutrition among under-five children.

#### **2.4.5 Structural Inequality**

From a structural inequality perspective, the individual household's or a community's ability to provide healthy and nurturing care is contingent upon the larger socio-economic, political, and cultural institutions that determines the allocation of

power, resources and opportunities. The arrangement of these institutions in a way that provides privileges to some sections of society and disadvantages to other sections of society creates and sustains socio-economic inequality, which forms the basis for child nutritional inequality as well (Royce, 2018). India's caste system is based on a hierarchical social structure in which upper caste communities were historically privileged in accessing socio-economic, political and cultural resources. In contrast, the lower caste social groups such as SCs and STs were historically oppressed and subjugated by the upper caste communities. Despite several affirmative actions taken by the government to improve the socio-economic, educational and health status, these communities continue to occupy the poorest rung in the social hierarchy due to several structural barriers, including caste-based prejudices and discrimination and residential segregation (Desai and Dubey, 2012). Their access to material resources to basic needs is constrained through several structural barriers: neighbourhood segregation, poor housing and sanitation facilities, inadequate access to health and education services, and legal deprivations. Societal arrangements outside individual control shaped these barriers.

Gender is another structural inequality axis that determines unequal access to socioeconomic, cultural, and political resources. Gender enforces an unequal relationship between men and women through socially sanctioned cultural norms and values. The patriarchal social norms place women below men in gender relationships, shape inequities in health, education, employment, and nutritional status, and limit their freedom and autonomy. Women have less access and control over resources in terms of educational and employment opportunities, information, decision-making power, income and other economic resources than their male counterparts. This inequitable gender relationship is an essential factor affecting their health

(Chidambaram, 2018; Sen et al., 2002). Gender inequality is like children's health and nutritional status acting through multiple pathways. Poor maternal health and nutritional status increase the risk of low birth weight babies (Rahman et al., 2015). Maternal deprivation leads to poor health outcomes for the foetus, which, in turn, leads to long-term health risks. The educational status of mothers is a critical factor in inappropriate feeding practices and children's health care (Le and Nguyen, 2020). Mothers' autonomy in economic resources is critical for ensuring adequate food and health care provision for children (Shroff et al., 2009).

Similarly, the maternal experience of domestic violence is associated with a child's nutritional status through multiple pathways. Malnourished and distressed pregnant mothers deliver LBW children. Secondly, domestic violence leaves both mental and physical impacts on the mothers, inducing risky behaviours prenatally and contributing to poor birth outcomes. Domestic violence's mental and physical impact impairs the mother's capacity to provide adequate child care postnatally (Yount et al., 2011). Gender inequality based on socially constructed social norms and values in India is well documented (Batra and Reio, 2016; Chidambaram, 2018) and could be an important factor in the high burden of child undernutrition in India.

The existing evidence on inequality in health and nutritional status from India and across the globe suggests that the pre-existing socio-economic inequalities interact with these macro-level factors to shape the household living condition, food availability, and childcaring practices that finally shape the individual-level determinants of child undernutrition. The micro-level pathways include water, sanitation and hygiene, agriculture practices and structural inequalities.

## *2.5 Paniya Vs Kurichiya*

Several studies have reported the inequality between Paniya and Kurichiya ST communities in the Wayanad district of Kerala on factors that are reported to be undernutrition. While most Paniya households had less than 2000 rupees monthly income, most Kurichiya households had more than 2000 rupees monthly income (Babu Ebrahim, 2013; Francis, 2006). A similar inequality was also observed in the extent of landholding between the Paniya and Kurichiya communities. Again, while most of the Paniya were landless agricultural labourers, most of the Kurichiya households had subsistent cultivators with diversified livelihood strategies such as; masonry, painting, and cattle rearing (Francis, 2006; Susamma, 2013). While Paniyas spent 72.3% of their income on food, Kurichiya spent only 42.70% on food items (Francis, 2006). Studies have consistently reported that most Paniya households cooked only one meal per day, while most Kurichiya households cooked three meals per day (Francis, 2006; Gangadharan, 2015; Susamma, 2013). During the lean season, the one-time cooking also became inconsistent among the Paniya community, and they depended on neighbours for food (Susamma, 2013). This evidence indicates the inequality in food security between the Paniya and Kurichiya communities in Wayanad district, Kerala.

There were also differences between the communities regarding their educational status and living conditions. While the literacy rate among the Kurichiya communities in Wayanad was 80.8%, among the Paniyas, it was only 52.3% (IIM, 2006). Regarding water and sanitation facilities, while 13.3% of Paniya households had a toilet facility, 68.9% of Kurichiya households had toilet facilities (Francis, 2006). Studies have also reported that most Paniya households did not boil the drinking water. The water source was not always protected, and there was a severe scarcity of water (Gangadharan,

2015; Mohindra, Narayana, Harikrishnadas, et al., 2010a). While almost two-thirds of the Paniya households lived in Kutcha houses, 90% of the Kurichiya households lived either in semi-pucca houses (42.22%) or in Pucca houses (48.89%). Alcohol consumption was near-universal among Paniya men, and even among women, 70.9% reported consuming alcohol. Comparable figures for Kurichiya were 70.9% and 19.13%, respectively (Francis, 2006). The studies also have noted that a substantial proportion of household income is diverted to alcohol consumption. It is perceived as a central problem of the community members (Betz et al., 2014; Haddad et al., 2011; Mohindra, Narayana and Haddad, 2010a; Mohindra, Narayana, Harikrishnadas, et al., 2010a). Previous studies had further reported that climate change and the agrarian crisis disproportionately impacted the Paniya community more than the Kurichiya community (Betz et al., 2014; Mohindra, Narayana, Harikrishnadas, et al., 2010a; Susamma, 2013).

Previous studies have reported the inequality between the Paniya and Kurichiya communities on their children's nutritional status and various household and parental level factors that are known to affect the nutritional status of the children. These studies gave a fragmented understanding of the inequalities at socioeconomic, education, health, and nutritional indicators, looked at these inequalities one at a time and considered the risk factors at the individual, maternal, and household levels. These studies do not provide an understanding of the pathways and mechanisms through which this inequality was created and sustained. While it is crucial to characterise the pattern of nutritional disparities in India, for this literature to mature into actionable knowledge, it is critical to understand the pathways and mechanisms that create and sustain nutritional inequality among the tribal communities (Ravindran, Gaitonde, Srinivas, et al., 2018; Srinivas et al., 2019). Understanding the context-specific factors,

pathways and mechanisms of nutritional inequality among the tribal community would help formulate equitable nutritional policies and interventions for the tribal communities.



### **3. MATERIALS AND METHODS**

In the third chapter, I discuss the research materials and methods used in this study. This includes the study design, study setting regarding the geographical location and people involved, sample size estimation and justification, sample selection process, tools used in data collection, and plan for data collection and analysis in the quantitative and qualitative phases. Subsequently, I describe the study's conceptual framework and the ethical consideration of each phase.

#### ***3.1 Study Design/Type***

The current study used a convergent mixed-method approach to capture the pathways and mechanisms that create and sustain inequalities in undernutrition (Grace, 2014). Quantitative methodology was necessary for generalisable results to the larger population on the relative effect of the different factors. Whereas qualitative methodology supplemented richer insight into how individual and collective identity interacted with the social dynamics and how the social or institutional process and people's subjective and context-dependent experience were related to child nutritional status (Grace, 2014). Among the different types of mixed methods explained by Creswell (2013), the current study used convergent parallel mixed methods in which the researcher combines quantitative and qualitative data to comprehensively analyse the research problem. In this design, the investigator usually collects both forms of data simultaneously and then integrates the information into their interpretation of the overall results. This design can help to explain any conflicting findings or to explore further (Creswell, 2013).

While the quantitative method used a cross-sectional design, the qualitative method used an explanatory case study, which sought to explore why there were differentials in child nutritional status across the two ST groups and within each of these groups. The study used the case study method as described by Yin (2013). Among the four types of case study designs explained by Yin (2013), namely, single-case (holistic) designs, single-case (embedded) designs, multiple-case (holistic) designs, and multiple-case (embedded) designs, I used **multiple-case (embedded) designs** in this study. The methodological approaches used to answer study objectives are described in table 5.

Table 5: Objectives and corresponding methods

| <b>Objective</b>  | <b>Methods used</b>   |
|---|---|
| To examine the child nutritional inequality between Paniya and Kurichiya tribal communities in the Wayanad district.  | Cross-sectional survey<br>Anthropometric Measurements   |
| To understand the historical and contextual factors that lead to significant differentials in child nutritional status between the Paniya and Kurichiya communities in Wayanad district, Kerala.  | Review of grey literature, cross-sectional survey, settlement level case studies  |
| To unravel the pathways of influence on differentials in child nutritional status within the Paniya and Kurichiya communities, of factors at multiple levels such as; community identity, geographical location, household social and economic status, and individual characteristics of the child. | Anthropometric Measurements, cross-sectional surveys, and the case study with in-depth interviews, direct observation, and participant observation. |

### 3.1.1 Study Setting

This section explains the study settings regarding the geographical area and the people involved and examines the rationale behind the selection. The study setting's geographical area was the Wayanad district of Kerala, and the people involved in the Study were Paniya and Kurichiya Tribal communities in the Wayanad district. The

reason for taking Wayanad as the area study was that while only 1.45% of the total population in Kerala is ST, 18.5% of the total population in Wayanad is ST. Home to 37.3% of the total ST population in Kerala, Wayanad has the highest ST population concentration in Kerala (Census, 2011). Eleven ST groups are found in Wayanad, with considerable variation in their land, livelihood, health, education, and nutritional status. They present substantial inequalities between them that warrant detailed exploration to promote better health and nutritional status. There were two factors considered while selecting the Paniya and Kurichiya communities. Firstly, Paniya and Kurichiya communities are the two largest ST communities in the Wayanad district, constituting 45.12% and 16.49% of the ST communities' total population (Wayanad district (Wayanad District Report, 2008). Furthermore, as explained above, Paniya and Kuraichiya represent the extreme inequality among the ST communities in the Wayanad district.

### **3.1.2 Conceptual framework of the study**

Drawing on the UNICEF conceptual framework (UNICEF, 2013) that captures the multi-level and multifactorial causality of undernutrition, this thesis theorised that the historical subjugation, ongoing social marginalisation, and exclusion processes which are unique to Paniya and Kurichiya communities, respectively are driving the underlying causes of undernutrition. The historical and contextual factors at the community and neighbourhood level, such as spatial features, social, economic and cultural capital, and behavioural pattern, interact with household-level factors to shape the underlying causes of household food insecurity, childcaring and feeding practices, unhealthy household environment and utilisation of nutritional services (**Figure 9**). These household-level factors directly influence the diversity and adequacy of nourishing food, which causes child nutritional outcomes and disease status. The

interaction between undernutrition and infection creates a potentially lethal cycle of worsening illness and deterioration in nutritional status (Robert E Black et al., 2008; Han et al., 2011). The interactions between the community level, settlement level, and household level factors produced different child nutritional outcomes among Paniya and Kurichiya communities. The parental level characteristics and household resources interact with individual biological and behavioural factors and shape different nutritional outcomes within individual households. Given that the inequalities operated at multiple levels, I finally chose Krieger's eco-social framework to identify the interplay between the various levels (Krieger, 2011).

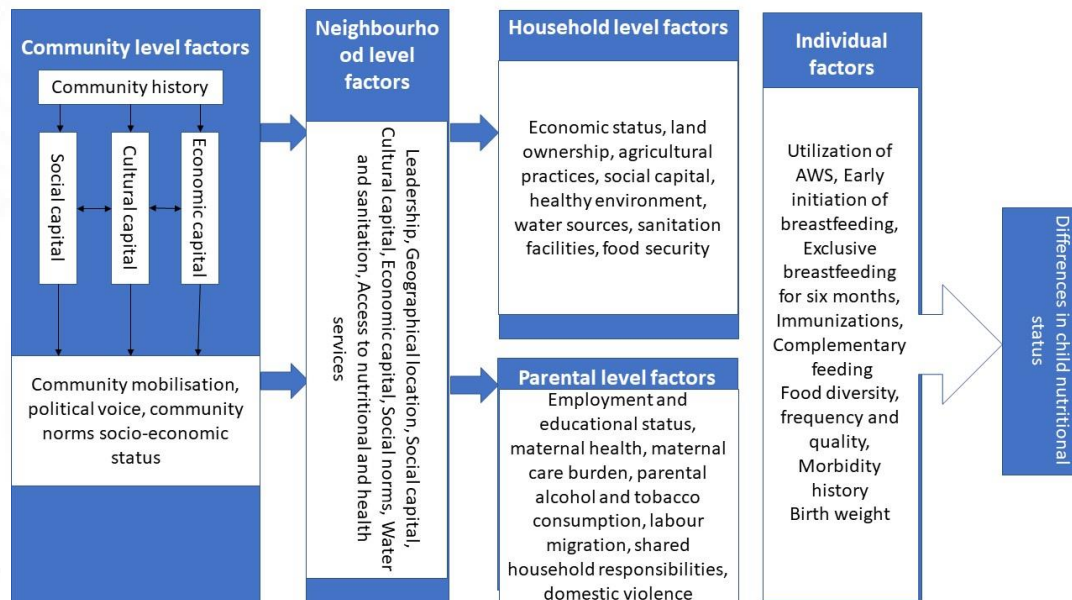


Figure 9: Conceptual framework of the child's nutritional status

### 3.2 Sample Size: Estimation and Justification

#### 3.2.1 Cross-sectional survey

Available studies on undernutrition among the Kurichiya and Paniya communities show inconsistent results regarding the proportion of undernourished children in each of these communities. However, all the studies consistently showed that the Paniya community had a significantly higher proportion of underweight children than the

Kurichiya community. Hence the current study assumed the prevalence of underweight among the children from Paniya and Kurichiya to be 63% and 43%, a previous study (Ladish, 2005). The sample size was calculated with a significance level of 0.05, with statistical power  $1-\beta=0.8$  and allocation ratio 1:1. The calculated sample size was 97 for each group. Considering the possibilities of difference in the proportion of undernutrition between the clusters, the design effect of 1.5 was taken, and assuming 10% as the non-response rate, the sample size calculated was 162 for each group. With rounding, I calculated the final sample size of 165 from each group (Kurichiya and Paniya). Thus, the total sample size calculated was 330.

### **3.2.2 Case study**

For the case studies, four Paniya and Kurichiya tribal settlements with high prevalence and low prevalences of child undernutrition were selected as the case study sample's primary unit. Within each primary unit, two embedded cases of Well-nourished children and two embedded cases of undernourished children were selected as sub-unit of analysis. Thus, the case study sample consisted of four primary units of case study samples at the settlement level and 16 embedded cases.

## ***3.3 Sample Selection Procedures***

### **3.3.1 Cross-sectional survey**

The sampling strategy for the quantitative survey was multistage cluster sampling. Each settlement was considered a cluster, as the Paniya and Kurichiya communities lived in settlements. In the first stage, six Panchayats with a higher proportion of Paniya and Kurichiya communities were selected out of 26 village Panchayats in the Wayanad district. In the second stage, a list of all Paniya (198) and Kurichiya (106) settlements with a minimum of 20 households from the six selected Panchayats were

collected from the Panchayat Tribal Development Extension Office. Of these, 33 (16.7%) Paniya settlements and 33 (31.1%) Kurichiya settlements were selected randomly (**Table 6**). The number of chosen settlements was proportionate to the total number of settlements in each of the selected Panchayats. All the children in the age group of 2–5 years from each selected settlement were included in the study. Approximately five children from each settlement were selected to achieve the calculated sample size. However, only three children were found in a few of the smaller settlements. This was made up of selecting seven or six children from larger settlements with more than 50 households. Overall, 167 children from the Paniya community and 166 from the Kurichiya community were included, within the total sample size of 333.

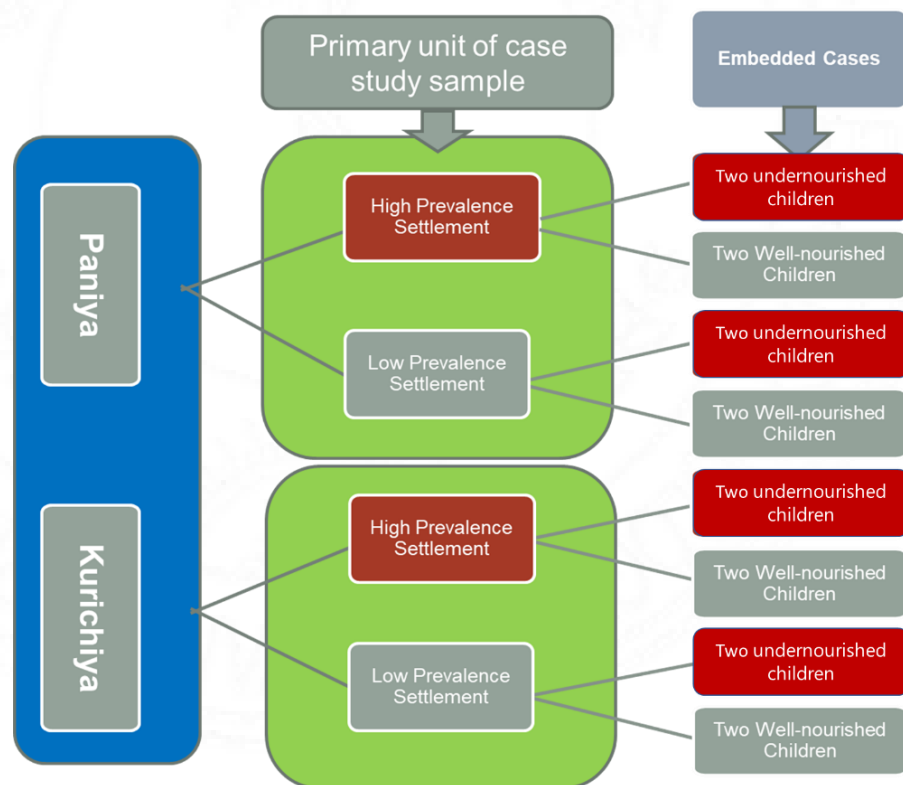
Table 6 : Sample selection scheme

|                             | Name of Panchayath | Name of block | No. of Paniya settlements | No. of Kurichiya settlements | No. Paniya settlements selected | No. Kurichiya settlements selected |
|-----------------------------|--------------------|---------------|---------------------------|------------------------------|---------------------------------|------------------------------------|
| 1                           | Noolpuzha          | S. Batheri    | 90                        | Nil                          | 8                               | 0                                  |
| 2                           | Kottathara         | Vythiri       | 59                        | 45                           | 5                               | 7                                  |
| 3                           | Panamaram          | Mananthavadi  | 107                       | 72                           | 9                               | 8                                  |
| 4                           | Edavaka            | Mananthavadi  | 32                        | 27                           | 4                               | 9                                  |
| 5                           | Thavinchal         | Mananthavadi  | 53                        | 50                           | 5                               | 6                                  |
| 6                           | Thrunelli          | Mananthavadi  | 53                        | 50                           | 5                               | 6                                  |
| Total number of settlements |                    |               | 394                       | 244                          | 36                              | 36                                 |

### 3.3.2 Case studies

The qualitative case study method used theoretical construct sampling (Tracy, 2012). To pursue the theoretical proposition mentioned earlier, four tribal settlements from the Paniya and Kurichiya communities with a high and low prevalence of undernutrition were selected. This selection was based on the secondary data available at Tribal Development extension offices at selected Panchayath. The primary unit of

analysis in the case study was the tribal settlements (or colonies). From each primary unit, four households consisting of two undernourished children and two nourished children were selected as embedded cases to understand how the households in the selected settlements navigated through various advantages and disadvantages at the community and household levels. While the analysis at the settlement level focused on how differences in the community-level contextual factors shaped child undernutrition, the households within the settlement focused on the pathways through which the community-level factors were amplified or mitigated by the household and individual-level factors in determining the nutritional status of children. Thus, within 4 cases at the settlement level, eight household-level embedded cases were selected based on the theoretical replication, and eight embedded cases were chosen to give context-specific rival explanations. The sampling frame of primary case studies and embedded cases are depicted in figure 10.



**Figure 10: Qualitative Sampling Procedures**

### ***3.4 Data Collection Tools***

#### **3.4.1 Data Collection Tool for the cross-sectional survey**

In the quantitative cross-sectional survey of the study, the data collection tool had three components: An interview schedule for the mother of two to a five-year-old child, an interview schedule for the tribal settlement, and anthropometry.

##### ***3.4.1.1 Interview Schedule for the Mother***

The interview schedule contained 104 items, including maternal and paternal level, household level, and Individual-level factors. To assess household food insecurity, I used the Household Food Insecurity Access Scale (HFIAS) (Coates et al., 2007). HFIAS was developed in 2007 by the USAID-funded Food and Nutrition Technical Assistance II Project (FANTA) in collaboration with Tufts and Cornell Universities. Several studies conducted in Tanzania, Iran, Malaysia, and India on HFIAS's validity and reliability reported that HFIAS is a useful tool in measuring household food security in different contexts—especially in resource-poor settings (Cooper, 2013; Knueppel et al., 2010; Maitra, 2017; Mohammadi et al., 2012; Salarkia et al., 2011; Swindale and Bilinsky, 2006). HFIAS was developed based on the concept that the food insecurity experience causes predictable reactions and responses captured and quantified through a survey and summarised on a scale (Coates et al., 2006). It is a nine-item scale that uses a four-Week recall period. The scale captured three dimensions of household food insecurity:

1. Anxiety and uncertainty about household food access (item no. 1);
2. Insufficient quality (items no. 2–4); and
3. Insufficient food intake and its physical consequences (items 5–9).

Responses on the nine items were summed to create the food access insecurity score, with a minimum score of 0 indicating the most food access secure households. A maximum score of 27 indicates the most food-access insecure households.

The interview schedule and information documentation schedule for tribal settlement were translated into Malayalam (the language of the study population). The translated interview schedules were back-translated into English and verified with the original schedule. Further, a correction was made to the Malayalam version of the interview schedule, where there was a mismatch between the original schedule and the back-translated version.

#### *3.4.1.2 Anthropometry*

The third component included Anthropometry. The study used the three most commonly used anthropometric indices, such as:

- Weight for height: an index used for measuring wasting
- Weight for age: an index used for measuring underweight
- Height for age: an index used for measuring stunting.

Among the two sets of reference standards: the National Centre for Health Statistics (NCHS) international reference (1978) and the WHO growth standards (2006), I adopted the WHO growth standard (2006) of the multicentre growth reference study (WHO, 2006). The cut-off of  $<-2$  Z scores of reference median of the whom growth standard was used for these indices to classify children as moderately undernourished, and the cut-off of  $<-3$  Z scores of reference median of the WHO growth standard was used for these indices for classifying children as severely undernourished.

**Measuring Child growth:** Height was also measured to the precision of 1 mm using the SECA stadiometer designed and monitored by UNICEF (SECA Medical Scales and Measuring System, Birmingham, UK). In order to measure the height, a stadiometer was mounted at a right angle between a level floor and against a straight, vertical surface such as a wall or pillar; the child was made to stand on the measuring board with shoulder blades and buttocks of the child placed against the board. The child's shoes, socks, and hair ornaments were removed prior to the measurement as it would interfere with the size. Once the accurate position of the child was achieved, the measurement was marked to the nearest 0.1cm. Weight was measured to the precision of 100 g using a lightWeight SECA 803 flat-scale having a digital monitor designed and monitored by the UNICEF (SECA Medical Scales and Measuring Systems, Birmingham, UK). Weight was measured using the standard electronic weighing machine. The weighing scale was calibrated at the beginning of each working day. Care was taken to minimise the clothing on the child while weighing (Cogill, 2001).

### **3.4.2 Case Study Data Collection Technique**

Among the six methods suggested by Yin (2013)Yin, the current study used document review, in-depth interviews, non-participant observation, and participant observation.

#### *3.4.2.1 Document review*

Document review is the systematic investigation of printed and electronic material to elicit meaning, gather empirical knowledge, and comprehend a phenomenon (Corbin and Strauss, 2008). I have used a document review of Anganwadi records, documents from the village office, a medical prescription from the Primary Health Centre (PHC), genealogical records, and published literature on Paniya and Kurichiya communities as supplementary methods to gain an understanding of the community history on the

matter that affects the livelihood, food security and child nutrition status of ST children in the selected settlement.

#### *3.4.2.2 In-depth interview*

In-depth interviewing is a qualitative research technique in which participants are encouraged and prompted to talk about their perspectives on a particular idea, program, or situation (Boyce and Neale, 2006). I collected data using in-depth interviews with primary caretakers (mothers and fathers of two to five-year-old children), community representatives (tribal head (moopan), older adult women in the settlement, (community leader), other key informants (KI), including Anganwadi worker (AWW), Accredited Social Health Activist (ASHA worker)<sup>2</sup>, Tribal Promoter<sup>3</sup> and a non-tribal person from the neighbourhood of settlement. To prevent reputational risk and maintain confidentiality, the KIs are anonymised as PS 1 to PS 4. The settlement with a high prevalence of undernutrition is coded as HPS, and the settlement with a low prevalence of undernutrition is coded as LPS.

#### *3.4.2.3 Non-participant observation*

Non-participation observation is a relatively unobtrusive qualitative research strategy for gathering primary data about some aspect of the social world without interacting directly with its participants (Given, 2008). In non-participant observation, the researcher observes the social situation, individual or group, without participating in their activities. An observation checklist containing 16 items was used for non-

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Community health worker instituted under National Rural Health Mission in 2005 to strengthen the rural public health service delivery and increase the ownership and involvement of community in public health programmes in India.

Tribal Promoters are facilitators in selected from tribal community appointed under Kerala tribal development department for the purpose of channelizing various tribal development schemes to tribal community.

participant observation. These items aimed to understand the community-level accessibility to food and health services and water and sanitation facilities available in the community.

### ***3.5 Data Collection and Analysis***

#### **3.5.1 Quantitative data collection and analysis**

Both quantitative and qualitative data were collected at roughly the same time between May 2018 to December 2018. The interviews with the community participants were conducted at the respondent's houses. In a quantitative cross-sectional survey, the interview schedule was administered to the mother of two- to five-year-old children. Each interview lasted for approximately 25 to 30 minutes. Data collected using the interview schedule were entered into SPSS software. And the anthropometric data were entered into WHO Anthro (version 3.2.2) software published by the Department of Nutrition of the World Health Organization for the assessment of the nutritional status of the children. As per WHO standards, the child's age, sex, weight and height measurements were used to calculate the growth indicators: Weight for age, height for age and weight for height (WHO, 2008). Open Data Kit (ODK) Collective v1.18.2 was used in a mobile tablet for data collection, and the data were exported to Statistical Package for the Social Sciences 23.0, Armonk, NY, US: IBM Corp (SPSS, License No.: 567588dab50014edac00) for cleaning and further analysis.

A descriptive analysis of Height for Age Z-score (HAZ), Weight for Age Z-score (WAZ), and Weight for Height Z-score (WHZ) was performed. CIAF was constructed using seven subgroups of anthropometric failures, namely A – no failure, B – only wasted, C – underweight and wasted, D – stunted, wasted, and underweight, E – stunted and underweight, F – only stunted, and Y – only underweight. Chi-square tests

were performed to test the statistical significance of the difference in the proportion of CIAF between children from the Paniya and Kurichiya communities. Finally, binary logistic regression was performed to examine the association between the CIAF and other sociodemographic variables. Multicollinearity among the predictor variables was verified using variance inflation factors (VIFs), and VIF higher than three was considered a collinear factor and was excluded from the model.

### 3.5.2 Case Study Data Collection and Analysis

Case study interviews were conducted in Malayalam using a digital audio recorder; data from interviews were audio-recorded. The data was collected, guaranteeing participants' privacy, and stored in a portable hard disc to maintain its confidentiality. The research scholar was the sole custodian of the data, and the scholar protected all identifiers linking the data to its source. The recorded audio was further transcribed and translated into English. Data from direct observation and participant observation were also transcribed into word format. Nvivo 12, a software for qualitative data analysis, was used to analyse the data (QSR International, 2019). The number of study participants interviewed, the number of non-participant observation notes and field diaries under each case study are listed in table 7.

| Table 7; Summary of case study data collected |                          |                    |   |
|---|--------------------------|--------------------|---|
|   |                          | In-depth interview | Non-Participant Observation diary notes |
| Paniya Settlement level case                  | HPS Paniya Settlement    | 4                  | 5                                       |
|   | LPS Paniya Settlement    | 8                  | 2                                       |
| Embedded Cases                                | HPS Paniya E. Cases      | 6                  | 4                                       |
|   | LPS Paniya E. Cases      | 10                 | 4                                       |
| Kurichiya Settlement level case               | HPS Kurichiya Settlement | 6                  | 4                                       |
|   | LPS Kurichiya Settlement | 6                  | 5                                       |
| Embedded Cases                                | HPS Kurichiya E. Cases   | 7                  | 2                                       |
|   | LPS Kurichiya E. Cases   | 9                  | 2                                       |
|   |                          | 56                 | 28                                      |

Data analysis in the qualitative phase used a combination of two analytical strategies: relying on the theoretical proposition and examining the rival explanation using counterfactual cross-case analysis. Relying on the theoretical proposition of the current study that the specific combinations of advantages and disadvantages operating at the community, household, parental and child level give rise to between and within-group inequalities of undernutrition among both Paniya and Kurichiya communities, the analysis strategy looked for data pertaining to both advantages and disadvantages at the community level, household level, parental level and child level. The second strategy of examining rival explanations was used for testing the rival theories. This strategy focused on contrasting perspectives, experiences, and conditions in the rival cases that may support the theoretical or the rival proposition.

Among the five analytic techniques such as; pattern matching, explanation building, time series analysis, logical model, and cross-case synthesis explained by Yin (2013), I employed explanation building and cross-case synthesis to analyse the data in this study. To explain pathways and mechanisms that perpetuated and sustained the inequality in child nutritional status between the Paniya and Kurichiya communities, I used the explanation-building technique method in this study. This technique aims to analyse the case study data by building an explanation of the cases (Yin, 2013). The explanation building started by matching the initial case against the theoretical proposition of the study. If the cases were contradictory to the theoretical proposition, the study's proposition was revised, and again details of the case study data were compared against the revised proposition. Finally, cross-case synthesis was performed across the case studies to determine the commonalities and differences between the high and low prevalence settlement and the nourished and undernourished children.

The case studies used the thematic analysis of each settlement-level case study focusing on the prominent themes characterising the inequalities in child nutritional status. The final list of themes included 1. Land ownership 2. Livelihood 3. Social and institutional capital 3. Cultural capital 4. Health behaviour 5. Household food security.

### ***3.6 Addressing Validity and Reliability***

To ensure the construct validity of the data, the study used multiple sources of evidence and had the draft case study report reviewed by key informants. Yin (2013) suggests that when the data for the case study is collected from multiple sources and triangulated, the data from the multiple sources addresses the problem of construct validity because the multiple sources of evidence provide multiple measures for the same phenomena. Internal validity is ensured by building an explanation and addressing rival case explanations. This means that while explaining the causal relationship between certain advantages or disadvantages at various levels and the children's nutritional outcome, I looked at all the alternative explanations and possibilities from the rival cases. For example, while the embedded case study of undernourished children from high prevalence Paniya settlement sought to explain how the disadvantageous conditions at the community and household level have resulted in the biological condition of undernutrition, the rival cases of Well-nourished children from the same settlement sought to provide other alternative explanation to the theoretical proposition. To test the analytical generalizability of the study finding or to deal with the external validity, I purposefully selected the cases that matched the theoretical propositions and their rival propositions.

### ***3.7 Ethical considerations***

The research was conducted in accordance with ethical standards. After gaining approval from the Institutional Ethics Committee (IEC) of Sree Chitra Tirunal Institute for Medical Sciences and Technology, verbal witnessed consent or informed consent with a thumbprint was taken from the participants after informing them of the objectives and potential benefits and risks of participating in the study prior to data collection. In the case of the oral witnessed consent, a literate person not associated with the research or the investigator personally and who is known to the study participant was selected as a witness, and the objectives and the purpose of the study and potential benefits and risk of participating in the study were explained to the participant in the presence of the witness and signature, or thumb impression was obtained from the witness. The participants were asked to permit a digital tape recorder for in-depth interviews; if this was refused, the researcher used hand-written notes. Names and other identifications of all the participants were removed or changed to maintain the participant's confidentiality and anonymity. Participants' right to withdraw from the study was maintained throughout the study. The participants were informed that their decision to participate in the study would be completely voluntary and that they had the right to withdraw from the study at any point.

## 4. RESULT

In this chapter, I have presented the result of both quantitative survey and qualitative case studies. In line with the objectives of my thesis, the chapter is organised into the following sections:

- 4.1 The differential in child nutritional status between *Paniya* and *Kurichiya* tribal communities in Wayanad district.
- 4.2 The historical and contextual factors (e.g. inequality of land ownership, education status, livelihood) that lead to significant differentials in child nutritional status between the *Paniya* and *Kurichiya* communities in Wayanad district, Kerala.
- 4.3 The pathways of influence on differentials in child nutritional status within the *Paniya* and *Kurichiya* communities, including factors at multiple levels such as; community, neighbourhood, household, parental and individual characteristics of the child

I have used the cross-sectional survey to present the findings related to objective 1 in the first section (4.1). This section presented findings on the inequality in child nutritional status between *Paniya* and *Kurichiya* communities. In section 4.2, I have presented the findings related to objective 2. This section has two sub-sections: In section 4.2.1, I have used the results from the analysis of secondary document analysis and the qualitative case study data to present the historical factors that shaped the child nutritional inequality between *Paniya* and *Kurichiya* communities. In section 4.2.2, I used quantitative cross-sectional survey data and case studies to present the contextual factors that lead to the child nutritional inequalities between *Paniya* and *Kurichiya* tribal communities. In section 4.3, I have presented the findings related to objective 3. This

section has three main subsections. In section 4.3.1, I have presented the findings from binary logistic regression of quantitative data. In order to understand the community-level factors associated with child nutritional status, disaggregated analysis was conducted for *Paniya* and *Kurichiya* communities. To present the findings on the pathways with community-level factors operating at the neighbourhood level, I have used counterfactual settlement-level case studies from *Paniya* and *Kurichiya* communities in section 4.3.2. In section 4.3.3, I have used settlement-level embedded case studies and presented the pathways of how household, parental and individual-level factors contributed to the nutritional inequalities within the *Paniya* and the *Kurichiya* settlements.

#### ***4.1 Differentials in child nutritional status between Paniya and Kurichya communities***

OBJECTIVE 1: To examine the child nutritional inequality between *Paniya* and *Kurichiya* tribal communities in the Wayanad district.

This section presents the differentials in child nutritional status between *Paniya* and *Kurichiya* with respect to moderate and severe undernutrition. The following anthropometric indicators were used to measure these: stunting, wasting, and underweight. Finally, the difference is presented using the CIAF index. Among the *Paniya* community, a higher proportion of children were moderately wasted (22.5%), underweighted (40.4%), and stunted (35.8%) as compared with children of the *Kurichiya* community (11% wasted, 27% underweight, 21.5% stunted). Indeed, there was a widening inequality in severe anthropometric failures between *Paniya* and *Kurichiya* children. A much higher proportion of *Paniya* children had severe stunting (18.5%) and were underweight (16.6%) compared to *Kurichiya* children: 3.1% were severely stunted, and 6.7% were severely underweight. Interestingly, severe

wasting was found in only 2.6% of *Paniya* and 1.2% of the *Kurichiya* community. All these differences were statistically significant (Table 8).

**Table 8: Differences in Child Nutritional Status**

| Wasted                      | Kurichya       | <i>Paniya</i>  | Total          |             |        |
|-----------------------------|----------------|----------------|----------------|-------------|--------|
| Not Wasted                  | 143<br>(87.7%) | 113<br>(74.8%) | 256<br>(81.5%) | 8.66        | 0.003  |
| Wasted                      | 20 (12.3%)     | 38 (25.2%)     | 58 (18.5%)     |             |        |
| Underweight                 |                |                |                |             |        |
| Not Underweight             | 114<br>(69.9%) | 62 (41.1%)     | 176<br>(56.1%) | 26.54       | 0.0001 |
| Underweight                 | 49 (30.1%)     | 89 (58.9%)     | 138<br>(43.9%) |             |        |
| Stunted                     |                |                |                |             |        |
| Not Stunted                 | 117<br>(71.8%) | 72 (47.7%)     | 189<br>(60.2%) | 19          | 0.0001 |
| Stunted                     | 46 (28.2%)     | 79 (52.3%)     | 125<br>(39.8%) |             |        |
| Severe wasting category     |                |                |                |             |        |
| Severe wasting              | 2 (1.2%)       | 4 (2.6%)       | 6 (1.9%)       | <b>8.63</b> | 0.008  |
| Moderate wasting            | 18 (11%)       | 34 (22.5%)     | 52 (16.6%)     |             |        |
| Normal                      | 143<br>(87.7%) | 113<br>(74.8%) | 256<br>(81.5%) |             |        |
| Severe underweight category |                |                |                |             |        |
| Severe underweight          | 5 (3.1%)       | 28 (18.5%)     | 33 (10.5%)     | 33.74       | 0.0001 |
| Moderate underweight        | 44 (27%)       | 61 (40.4%)     | 105<br>(33.4%) |             |        |
| Normal                      | 114<br>(69.9%) | 62 (41.1%)     | 176<br>(56.1%) |             |        |
| Severe Stunted category     |                |                |                |             |        |
| Severe stunted              | 11 (6.7%)      | 25 (16.6%)     | 36 (11.5%)     | 19.79       | 0.0001 |
| Moderate stunted            | 35 (21.5%)     | 54 (35.8%)     | 89 (28.3%)     |             |        |
| Normal                      | 117<br>(71.8%) | 72 (47.7%)     | 189<br>(60.2%) |             |        |

Table 9 provides data on the Composite Index of Anthropometric Failure (CIAF) among children from the *Paniya* and *Kurichiya* communities. A higher proportion of children from the *Paniya* community was reported to suffer at least one anthropometric failure (66.9%) compared with that of the *Kurichiya* community (41.1%). However,

no significant difference was observed in single anthropometric failures (only stunting, only wasting and only underweight) and double failure of underweight and wasting. All the same, there was a significant difference in the proportion of children who suffered from all three forms of anthropometric failures observed between the *Paniya* (16.6%) and *Kurichiya* (4.3%) communities ( $p= 0.0001$ ). Similarly, differences in double failures of underweight and stunting were also significant between *Paniya* (29.1%) and *Kurichiya* (14.1%) communities ( $X^2= 10.54$ ,  $p=.001$ ).

| Table 9: Differences in Composite Index of Anthropometric Failure |               |                  |             |       |        |
|---|---------------|------------------|-------------|-------|--------|
|   | <i>Paniya</i> | <i>Kurichiya</i> | Total       | X2    | P      |
| No failures   |               |                  |             |       |        |
| No  | 101 (66.9%)   | 67 (41.1%)       | 168 (53.5%) | 20.95 | 0.0001 |
| Yes   | 50 (33.1%)    | 96 (58.9%)       | 146 (46.5%) |       |        |
| Only wasting  |               |                  |             |       |        |
| No  | 149 (98.7%)   | 161 (98.8%)      | 310 (98.7%) | 0.006 | 1      |
| Yes   | 2 (1.3%)      | 2 (1.2%)         | 4 (1.3%)    |       |        |
| Underweight and wasting   |               |                  |             |       |        |
| No  | 140 (92.7%)   | 152 (93.3%)      | 292 (93%)   | 0.035 | 1      |
| Yes   | 11 (7.3%)     | 11 (6.7%)        | 22 (7%)     |       |        |
| Underweight, wasting, and stunting                                |               |                  |             |       |        |
| No  | 126 (83.4%)   | 156 (95.7%)      | 282 (89.8%) | 12.9  | 0.0001 |
| Yes   | 25 (16.6%)    | 7 (4.3%)         | 32 (10.2%)  |       |        |
| Underweight and stunted   |               |                  |             |       |        |
| No  | 107 (70.9%)   | 140 (85.9%)      | 247 (78.7%) | 10.54 | 0.001  |
| Yes   | 44 (29.1%)    | 23 (14.1%)       | 67 (21.3%)  |       |        |
| Only stunted  |               |                  |             |       |        |
| No  | 141 (93.4%)   | 147 (90.2%)      | 288 (91.7%) | 1.05  | 0.2    |
| Yes   | 10 (6.6%)     | 16 (9.8)         | 26 (8.3%)   |       |        |
| Only underweight  |               |                  |             |       |        |
| No  | 142 (94%)     | 155 (95.1%)      | 297 (94.6%) | 0.17  | 0.8    |
| Yes   | 9 (6%)        | 8 (4.9%)         | 17 (5.4%)   |       |        |
| CIAF*   |               |                  |             |       |        |
| No  | 50 (33.1%)    | 96 (58.9%)       | 146 (46.5%) | 20.95 | 0.0001 |
| Yes   | 101 (66.9%)   | 67 (41.1%)       | 168 (53.5%) |       |        |

\*Composite Index of Anthropometric Failures

## ***4.2 Historical and Contextual Factors underpinning inequities in child nutritional status between Paniya and Kurichiya communities***

**Objective 2:** To understand the historical and contextual factors that lead to significant differentials in child nutritional status between the *Paniya* and *Kurichiya* communities in Wayanad district, Kerala.

In order to elucidate the historical factors, this section draws on the secondary data collected from the published studies that documented *Paniya* and *Kurichiya* history and the primary data collected from *Paniya* and *Kurichiya* community participants non-tribal community members and key Informants in the settlement level case studies. To explain the contextual factors, I have used quantitative and qualitative case studies data.

### **4.2.1 Historical Factors**

#### ***4.2.1.1 Land ownership***

***Paniya:*** In line with the historical account of the *Paniya* community in Wayanad (Kulirani, 1996; Nair, 1911), the *Paniya* people in our case studies were the descendants of bonded labourers of upper-caste landlords. The community's history as bonded labourers was perceived as the reason for the landlessness and current miseries they face. As noted by other scholars, the elderly *Paniya* participants in this study spoke of being subjected to oppression, subjugation, violence (Gopi, 2002; Susamma, 2013; Vinod, 2009), and economic exploitation under their masters (Vinod, 2009).

While describing the poor living condition that existed in the settlement, a community leader (48 years old) reported:

*"Those people (parents who received land in the settlement) were slave workers. The government gave this land. Each slave worker was given one-acre land."*

In the aftermath of World War II, the food crisis in Kerala in the 1940s triggered large-scale migration of non-tribal marginal farmers from erstwhile Cochin and Travancore to the high mountains of Wayanad. The non-tribal immigrants acquired large tracts of land during this period. Firstly, they have directly acquired land from the landlords. Secondly, they obtained the land at a cheaper rate owned by the tribal communities through counterfeit land titles or by giving alcohol to tribal men. Thus, the only marginal landholding of the *Paniya* community was lost to the non-tribal migrant community during this time (Bijoy and Raman, 2003; Paul, 2017). When Kerala's land reform act of 1963<sup>4</sup> was enacted and amended in 1969, the landlords and other settlers who owned more land had sufficient time to transfer the landholding to their relatives and trustworthy dependents to escape the land ceiling laws. Consequently, the bulk of the land transfer during this time was in favour of the non-tribal population. It did not benefit the *Paniya* communities to secure land ownership (Prashanth, 1985). After the land reform act in 1963, many *Paniya* households were forcefully removed from the fertile land. They were pushed to the corner of the property as the landlords feared the loss of the land. The large-scale migration of the non-tribal people from the plains that happened prior to this period reduced the land available to the *Paniya* people during the bonded labour period. The elderly *Paniya* participants in the *Paniya* case studies recalled the landlessness during this time and being rehabilitated in new places

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<sup>4</sup> An Act to enact a comprehensive legislation relating to land reforms in the State of Kerala.

under the government tribal land rehabilitation project. This has resulted in the merger and unproductive landholding of the *Paniya* community.

***Kurichiya:*** There is no consensus about the historical origin of the *Kurichiya* community. According to the local belief system, *Kurichiya* were the soldiers of Lord Rama (Nimisha, 2018a), while; some other accounts reported that *Kurichiya* were the early settlers in Wayanad around the first and third century AD (Thurston, 1897). All the historical accounts recorded in the literature and reports shared by the study respondents revealed that the *Kurichiya* community enjoyed a higher social status among the tribal communities in Wayanad. The historical narratives of the *Kurichiya* community by Kunhaman (1989) and; Kurup (2010) revealed that the *Kurichiya* community was closely associated with erstwhile king Kerala Varma Pazhassi Raja and conducted guerrilla warfare against colonial rulers from 1792. In the subsequent period after the death of Pazhassi Raja in November 1805, the *Kurichiya* revolted against the colonial rulers on 1812 March against the oppressive administrative practices and could protect their common community land (Kunhaman, 1989; Kurup, 2010). The two *Kurichiya* settlements in the case study followed a joint family system called *mittam* or *tharavad* and owned a large land area, including one or two hillocks and a wetland between the hillocks. During the land reform act of 1963, the community leaders in *Kurichiya* study settlements divided the land among the individual households to protect the land owned by the community.

#### 4.2.1.2 *Livelihood*

***Paniya:*** *Paniya* community was bonded labour of upper-caste Hindu or Muslim landlords (Kulirani, 1996; Nair, 1911). The evidence collected from the document review highlighted three significant features of the bonded labour system during this

period, including the institutionalization of bonded labour system around the temple rituals, violent oppression and subjugation of the enslaved people and economic exploitation. Panoor (1971) and Gopi (2002) have elaborated on how the annual slave market was organized during the festival of Valliyoorkav Bhagavathy temple, where *Paniya* households were recruited or renewed their contract as bonded labours by advancing money called Nippupanam or Valiyurkaupanam. After accepting the money, *Paniya* had to take an oath to serve the master for one year until the temple festival the following year, and disobedience or the breach of the oath was considered a sin (Gopi, 2002; Panoor, 1971). Though slavery was legally abolished in India in 1843, the British administrative system allowed it to continue in support of feudal landlords (Paul, 2017). Though bonded labour system ceased to exist subsequent to the independence period of the country, the land available to the *Paniya* people in both settlements was inadequate to meet their daily needs. This forced the *Paniya* people from both the settlements to depend on the non-tribal people in the immediate neighbourhood for livelihood. During the early days of their life in the settlement, their landlords continued the bonded labour system informally. Recalling the experience of labour exploitation during this time, an elderly participant from the community reported that

*"You know, we were the slaves of XXX. We were afraid of them. If we failed to go to work a day, they would beat us. We were so much afraid of them".*

After the large-scale migration of non-tribal to the district, the community's traditional labour opportunities become unviable due to the overall shift in agriculture from food crops to cash crop cultivation. To cope with the unstable labour opportunities, the *Paniya* people adopted seasonal labour migration and domestic work in the house of non-tribals.

***Kurichiya:*** With sufficient land ownership, the *Kurichiya* people in the case studies depend on agriculture and cattle rearing as their main livelihood practices. During the period of the joint family system, the community cultivated a variety of food crops, including rice, ragi, jowar, pulses, tubers, and vegetables, collectively and maintained a self-sufficient food system and livelihood. People were generally discouraged from working outside the community settlement as daily wage labourers. Cattle rearing was an important occupation; each settlement owned hundreds of cattle. The ownership of cattle was considered an important marker of social position. However, the community members responded that after the joint family period, when each household family started living separately, there was an initial period of the financial crisis. The increasing interaction with the non-tribal communities marked a gradual departure from food crop cultivation to cash crop cultivation. Recalling this shift, an elderly participant from the *Kurichiya* community reported that

*“When they (the migrant non-tribal people) visited us from outside, they would remind us of the necessary change in our way of life. They told us about the importance of education. We learned that we could make a lot of money by farming certain crops like ginger and coffee from them. We also realized that our children could go to school and get educated if we could stand on our own.”*

During this time, the community started cultivating cash crops, including coffee, pepper, beetle, rubber, areca nut, coconut, cashew, plantain, cardamom, ginger, and the cultivation of food crops declined gradually. In addition to agriculture practices, several community members in selected settlements were employed in government services, predominantly in Indian postal services.

#### 4.2.1.3 *Social and Institutional Capital*

***Paniya***: The elderly participants in the study reported that during the period of bonded labour system, a cluster of *Paniya* households (usually belonging to the same clan) were organised under one *mooppan* (tribal head) who would stay near the paddy fields under one landlord. The *mooppan* was usually the eldest member of the settlement and was appointed by the landlord as a mediator between the landlord and the settlement household. The *mooppan* was generally respected among the settlement households and held an important position, and it was a very close-knit community. Meaning that though the community suffered exploitation and oppression during this time, the *Paniya* people had a community leader and were organised under this leadership. However, the responses of the *Paniya* people in our case studies revealed that this leadership was weakened over time. When people were dislocated from their land by their masters after the land reform act, the community-level leadership under the bonded labour system weakened, and the binding social norms were disrupted. This led to the breakdown of community ties, norms, and solidarity that regulated their public behaviour earlier. This was because when the government rehabilitated the landless *Paniya* people under various rehabilitation projects, the people who received the new land in the same settlement area often belonged to different clans and reported poor social ties within the settlement. The weakening of traditional leadership in the community necessitated the support of external leadership. In the absence of this, the *Paniya* people were observed to be disorganised and silenced. The weakening community leadership adversely affected social cohesion and community organisation. The *Paniya* people who received the support of an external leadership were more organised, could question the discriminatory experiences in public institutions, and could represent their voice in developmental programmes implemented for the community.

***Kurichiya:*** Traditionally, the community head in the *Kurichiya* community was known as "*Karanavar*", who played a critical role in the organisation of the workforce, utilisation and distribution of land resources, and practices of community cultural and religious events. The responses of the community participants revealed that the *Karanavar* played a crucial role in building social cohesion and community organisation through establishing community norms and practising community rituals. The elderly *Kurichiya* people think that the community's association with the local king helped them expand their social network with the upper caste communities in the places and earned them respect. The non-tribal people from the neighbourhood of the case study settlements reported having a better social connection with the *Kurichiya* and receiving food support from the *Kurichiya* people during the lean. This better social network outside the community settlement seems to have translated into achieving political power and representation of the *Kurichiya* community. Out of all four Panchayaths where our case study settlements were located, in two panchayaths, *Kurichiya* community members were represented as panchayath presidents, and in two panchayaths, non-tribal people were represented.

#### 4.2.1.4 *Cultural capital*

***Paniya:*** As recounted by an elderly member of the community, during the bonded labour period, the *Paniya* people lived on the fringes of paddy fields, and their culture and lifestyle evolved to the echo system they lived in. They followed elaborate religious rituals in connection with the community members' puberty, marriage, and death. A traditional dance known as Vattakkali was performed on all these occasions and was directly observed during the fieldwork. The elderly community members reported that these community celebrations fostered a feeling of oneness among the

community members. Mooppan, as community head, officiated these rituals. *Paniya* people spoke a distinct language known as *Paniya* Bhasha, which had no written script. Though *Paniya*'s religious practices differ from the non-tribal people's religion in the neighbourhood, most of the *Paniya* people in the case study identify themselves as belonging to the Hindu religion. In an informal interaction, a scholar who worked among the *Paniya* community opined that the non-tribal people influenced the religious practices of the *Paniya* community in different phases. During the bonded labour period, the *Paniya* people were influenced by upper-caste landlords from the Hindu religion. The non-tribal Christian migrants who came to Wayanad, under whom *Paniya* people were agriculture labourers. Scholars have noted that the schools started by Christian missionaries during this time focused mainly on educating the Christian migrants. Though they extended their services to the tribal communities, including *Paniya*, their culture and lifestyle were deemed inferior, alienating the *Paniya* children from schools (Susamma, 2013). The exclusion of *Paniya* people from schools due to cultural barriers contributed to poor educational achievement as the cultural capital and exclusion from the formal labour market.

**Kurchiya:** Though the *Kurichiya* people followed an indigenous religious practice, in many aspects, the *Kurichiya* people maintained a close affinity with the upper-caste Nair community. The *Kurichiya* people believed in the practice of purity and pollution. They followed the matrilineal joint family system and lived in what was known as *Tharavadu* or *mittam* (ancestral home), similar to the upper caste Nair community. Traditionally, the community worshipped natural forces, stones, and trees, maintained a sacred grove called Kavay for worshipping God and considered the settlement area a sacred place. While returning from outside, the household members had to take a bath from the shared community pond to purify themselves. Overall, the community's

religious and cultural practices helped the community develop hygienic habits. Household members were prohibited from eating the food prepared by people from other castes except for Namboothiri and Nair caste, and those who violated this were expelled from the community. The community members' response reflected that the community's everyday cultural celebrations, including *puthari maholsthavam*, *thulapathe*, and *vishu* were associated with agriculture practices and the joint family system, which were the essential markers of community culture which fostered community cohesion. However, the community members' responses revealed inequitable social positions for women in the community. Though the community followed the matrilineal inheritance system, the women in the community did not have the decision-making power in the affairs of the *Tharavad*. The community participants reported that women's struggles increased even more during the early period of the nuclear family. Men used to marry twice or thrice. If a man felt that a woman was not fit, he would discard her, and his parents would bring him another woman. Women's education was neglected among the generation. Travelling outside the settlement was restricted for women. As an elderly male participant recounted:

*“They could not go out of their houses or look at any man on his face in the past. Now, couples go out together and travel in the same vehicle. They were not allowed to talk to the men who had visited their houses earlier. That has also changed.”*

Some older men could complete their secondary or higher secondary school education, serve as public servants, and retire. However, among the older women, none completed secondary school education or achieved any white-collar job.

#### 4.2.1.5 Health Behaviour

**Paniya:** During the bonded labour period, tobacco use was common among the *Paniya* community. Upper-caste landlords cultivated tobacco in Wayanad and offered it to the *Paniya* people at the time of yearly recruitment of *Paniya* as bonded labour at Valliyoorkavu temple. However, alcohol consumption was not reported among the *Paniya* people during the bonded labour period. The report of our study participants revealed that the Christian farmers who migrated to Wayanad in the 1920s introduced brewing alcohol from locally available resources. They used this alcohol to attract the *Paniya* labour force to their agricultural land or to obtain land belonging to tribal people. In the beginning, alcohol was served to the *Paniya* people to extract maximum labour capacity. Later, when they became addicted to it, the price of the alcohol was deducted from their wage (Paul, 2017). The responses of our case study participants revealed that when the bonded labour system was ended legally, the households in the settlement faced severe poverty and uncertainty about their future. During this time, the *Paniya* people learned to brew alcohol from the migrant farmers and started making it their own. During this time, among the non-tribal people, the settlement was known for high alcohol consumption, crime, suicide, and domestic violence.

**Kurichiya:** Traditionally, chewing betel quid with tobacco was part of community life. The community members consumed country-made alcoholic beverages in small quantities during community festivals; on other occasions, alcohol consumption was prohibited in the community. The household used to practice indigenous medicine for minor ailments, bone setting, and snake bites. Traditionally, illness was believed to be associated with the violation of community rituals and the wrath of gods. The community followed indigenous caring practices for pregnant and lactating mothers with special diets and medicine. After the child's delivery, the mothers were given a

special gruel prepared using broken rice, pepper, cumin, garlic and other spices in the days after the delivery. On the 28th day, the child is given semi-solid food made of milk, ragi powder and jaggery. Early initiation of complementary feeding was common among the *Kurichiya* people.

#### 4.2.1.6 Food security

***Paniya:*** The elderly *Paniya* people were given paddy as a wage for their labour during the bonded labour system. The men were paid two and half *sers* (1 ser = 1 litre) for men and two *sers* for women. During harvest, they also received additional quantities of 60 *sers* of paddy twice a year. After the day-long work, the women would return home with their share of rice and process it to extract the rice from the paddy and then cook it. Meanwhile, men would go to the market and sell the paddy to the local vendor. *Paniya* people had free access to the forest land and vast spans of open and swampy fields where they could explore and harvest plants, collect crabs and fish, etc. The food collected from the surrounding ecosystem served rich dietary diversity to the community. They had followed dietary practices rich in wild tubers, leafy vegetables, mushrooms, fish, and meat collected from their immediate neighbourhoods. However, with the migration of the non-tribal Christian communities in the twentieth century, the open land that the *Paniya* had access to earlier became private property to which the *Paniya* people had no access. The conversion of wetlands to cultivate commercial crops changed the ecological system, reducing the availability of crabs, fish, and various leafy vegetables available to the *Paniya* people in abundance.

***Kurichiya:*** During the joint family system, the community had diverse sources of food. This included many varieties of rice, ragi, tubers, vegetables, and leafy vegetables grown on their homestead. Hunting wild animals was an essential part of the community ritual. However, the Wildlife Protection Act of 1972 limited community access to the forest. Though the cultivation of cereals declined drastically, most households in the case study settlements could grow various fruits and vegetables in their backyard. The rice distributed from the PDS shops

compensated for the decline in cereal cultivation. The multiple food sources could ensure food diversity and quantity for most households. Additionally, because of the better livelihood practices and the availability of disposable household income, most of the Kurichiya households in the case study could access food from the open market.

## **4.2.2 Contextual Factors**

### *4.2.2.1 Land ownership*

The cross-sectional survey revealed that the multiple historical trajectories explained in the previous section shaped an inequitable distribution of land resources between the *Paniya* and *Kurichiya* communities. Nearly three fourth of the *Paniya* households (71.5%) and one-fourth of *Kurichiya* households (25.8%) own less than 5 cents of land. An almost equal proportion of *Paniya* and *Kurichiya* households own six to ten cents of land (9.9% and 10.4%, respectively). However, while 30.1% of *Kurichiya* households own 11 to 50 cents of land, only 17.2% of *Paniya* households own 11 to 50 cents of land. Widening inequality was reported in a household with more than 50 cents of land. While 33.7% of *Kurichiya* households own more than 51 cents of land, only 1.3% of *Paniya* households could own it. Overall, the mean land holding of the *Paniya* community was 8.69 cents (SD = 15.11), whereas the mean land holding of the *Kurichiya* community was 58.36 cents (SD = 71.47). The independent-sample t-test shows this difference in the land hold is significant ( $t= 8.37$ ;  $p=.0001$ ) with a mean difference of 49.67 cents (95% CI= 37.99 – 61.35) (Table 10). Further cross-tabulation reveals that the household's ability to grow a small kitchen garden follows the land ownership pattern. Among the households that own less than five cents of land, only 56.7% of households could grow any vegetables or fruit plants on their homestead. However, 87.5% of the households that own six to ten cents of land and 100% of the

households that own more than 10 cents of land could grow at least some varieties of fruits and vegetable plants in their homestead. This pattern differs for *Paniya* and *Kurichiya* households. Among the *Kurichiya* households that own less than five cents of land, 85.7% of them could grow at least some vegetables or fruit plants, whereas, among the *Paniya* community, it was only 45.4%. The availability of water sources in the settlement is a striking difference between *Paniya* and *Kurichiya* households. While half of *Kurichiya* households (51.5%) have piped water connections, only 11.9% of *Paniya* households have piped water connections. Approximately one-third (32.5%) of the *Paniya* household had to fetch water from more than five minutes' distance, while only 23.9% of households in the *Kurichiya* community had that difficulty. In the settlement level observation checklist, 28 (18.5%) settlements were observed with very unsatisfactory hygienic conditions. The very unsatisfactory hygienic condition was scored based on the observation of no drainage facilities, accumulation of garbage and refuse in the open space, and high-level vermin infestation in the settlement. At the same time, none of the *Kurichiya* settlements scored in this category. Similarly, 103 (68.2%) *Paniya* settlements and 15 (9.2%) *Kurichiya* settlements were observed with the unsatisfactory hygienic condition. This means that any of the two unhygienic conditions three mentioned above exist in these settlements. While only 15 (9.9%) *Paniya* settlements were observed to have satisfactory hygiene, 28 (17.2%) *Kurichiya* settlements were in this category. The satisfactory hygiene meant the three environmental hygiene issues were not observed in most of the houses. Nearly three fourth of the *Kurichiya* settlements (73.6%) were observed with a very satisfactory level of hygiene, with all the houses maintaining good hygiene with adequate drainage facilities, garbage disposal and with flies, pests and rodents. Whereas only five *Paniya* settlements (3.3%) were observed to a very satisfactory level

of hygiene. The settlement-level case studies of the *Paniya* and *Kurichiya* communities further unravelled how the inequality in land ownership affected the nutritional status of children in both communities.

***Paniya:*** In this study, the two *Paniya* settlements are the rehabilitated settlements of landless *Paniya* people. Currently, 3.8 acres of land was shared among 27 households (avg. 14 cents) in the LPS *Paniya* community and 5.3 acres of land among 33 households (avg. 16 cents) in the HPS community. Overall, the land available to households in both settlements was inadequate to meet their livelihood needs, forcing them to depend on the non-tribal people in the neighbourhood, resulting in unequal power relations between the tribal and non-tribal people. Additionally, the quality of the land available to the community was a striking feature in the case study. The land the *Paniya* people received as part of the rehabilitation project was barren and infertile land with inadequate water sources. Water availability was a critical factor that shaped hygiene and sanitation practices and the cultivation of the available land. The *Paniya* households with poor access to water sources could grow only a limited variety of food in their kitchen garden. The community members reported water scarcity as a critical concern that led to poor hygiene and sanitation practices. With the increasing population in the *Paniya* settlements and the shrinking household space, household garbage and refuse accumulated in the *Paniya* settlements.

***Kurichiya:*** The two *Kurichiya* settlements in the case studies are traditionally inherited land. The average land holding in HPS *Kurichiya* is 1.2 acres, and in LPS *Kurichiya*, it is 2.9 acres. Most households in the *Kurichiya* case study practice agriculture as part of their livelihood and other occupations. The settlement consisted of both dry land and wetland. Multiple water sources are available in the settlement, facilitating most households' optimal use of the available land for cultivation. The households generally

grow cash crops on dry land. Rice cultivation in both case studies declined, and most of the wetland was converted for banana cultivation. Rice is generally cultivated for community rituals.

#### 4.2.2.2 *Livelihood*

My cross-sectional survey collected limited information about the inequality in livelihood practices between *Paniya* and *Kurichiya* communities. The questions on mothers' employment status recorded that a higher proportion of *Paniya* mothers (41.1%) were engaged in remunerated work compared with *Kurichiya* mothers (34.4%). In contrast to this, while 43% of *Paniya* mothers were engaged in only domestic work, it was 21.5% among the *Kurichiya* community (Table 10). The settlement-level case studies revealed a detailed understanding of the livelihood practices and inequality between the *Paniya* and *Kurichiya* communities.

***Paniya:*** *Paniya* people in the case study settlement get domestic daily wage labour opportunities depending on the agriculture season. Economic marginalisation due to landlessness and inadequate livelihood sources forced the *Paniya* people to depend on the neighbourhood's non-tribal people. Without regular domestic employment opportunities, *Paniya* people generally depend on seasonal labour migration to the neighbouring state of Karnataka or employment opportunities under the National Rural Employment Guarantee Act (NREGA) program. *Paniya* men migrate to work in the ginger or banana cultivation fields in Karnataka districts that share borders with Wayanad. Usually, the non-tribal people in the neighbourhood take land on lease and employ *Paniya* people to work in the field. The living arrangement in these fields is reported to be minimal. *Paniya* men reported that after a heavy day of work, they require alcohol to ease their physical pain from work and sleep. Hence, a major portion

of their wage is spent on alcohol consumption. These men usually return to their homes once a month or two. When they return home, they buy a few bottles of alcohol to be given to their other household members, relatives and friends and a few packets of bakery food items for their kids with a major portion of the money they saved from their daily wage. Consequently, the household financial support from the men who migrate is limited, forcing the women to engage more time in income-generating activities to make ends meet. The women were primarily domestic workers in non-tribal households and worked under Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) schemes. Maternal employment provided financial autonomy to the mother, but this has compromised child care and did not significantly improve child nutrition. In these ways, the poor land ownership and livelihood opportunities, in general, limited the *Paniya* household's ability to ensure adequate care, food diversity and quality in times of economic difficulties.

***Kurichiya:*** As the land got partitioned among the households, most of the households in both settlements became marginal farmers. In the case study, most *Kurichiya* people shifted from food crop cultivation to predominantly cash crop cultivation. The crops cultivated include coffee, pepper, paddy, beetle, rubber, areca nut, coconut, cashew, plantain, cardamom, clove, cinnamon, ginger, kokum, purple yam, colocasia, elephant yam and tapioca. The land has a rich diversity of wild trees, and in most of the trees, pepper is grown. However, the increasing climate change and market fluctuation in the price of agricultural products have increased the uncertainty in the agriculture-based livelihood of the *Kurichiya* people. *Kurichiya* people from both case studies diversified their livelihoods and are actively involved in the domestic labour market to cope with this. *Kurichiya* people in both settlements reported that in addition to domestic work, they take remunerative work such as domestic work, home nursing, etc. *Kurichiya*

community members are known for their expertise in Ayurvedic treatment, known as *Marma Chikitsa* (marma point therapy) and archery. Several *Marma Chikitsa* centres and archery training institutes were run by Kurichiya community members. Other engagements include contract works in Kerala State Electricity Board, security guard, salesperson, poultry farming, driver, electrical work, plumbing, painting, cable tv operator, tailoring, archery training and landscaping artist. The households practice co-operated farming in which each household member works on the land of other households in return for the work they receive from other household members. There were a few public servants who worked in the Indian postal service. Though labour migration is relatively less among the *Kurichiya* community, few households in case studies reported that they had leased land in Karnataka and had ginger cultivation. Only recently, women started to engage in remunerated work primarily under the MGNREGA as an economic safety net. With the diversified livelihood strategy and land availability, *Kurichiya* households could ensure more stable income, food security, and care for young children.

#### 4.2.2.1 *Social and institutional capital*

Community access to institutional resources is considered as social capital because it represents the community's ability to access and utilise social resources for their well-being and benefit. The cross-sectional survey recorded inequality between *Paniya* and *Kurichiya* communities' access to social welfare and nutritional services. The cross-sectional survey revealed that only half of the *Paniya* children (50.5%) could access the Anganwadi services regularly, whereas from the *Kurichiya* community (61.3%) of children reported using Anganwadi services. Similarly, a higher proportion of *Kurichiya* households (80.4%) could access PDS services than the *Paniya* community

(69.5%). The finding from the case study further explained the contextual factors that shaped the community-level inequality in service utilisation.

| Table 10: Distribution of socio-demographic variables and nutritional status between <i>Kurichiya</i> and <i>Paniya</i> tribal communities |                         |                      |              |                |     |        |
|--|-------------------------|----------------------|--------------|----------------|-----|--------|
| Variable   | <i>Kurichiya</i><br>(%) | <i>Paniya</i><br>(%) | Total<br>(%) | X <sup>2</sup> | df  | P      |
| <b>Land ownership-related factors</b>  |                         |                      |              |                |     |        |
| <b>Land ownership-related factors</b>  |                         |                      |              |                |     |        |
| 51+ cents  | 55 (33.7)               | 2 (1.3)              | 57 (18.2)    | 85.16          | 3   | 0.0001 |
| 11 - 50 cents  | 49 (30.1)               | 26 (17.2)            | 75 (23.9)    |                |     |        |
| 6 - 10 cents   | 17 (10.4)               | 15 (9.9)             | 32 (10.2)    |                |     |        |
| <=5 cents  | 42 (25.8)               | 108 (71.5)           | 150 (47.8)   |                |     |        |
| <b>Availability of kitchen garden</b>  |                         |                      |              |                |     |        |
| Yes  | 155 (95.1)              | 90 (59.6)            | 245 (78)     | 57.58          | 1   | 0.0001 |
| No   | 8 (4.9)                 | 61 (40.4)            | 69 (22)      |                |     |        |
| <b>The main source of drinking water</b>   |                         |                      |              |                |     |        |
| Well   | 55 (33.7)               | 105 (69.5)           | 160 (51)     | 63.21          | 5   | 0.0001 |
| Common Municipal tap   | 12 (7.4)                | 19 (12.6)            | 31 (9.9)     |                |     |        |
| Tap in house   | 84 (51.5)               | 18 (11.9)            | 102 (32.5)   |                |     |        |
| common hand pump   | 2 (1.2)                 | 2 (1.3)              | 4 (1.3)      |                |     |        |
| River/canal  | 0                       | 2 (1.3)              | 2 (.6)       |                |     |        |
| Pond   | 10 (6.1)                | 5 (3.3)              | 15 (4.8)     |                |     |        |
| <b>Hygienic conditions observed in the settlement</b>  |                         |                      |              |                |     |        |
| Very Unsatisfactory  | 0 (0.0)                 | 28 (18.5)            | 28 (8.9)     | 203.2          | 3   | 0.0001 |
| Unsatisfactory   | 15 (9.2)                | 103(68.2)            | 118 (37.6)   |                |     |        |
| Satisfactory   | 28 (17.2)               | 15 (9.9)             | 43 (13.7)    |                |     |        |
| Very Satisfactory  | 120 (73.6)              | 5 (3.3)              | 125 (39.8)   |                |     |        |
| <b>Livelihood related factors</b>  |                         |                      |              |                |     |        |
| <b>Mothers engaged in remunerated work</b>   |                         |                      |              |                |     |        |
| Yes  | 56 (34.4)               | 62 (41.1)            | 118 (37.6)   | 1.5            | df  | 0.13   |
| No   | 107 (65.6)              | 89 (58.9)            | 196 (62.4)   |                | 1   |        |
| <b>Social Capital</b>  |                         |                      |              |                |     |        |
| <b>Access to Anganwadi services</b>  |                         |                      |              |                |     |        |
| No   | 25 (21.7)               | 50 (49.5)            | 75 (34.7)    | 18.29          | df1 | 0.0001 |
| Yes  | 90 (78.3)               | 51 (50.5)            | 141 (65.3)   |                |     |        |

|  |                      |                   |            |                |    |        |
|--|----------------------|-------------------|------------|----------------|----|--------|
| Ownership of ration card                 |                      |                   |            |                |    |        |
| Yes                                      | 131 (80.4)           | 105 (69.5)        | 236 (75.2) | 4.9            | df | 0.03   |
| No                                       | 32 (19.6)            | 46 (30.5)         | 78 (24.8)  |                | 1  |        |
| <b>Cultural Capital</b>                  |                      |                   |            |                |    |        |
| <b>Variable</b>                          | <i>Kurichiya (%)</i> | <i>Paniya (%)</i> | Total (%)  | X <sup>2</sup> | df | P      |
| Education of the mother                  |                      |                   |            |                |    |        |
| Higher-secondary or above                | 51 (31.3)            | 5 (3.3)           | 56 (17.8)  | 159.2          | df | 0.0001 |
| Secondary                                | 103 (63.2)           | 36 (23.8)         | 139 (44.3) |                | 3  |        |
| Primary                                  | 7 (4.3)              | 25 (16.6)         | 32 (10.2)  |                |    |        |
| Without formal education                 | 2 (1.2)              | 85 (56.3)         | 87 (27.7)  |                |    |        |
| Education of the father                  |                      |                   |            |                |    |        |
| Higher-secondary or above                | 24 (14.7)            | 3 (2)             | 27 (8.6)   | 91.7           | df | 0.0001 |
| Secondary                                | 100 (61.3)           | 39 (25.8)         | 139 (44.3) |                | 3  |        |
| Primary                                  | 23 (14.1)            | 22 (14.6)         | 45 (14.3)  |                |    |        |
| Without formal education                 | 16 (9.8)             | 87 (57.6)         | 103 (32.8) |                |    |        |
| <b>Health Behaviour</b>                  |                      |                   |            |                |    |        |
| Maternal alcoholic consumption           |                      |                   |            |                |    |        |
| No                                       | 161 (98.8)           | 116 (76.8)        | 277 (88.2) | 36             | df | 0.0001 |
| Yes                                      | 2 (1.2)              | 35 (23.2)         | 37 (11.8)  |                | 1  |        |
| Maternal experience of domestic Violence |                      |                   |            |                |    |        |
| No                                       | 154 (94.5)           | 99 (65.6)         | 253 (80.6) | 41.87          | df | 0.0001 |
| Yes                                      | 9 (5.5)              | 52 (34.4)         | 61 (19.4)  |                | 1  |        |
| Maternal Age of Marriage                 |                      |                   |            |                |    |        |
| 18+                                      | 155 (96.3)           | 91 (61.5)         | 246 (79.6) | 57.49          | df | 0.0001 |
| <=17                                     | 6 (3.7)              | 57 (38.5)         | 63 (20.4)  |                | 1  |        |
| Paternal alcoholic consumption           |                      |                   |            |                |    |        |
| No                                       | 67 (41.1)            | 37 (24.5)         | 104 (33.1) | 9.75           | df | 0.002  |
| Yes                                      | 96 (58.9)            | 114 (75.5)        | 210 (66.9) |                | 1  |        |
| Total number of household members        |                      |                   |            |                |    |        |
| 9+                                       | 9 (5.6)              | 45 (30)           | 54 (17.3)  | 36.4           | df | 0.0001 |
| 05 – 08                                  | 112 (69.1)           | 88 (58.7)         | 200 (64.1) |                | 2  |        |
| <=4                                      | 41 (25.3)            | 17 (11.3)         | 58 (18.6)  |                |    |        |
| Availability of toilet facility          |                      |                   |            |                |    |        |
| Yes                                      | 154 (94.5)           | 123 (81.5)        | 277 (88.2) | 12.78          | df | 0.0001 |
| No                                       | 9 (5.5)              | 28 (18.5)         | 37 (11.8)  |                | 1  |        |
| Birth Weight                             |                      |                   |            |                |    |        |
| 2.5 kg+                                  | 112 (70.9)           | 80 (58.4)         | 192 (65.1) | 5.04           | df | 0.03   |
| <2.5 kg                                  | 46 (29.1)            | 57 (41.6)         | 103 (34.9) |                | 1  |        |

|  |            |            |             |      |    |      |
|--|------------|------------|-------------|------|----|------|
| History of cough and fever during the last two weeks |            |            |             |      |    |      |
| Yes  | 72 (44.2%) | 90 (59.6%) | 162 (51.6%) | 7.47 | df | .004 |
| No   | 91 (55.8%) | 61 (40.4%) | 152 (48.4%) |      | 1  |      |

**Paniya:** The settlement-level case studies revealed that multiple factors at the institutional and community level constrained the *Paniya* people's ability to utilise institutional resources for their welfare. The Anganwadi Centers (AWCs) in the *Paniya* case studies were located approximately 1 km from the settlement. The Anganwadi Worker (AWW), Anganwadi Helper, and ASHA worker in both case studies belonged to non-tribal communities. Though both the AWWs were well-intentioned, the responses of the AWWs revealed their unconscious stereotype of the *Paniya*, which shaped the undignified experience of the *Paniya* people. Additionally, the KI from both case studies reported that the *Paniya* households often alternate between maternal or paternal natal homes depending on the livelihood opportunities. This often disconnected *Paniya* people from several welfare services like Anganwadi and PDS. The TP in both settlements belonged to the *Kurichiya* community. Overall, the *Paniya* community's representation among the frontline workers was limited, which constrained the *Paniya* voice representation in the welfare service delivery to the community. Community cohesion as social capital was deferred between the settlement and was determined by the kinship relationship within the settlement. The traditional role of the *Mooppan* as a community leader has weakened in the *Paniya* settlements. However, in a place where the community received the support of an external leadership, the *Paniya* people were mobilised and could better utilise institutional resources and resist social and institutional discrimination.

***Kurichiya:*** The AWCs in the *Kurichiya* case study was located in the community's land within the settlement. Anganwadi helpers in both case studies belonged to the *Kurichiya* community. Though the current AWWs belonged to the non-tribal community, in the previous year, AWWs from the *Kurichiya* community served in these AWCs on a temporary appointment basis in previous years. The Anganwadi workers from both settlements were observed escorting the children from their homes in the morning and back to their homes in the absence of their parents. This helped many children to use Anganwadi services regularly. Additionally, children from well-to-do *Kurichiya* households admitted their children to private English medium kindergarten school from three years of age. Tribal Promoters, in both cases, belonged to the *Kurichiya* community from different settlements. The better educational status and political participation *Kurichiya* community were reported as the possible reason for the better representation of the *Kurichiya* community in government jobs compared with other tribal communities. However, the ASHA workers in both case studies belonged to non-tribal communities in the immediate neighbourhood of the settlement. The better utilisation of welfare services, mainly nutritional services, added to the children's household food security and dietary diversity, promoting better nourishment. These factors contributed to the better utilisation of public welfare services among the *Kurichiya* communities.

Though the role of *Karanavar* in the *Kurichiya* community has changed now, the *Karanavar* in the *Kurichiya* community has a substantial role in keeping the community norms and values. The better social capital in the form of community-level cohesion of the *Kurichiya* people was further translated to political representation for the community. The non-tribal people in the neighbourhood of the *Kurichiya* case study settlements expressed their gratitude and trust in the *Kurichiya* people for the

support they received from the *Kurichiya* people when they were new settlers in the neighbourhood. At the community level, the *Kurichiya* people were better mobilised. In this way, the community-level social capital in the form of community cohesion and better representation of community voice in welfare services and network with non-tribal people outside the community facilitated better utilisation of welfare services by *Kurichiya* people.

#### 4.2.2.2 *Cultural Capital*

The settlement-level case studies further explored how the inequality in cultural capital contributed to the inequality in nutritional outcomes. The cross-sectional survey recorded inequality in cultural capital between Paniya and Kurichiya communities regarding their educational attainment. While more than one-third (35.8%) of the Paniya mothers were illiterate, and 20.5% of the mothers were literate but had not received any formal education, illiteracy was only 0.6% among the Kurichiya mothers. Similarly, Paniya mothers who received only primary school, secondary school, and higher secondary school education were 16.6%, 23.8%, and 3.3%, respectively, whereas they were 4.3%, 63.2%, and 31.3% in the Kurichiya community. Similarly, most Paniya fathers (58.9%) did not receive any formal education; only 13.9% received primary education, 25.2% received secondary education, and only 2% received higher or above education. Whereas among the Kurichiya community, most fathers received schooling up to secondary school education, 14.1% received higher secondary or above education, 14.7% received primary school education, and only 8.6% received no formal education.

***Paniya:*** Though *Paniya* children are provided with financial support, transportation facilities, two meals, and a school uniform, the children in the case study settlement

were observed not attending school. The responses of the KIs representing schools and AWCs primarily reflected their perception of the *Paniya* people as primitive and uncivilised. The stereotyped perception of the service providers at school and AWCs contributed to the insulting and discriminatory experience of *Paniya* children leading to their hesitancy in using these services. *Paniya* children roaming around in the settlement during school days and the involvement of *Paniya* children in domestic labour forces in the neighbourhood household were also observed during our data collection. Poor cultural capital in the form of education status also caused the poor institutional capital of the *Paniya* people. Informal interaction with a tribal development officer revealed that though *Paniya* is the numerically dominant tribal group, one must have a minimum of secondary school education to qualify for the selection of tribal promoter post. The general educational backwardness of *Paniya* limited their opportunity to be frontline workers even in places *Paniya* is the majority community. This lack of community representation among frontline service providers limited the *Paniya* voice representation in the welfare public institution leading to the victim-blame attitude of public servants against the *Paniya* people. The non-tribal people make up the numerical majority of the population in the case study location. The responses of the elderly *Paniya* participants and the non-tribal people revealed that *Paniya* people's lifestyle in terms of their language, religious practices, dressing style and dietary practices were distinct from that of non-tribal in the neighbourhood. The *Paniya* culture and lifestyle were considered primitive or inferior by non-tribal participants in the study. *Paniya* people's dependency on the non-tribal people for their livelihood caused coercive acculturation of the *Paniya* community. In non-tribal perception, becoming cultured means confirming the behavioural conduct and social norms of non-tribal people in the neighbourhood. The two *Paniya* case studies show

that the *Paniya* people are at different stages of cultural transition. The *Paniya* people who could adopt the dressing style, linguistic dialect, and dietary practices of non-tribal people in the immediate neighbourhood were accepted as cultured or civilised. *Paniya* people perceived their changing dressing style, linguistic dialect, and food consumption as essential markers of acceptance and culture among the non-tribal in the immediate neighbourhood. The cultural marginalisation of the *Paniya* community is also reflected in public institutions. The *Paniya* language and art forms were not entertained in the public schools they attended. This has been reflected in the poor education status of the *Paniya* people. The early school drop-out and exclusion of *Paniya* people from the social space often deprived the community of health and nutrition-related knowledge and behaviour, exclusion from the formal labour market and limited livelihood opportunities.

***Kurichiya:*** Several culturally specific practices, including the matrilineal inheritance system, early marriage, community-specific attire, hairstyle, and linguistic dialect, have been changed. At present, linguistic dialect and attire resemble the non-tribal communities in the neighbourhood. *Kurichiya* people have not been *othered* to the same extent as *Paniya*. They have been regarded as culturally closer to non-tribal. This cultural affinity with non-tribal people also buffered the discrimination and othering experience of the non-tribal people that the *Paniya* community experiences.

Along with this, better economic and social capital were the other conditions that promoted better educational achievement for the *Kurichiya* community. Currently, most *Kurichiya* households in the case studies own television sets and android mobile handsets with internet connections. Exposure to information media have influenced dietary habit and facilitated cultural transformation. Though many of the cultural practices of the *Kurichiya* community have changed, the community could preserve

important cultural knowledge and practices. The responses of the *Kurichiya karanavar* revealed their rich traditional knowledge about their echo system and resource management in a sustainable way. *Kurichiya* people could capitalise on their traditional knowledge to sustain a better food system by maintaining a better ecosystem. The community is particular in maintaining the community festivals together and perceived such celebrations with pride and as markers of community identity and social cohesion. *Kurichiya* people's mastery of archery won national and regional level accolades and increased their social acceptance. *Kurichiya* could mobilise historically acquired cultural advantages and use them to leverage their social positioning with non-tribal people. The responses of the *Kurichiya* participants revealed that the increased social interaction, education status, and exposure to information media had influenced the community culture.

#### 4.2.2.3 Health Behaviour

While 23.2% of *Paniya* mothers and 75.5% of *Paniya* fathers consume alcohol, it was 1.2% among *Kurichiya* mothers and 58.9% among *Kurichiya* fathers. Among the *Kurichiya* men who consume alcohol, most (67.7%) reported that they consume it once a month or less, 29.2% reported they consume it 2-4 times monthly, and only 3.1% reported they consume it more than two times a week. Whereas among the *Paniya* men who consume alcohol, the majority (51.3%) reported they consume it more than two times a week, 29.2% reported they consume it more than 2-4 times a month, and 19.5% reported they consume it monthly or less. A much higher proportion of *Paniya* mothers reported having experienced domestic violence (34.4%) compared with that *Kurichiya* mothers (5.5%). A greater majority of *Paniya* mothers who experience domestic violence (94.2%) also reported that their spouses consume alcohol. Regarding

sanitation behaviour, 81.5% of the Paniya households have toilet facilities; however, only 67.5% of the mothers reported that their children use the toilet. Whereas 94.5% of *Kurichiya* households recorded having a toilet in their households, 85.3% of *Kurichiya* mothers reported their children using the toilet. Regarding infant and young child feeding practices, a higher proportion of *Paniya* mothers (87.8%) recorded breastfeeding initiation immediately after childbirth compared with the *Kurichiya* mothers (75.6%). Similarly, a higher proportion (61.6%) of *Paniya* mothers reported exclusive breastfeeding for the first six months compared to *Kurichiya* mothers (58.9%). A greater proportion of *Kurichiya* mothers reported early initiation of complementary feeding (21.5%) compared to delayed initiation of complementary feeding (19.6%). Whereas, among the *Paniya* community, more mothers reported delayed initiation of complementary feeding (32.5%) compared to early initiation of complementary feeding (6%). Nearly one-third of the *Paniya* mothers (31.8%) reported they could feed their children two or fewer times a day, 45.7% of mothers reported feeding their children three times a day, and 22.5% of mothers reported feeding their children four times a day. Whereas 46% of *Kurichiya* mothers reported feeding their children four or more times a day, 40.5% reported feeding their children three times a day, and 13.5% reported feeding their children two or fewer times a day. As per the cross-sectional survey, 41.6% of *Paniya* children were born with low birth weight (<2.5 kg), whereas it was 29.1% among the *Kurichiya* children. The *Paniya* case studies further reveal how the contextual factors shaped the behavioural health pattern of the *Paniya* and *Kurichiya* people.

***Paniya:*** A key informant from the *Paniya* case study reported that alcohol and tobacco use is a hunger coping mechanism for community members. Chewing betel quid with tobacco (known as *Murukke*) was observed to be common among both adults and

children in the community during family get together. The guests are also offered murukku during the social gathering. The children were observed using *murukku* with their parents as early as ten years of age. They had reported that when *Paniya*, the household suffered a food shortage, the parents gave tobacco to children to cope with the hunger pangs. The reason reported by *Paniya* people for alcohol consumption was to cope with the pain of manual labour and the easy availability of alcohol at the places of labour migration. Alcohol consumption was perceived as an important problem by the *Paniya* community members. Paternal alcohol consumption was reported to be the most common reason for domestic violence among the parents in the *Paniya* case studies. The mother who reported the experience of Intimate Partner Violence (IPV) in the case studies also suffered the emotional impact of the IPV, which also affected the quality of childcaring practices. As per a medical practitioner's report from the mobile health clinic in one case study, poor maternal health is a major factor affecting the child's nutritional status. He observed that anaemia among the *Paniya* mothers was common, which caused low birth weight babies.

As per the cross-sectional survey, a greater proportion of *Paniya* mothers reported delayed initiation of complementary feeding practices. In connection with this, my case studies showed that *Paniya* children are usually initiated feeding solid food with a ceremony in the temple known as rice eating ceremony "*chorune*" which is celebrated by the household by providing a feast to the family relatives and neighbours. This is celebrated at the age of six months now; however, in the event of financial distress in the household, this can be extended up to nine months. The majority of the *Paniya* mothers could give better feeding practices in terms of early initiation of breastfeeding (75.6%) and exclusive breastfeeding for the first six months (61.6%). However, our case studies reveal that as the *Paniya* mothers start moving out for

remunerated work outside the home, their ability to provide optimal care for their children is limited. In households where both parents were engaged in remunerated work outside the home, children were often seen playing in the mud contaminated with the faeces of humans and domestic animals or near sewage canals, endangering their health. Most of the respondents from this community and the KIs identified this as a possible reason for illness. The higher incidents of infection (cough and fever) among Paniya children could be due to unhealthy environmental conditions. Hand washing before eating or feeding was less common among adults and children. Growth monitoring is rarely done. The *Paniya* case studies further highlighted that the water scarcity at the settlement level limited the household member's ability to follow the appropriate sanitation behaviour even though they were provided with toilet facilities. In one of the case studies, the community members reported that the unhygienic condition in the settlement is an important reason for most of the illnesses children suffered in the settlement; the water scarcity in the settlement limited their ability to address such concerns.

***Kurichiya:*** Participants in the *Kurichiya* settlements reported an increasing trend in alcohol consumption among men. None of the *Kurichiya* mothers in the case study reported consuming alcohol. In line with the cross-sectional survey findings, the consumption of alcohol in limited quantities continues to be practised during festival celebrations, including childbirth, puberty, marriage, housewarming, and the construction of houses. The female respondents in a few households in the case study settlement reported that regular alcohol consumption among men is also associated with conflict and violence between the households and incidents of IPV. Most of the deliveries in the case studies were conducted in the hospital. Mothers are generally given 90 days of special post-natal care. The community members reported that now

pregnant women were sent to their parental homes in the seventh month. They are not assigned any heavy work, and the mothers generally follow doctors' instructions during their Antenatal care (ANC) visits. The community's customary practices of feeding the child with semi-solid food made of ragi, cow milk, and jaggery on the 28<sup>th</sup> day of childbirth vary by settlement. While it is practised in the HPS *Kurichiya* settlement, the LPS *Kurichiya* participants reported that the awareness programmes implemented through SHGs and ICDS positively impacted child-caring practice, and such practices are ceased to exist, which means that most households' traditional rituals related to childbirth are now aligned with instructions they receive from doctors during the ANC visit. *Kurichiya* case studies reported that most nursing mothers are not engaged in remunerated work outside the house. Hygienic caring for the children is reported by most of the KIs. Once the children are admitted to Anganwadi, the mother engages in remunerated work.

#### 4.2.2.4 *Household Food Security*

In all three domains of food insecurity (Anxiety and uncertainty about household food access, Insufficient quality, Insufficient food intake, and its physical consequences) a higher proportion of *Paniya* households reported food insecurity as opposed to the *Kurichiya* community (**Table 11**). This gap was narrow in the domain of anxiety and uncertainty about household food access, where more than three-fourths of the households from *Paniya* (77.5%) and *Kurichiya* (75.5%) communities experienced some degrees of insecurity, and the difference was significant ( $p < .01$ ). In the domain of "Insufficient quality of food", this difference increased with a mean score of 2.61 ( $sd=2.35$ ) in the *Kurichiya* community and 4.5 ( $sd=2.46$ ) in the *Paniya* community ( $p < .001$ ). In the third domain, "Insufficient food intake and its physical consequences",

the mean score of the *Paniya* community (M= 3.3, sd= 2.78) were more than two times that of the *Kurichiya* community (M= 1.48, sd= 1.99), ( $p < .001$ ). The table shows that food insufficiency was not to the extent that anyone had to go hungry all day and night or even go to bed hungry. However, a far more significant proportion of *Paniya* compared to *Kurichiya* households, had to have a smaller meal, skip one of the meals in the day, or go without a particular kind of food. Overall, while more than a third (37.8%) of *Paniya* households were severely food insecure, it was only 11.04% among the *Kurichiya* community. In contrast, the *Kurichiya* community had a higher proportion (20.9%) of mild food insecurity as against only 7.9% in the *Paniya* community. Both communities had an almost equal proportion of moderate food-insecure households. (**Figure 11**).

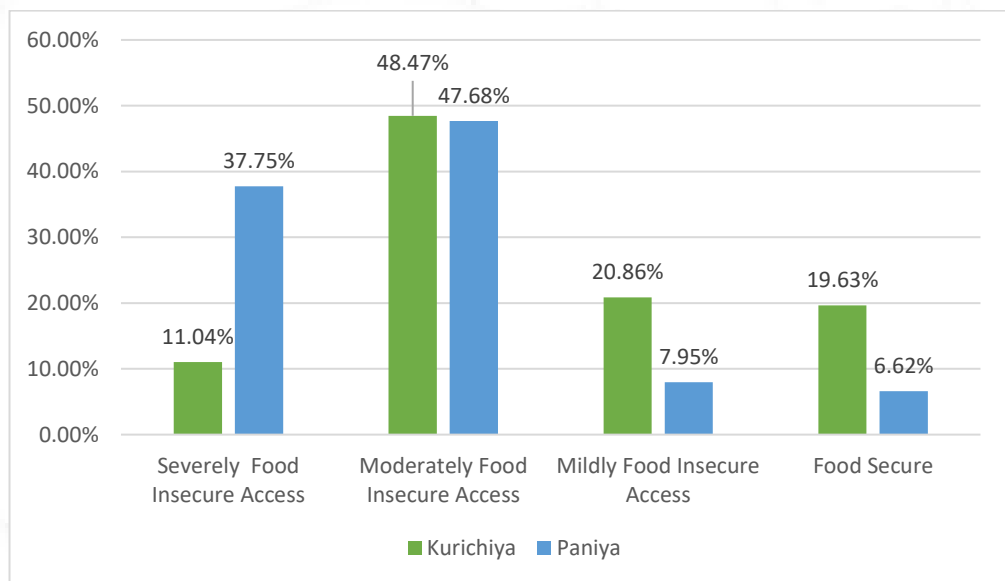


Figure 11: Differences in the food insecurity status between Paniya and Kurichiya tribal communities

Table 11: Prevalence of food insecurity, based on the Household Food Insecurity Access Scale, among the households

|  | No   |                  | Rarely        |                  | Sometime      |                  | Often         |                  | Mean Score (SD) |                  | t              |
|--|--|------------------|---------------|------------------|---------------|------------------|---------------|------------------|-----------------|------------------|----------------|
|  | <i>Paniya</i>  | <i>Kurichiya</i> | <i>Paniya</i> | <i>Kurichiya</i> | <i>Paniya</i> | <i>Kurichiya</i> | <i>Paniya</i> | <i>Kurichiya</i> | <i>Paniya</i>   | <i>Kurichiya</i> |                |
|  | N (%)  | N (%)            | N (%)         | N (%)            | N (%)         | N (%)            | N (%)         | N (%)            | N (%)           | N (%)            |                |
| <b>Domaine 1: Anxiety and uncertainty about household food access</b>    |  |                  |               |                  |               |                  |               |                  |                 |                  |                |
| 1  | In the past four weeks, did you worry that your household would not have enough food?  |                  |               |                  |               |                  |               |                  |                 |                  |                |
|  | 34<br>(22.5)   | 40 (24.5)        | 3 (2)         | 29 (17.8)        | 90<br>(59.6)  | 86 (52.8)        | 24<br>(15.9)  | 8 (4.9)          | 1.69<br>(.99)   | 1.38 (.91)       | <b>2.87**</b>  |
| <b>Domaine 2: Insufficient quality</b>                                   |  |                  |               |                  |               |                  |               |                  |                 |                  |                |
| 2  | In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?  |                  |               |                  |               |                  |               |                  |                 |                  |                |
|  | 36<br>(23.8)   | 75 (46)          | 10 (6.6)      | 27 (16.6)        | 85<br>(56.3)  | 56 (34.4)        | 20<br>(13.2)  | 5 (3.1)          |                 |                  |                |
| 3  | In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?   |                  |               |                  |               |                  |               |                  |                 |                  |                |
|  | 37<br>(24.5)   | 78 (47.9)        | 10 (6.6)      | 30 (18.4)        | 80 (53)       | 50 (30.7)        | 24<br>(15.9)  | 5 (3.1)          | 4.5<br>(2.46)   | 2.61<br>(2.35)   | <b>6.93***</b> |
| 4  | In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food? |                  |               |                  |               |                  |               |                  |                 |                  |                |
|  | 53<br>(35.1)   | 87 (53.4)        | 9 (6)         | 26 (16)          | 78<br>(51.7)  | 48 (29.4)        | 11 (7.3)      | 2 (1.2)          |                 |                  |                |
| <b>Domaine 3: Insufficient food intake and its physical consequences</b> |  |                  |               |                  |               |                  |               |                  |                 |                  |                |

|   | No   |                  | Rarely        |                  | Sometime      |                  | Often         |                  | Mean Score (SD) |                  | t              |
|---|--|------------------|---------------|------------------|---------------|------------------|---------------|------------------|-----------------|------------------|----------------|
|   | <i>Paniya</i>  | <i>Kurichiya</i> | <i>Paniya</i> | <i>Kurichiya</i> | <i>Paniya</i> | <i>Kurichiya</i> | <i>Paniya</i> | <i>Kurichiya</i> | <i>Paniya</i>   | <i>Kurichiya</i> |                |
| 5 | In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food? |                  |               |                  |               |                  |               |                  |                 |                  |                |
|   | 57<br>(37.7)   | 88 (54)          | 8 (5.3)       | 21 (12.9)        | 78<br>(51.7)  | 51 (31.3)        | 8 (53)        | 3 (1.8)          |                 |                  |                |
| 6 | In the past four weeks, did you or any other household members have to eat fewer meals in a day because there was not enough food?             |                  |               |                  |               |                  |               |                  |                 |                  |                |
|   | 57<br>(37.7)   | 120 (73.6)       | 15 (9.9)      | 10 (6.1)         | 70<br>(46.4)  | 32 (19.6)        | 9 (6)         | 1 (.6)           |                 |                  |                |
| 7 | In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?                  |                  |               |                  |               |                  |               |                  |                 |                  |                |
|   | 99<br>(65.6)   | 148 (90.8)       | 20<br>(13.2)  | 8 (4.9)          | 32<br>(21.2)  | 7 (4.3)          | 0.00%         | 0.00%            | 3.3<br>(2.78)   | 1.48<br>(1.99)   | <b>6.69***</b> |
| 8 | In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?                         |                  |               |                  |               |                  |               |                  |                 |                  |                |
|   | 128<br>(84.8)  | 156 (95.7)       | 10 (6.6)      | 3 (1.8)          | 13 (8.6)      | 4 (2.5)          | 0             | 0                |                 |                  |                |
| 9 | In the past four weeks, did you or any household member go a whole day and a night without eating anything because there was not enough food?  |                  |               |                  |               |                  |               |                  |                 |                  |                |
|   | 145<br>(96%)   | 163 (100)        | 3 (2)         | 0                | 3 (2)         | 0                |               |                  |                 |                  |                |

, \*\* p < 0.01, \*\*\* p < 0.001, p-values obtained with independent samples t-tests

***Paniya***: The settlement-level case studies revealed that the changes in the neighbourhood ecology have adversely impacted the food system of the *Paniya* community. The paddy field in the immediate neighbourhood of both case studies has been converted to cultivate banana plants. With these changes, several of the indigenous leafy vegetables that the *Paniya* people eat disappeared from the place of declined drastically. The community members have reported that the use of chemical fertilisers in the field eroded the availability of fish and crabs. Hence, the *Paniya* community depend largely on the rice distributed from PDS shops. Most households receive 30 kg of rice from Public Distribution System (PDS) under the Antodaya scheme, which is the primary staple food source. In addition to this, households receive food supplies from AWC, mid-day meals provided by schools, and occasional food supplies from the tribal department. However, the settlement-level case studies show that the utilisation of these services varies among the *Paniya* community. The cross-sectional survey reported that only 69.5% of *Paniya* households own PDS cards to access these services. Only 50.5% of *Paniya* children aged three to five years old avail of Anganwadi services. Hence, nearly one-third (30.5%) of the *Paniya* households have to purchase food from the open market. The larger families (more than five household members) in the case studies reported that the monthly food supplies received from the PDS were not sufficient to meet their monthly household needs. They have to access food supplies from the open market. The unstable livelihood sources of *Paniya* households limited many of the household's access to food supplies from the open market.

***Kurichiya***: The *Kurichiya* people's agriculture practices shifted from food crop cultivation to cash crop cultivation. However, this has been reflected in cereal

cultivation has declined drastically. The *Kurichiya* people in both case studies continue to cultivate a variety of vegetables and fruits in their kitchen garden. Currently, rice is cultivated for community rituals and the celebration of community festivals. The community depend on the rice distributed from the PDS shop or the open market for staple food. The majority of the *Kurichiya* households (80.4%) in the cross-sectional study reported access to PDS services and received 30 kgs of rice per month per household. In addition to this, households receive food supplies for children and adolescents from AWC, mid-day meals provided by schools, and occasional food supplies from the tribal department. More than three-fourths of children (78.3%) between the age of three to five years could access AWC. In households with multiple water sources, the major portion of vegetables, tubers and fruits consumed in the household was cultivated in the kitchen garden. Additionally, most of the *Kurichiya* people in the case study reported purchasing fruits and vegetables from open markets. The community members cook two main courses on a typical day, which are consumed three times, including breakfast (rice or wheat dish) and rice for lunch and dinner. The changing food style also seems to have affected the health of the people, and the elder members of the community advocate for a return to the traditional organic farming of food crops for better health.

### ***4.3 Pathways of nutritional inequality within the community***

**Objective: To unravel the factors and pathways of influence on differentials in child nutritional status within the *Paniya* and *Kurichiya* communities, including factors at multiple levels such as; community, neighbourhood, household, parental and individual characteristics of the child**

In order to understand the factors associated with nutritional inequality at the community level, I have used a quantitative cross-sectional survey. However, to make

a granular understanding of how the factors at the local neighbourhood level power relationship shape inequity in household food security, healthy environment and nutritional behaviour within the community, I have used community-level counterfactual case studies. To understand how and what factors at the household, parental and individual levels determine food accessibility and nutritional behaviour, I have used household-embedded case studies conducted within the settlement level case studies.

#### **4.3.1 Community-level factors and pathway of nutritional inequality**

To understand the community specific factors associated with child undernutrition (CIAF) among *Paniya* and *Kurichiya* communities, a disaggregated analysis for *Paniya* and *Kurichiya* communities were conducted (Tabel 12 and 13). Interestingly, both communities reported availability of a kitchen garden with fruits and vegetables was significantly associated with CIAF in both communities. In the Panya community, the children from a household without a kitchen garden reported 2.85 (95% CI: 1.04 - 7.81) times higher risk than the *Paniya* children from households with a kitchen garden. This figure is observed to be much higher (Adjusted OR=12.02; 95% CI=1.13 - 128.01) among the *Kurichiya* community. The other significant factor associated with CIAF among the *Paniya* community was a morbidity history of cough and fever during the previous two weeks. While the majority of the *Paniya* children with a morbidity history of cough and fever (78.6%) reported CIAF, the majority of the *Kurichiya* children with a similar morbidity history (54.2%) did not report CIAF. The sex of the child was the only other significant factor associated with CIAF among the *Kurichiya* community. The male children from the *Kurichiya* community had a 2.17 (95% CI: 1.04 - 4.50) higher risk of CIAF compared with their female counterparts. Whereas although not statistically significant, this pattern was observed to reverse

| <b>Table 12: Socio-demographic factors associated with CIAF among <i>Paniya</i> children</b> |             |             |                             |
|--|-------------|-------------|-----------------------------|
| <b>Variable</b>  | <b>CIAF</b> |             | <b>Adjusted OR (95% CI)</b> |
|  | <b>No</b>   | <b>Yes</b>  |                             |
| <b>Total number of household members</b>   |             |             |                             |
| <b>&lt;=4</b>  | 5 (29.41%)  | 12 (70.58%) | 0.84 (.21 - 3.37)           |
| <b>5 - 8.</b>  | 32 (36.36%) | 56 (63.63%) | 0.75 (.17 - 3.25)           |
| <b>9+</b>  | 12 (26.66%) | 33 (73.33%) | Ref:                        |
| <b>Do you get any fruits or vegetables from your back yard?</b>                              |             |             |                             |
| <b>Yes</b>   | 35 (38.9%)  | 55 (61.1%)  | Ref:                        |
| <b>No</b>  | 15 (24.6%)  | 46 (75.4%)  | <b>2.85* (1.04 - 7.81)</b>  |
| <b>Domicile</b>  |             |             |                             |
| <b>Non-Forest</b>  | 29 (34.5%)  | 55 (65.5%)  | Ref:                        |
| <b>Forest</b>  | 21 (31.3%)  | 46 (68.7%)  | 0.95 (.40 - 2.27)           |
| <b>Ownership of ration card</b>  |             |             |                             |
| <b>Yes</b>   | 38 (36.2%)  | 67 (63.8%)  | Ref:                        |
| <b>No</b>  | 12 (26.1%)  | 34 (73.9%)  | 1.07 (.40 - 2.86)           |
| <b>Household food insecurity status</b>  |             |             |                             |
| <b>Food Secure</b>   | 9 (40.9%)   | 13 (59.1%)  | Ref:                        |
| <b>Food insecure</b>   | 41 (31.8%)  | 88 (68.2%)  | 2.04 (.63 - 6.63)           |
| <b>Maternal Experience of Domestic Violence</b>  |             |             |                             |
| <b>No</b>  | 35 (35.4%)  | 64(64.6%)   | Ref:                        |
| <b>Yes</b>   | 15 (28.8%)  | 37 (71.2%)  | 1.12 (.45 - 2.80)           |
| <b>Sex of the Child</b>  |             |             |                             |
| <b>Female</b>  | 23 (29.1)   | 56 (70.9)   | Ref:                        |
| <b>Male</b>  | 27 (37.5)   | 45 (62.5)   | 0.63 (.28 - 1.45)           |
| <b>Birth Weight</b>  |             |             |                             |
| <b>2.5 kg+</b>   | 30 (37.5%)  | 50 (62.5%)  | Ref:                        |
| <b>&lt;2.5 kg</b>  | 15 (26.3%)  | 42 (73.7%)  | <b>2.3 (.94 - 5.61)</b>     |
| <b>History of cough and fever (last two weeks)</b>   |             |             |                             |
| <b>No</b>  | 28 (45.9%)  | 33 (54.1%)  | Ref:                        |
| <b>Yes</b>   | 22 (24.4%)  | 68 (75.6%)  | <b>2.93* (1.24 - 6.93)</b>  |
| <b>Frequency of food consumption</b>   |             |             |                             |
| <b>Four times or more</b>  | 16 (47.1%)  | 18 (52.9%)  | Ref:                        |
| <b>Three times</b>   | 20 (29.0%)  | 49 (71.0%)  | 1.5 (.52 - 4.33)            |
| <b>Two times or less</b>   | 14 (29.2%)  | 34 (70.8%)  | 1.83 (.52 - 6.49)           |

\*p < .05

among the *Paniya* community. In contrast to the *Kurichiya* community, a higher proportion of *Paniya* female children (70.9%) reported CIAF compared to their male counterparts (62.5%). They indicated that the usual female advantage in child nutritional status observed in a nationally representative sample is reversed among the *Paniya* community.

Since *Paniya* and *Kurichiya* households are clustered in settlements, I considered the settlement as a primary unit of the case study. Based on the information collected from the tribal development and Integrated Child Development Services (ICDS)<sup>5</sup> department and assessment of child nutritional status and settlement level characteristics, I selected two *Paniya* and two *Kurichiya* settlements for the counterfactual case study, one with a high prevalence of undernutrition and named it as High Prevalence Settlement (HPS). The other settlement with a low prevalence of undernutrition was called Low Prevalence Settlement (LPS). In this section, I draw on settlement-level case studies and household-level embedded case studies to explain the multi-level (Neighbourhood, household, parental and individual) causal pathways of nutritional inequality within the *Paniya* and *Kurichiya* communities.

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<sup>5</sup> Integrated Child Development Services (ICDS) is India's flagship nutritional program targeted at children upto the age of 6 years, pregnant and lactating mothers and women 16–44 years of age.

**Table 13: Socio-demographic factors associated with CIAF among Kurichiya children**

| Variable   | CIAF              |                   | Adjusted OR<br>(95% CI)       |
|--|-------------------|-------------------|-------------------------------|
|  | No                | Yes               |                               |
| <b>Total number of household members</b>                       |                   |                   |                               |
| <=4  | 28 (68.3%)        | 13 (31.7%)        | Ref:                          |
| 5 - 8.   | 63 (56.3%)        | 49 (43.8%)        | 2.29 (.90 - 5.82)             |
| 9+   | 5 (55.6%)         | 4 (44.4%)         | 3.61 (.72 - 18.06)            |
| <b>Do you get any fruits or vegetables from your backyard?</b> |                   |                   |                               |
| Yes  | 94 (60.6%)        | 61 (39.4%)        | Ref:                          |
| No   | 2 (25%)           | 6 (75%)           | <b>12.02* (1.13 - 128.01)</b> |
| <b>Ownership of ration card</b>                                |                   |                   |                               |
| Yes  | 75 (57.3%)        | 56 (42.7%)        | Ref:                          |
| No   | 21 (65.6%)        | 11 (34.4%)        | 0.39 (0.14 - 1.11)            |
| <b>Household food insecurity status</b>                        |                   |                   |                               |
| Food Secure  | 44 (66.7%)        | 22 (33.3%)        | Ref:                          |
| Food insecure  | 52 (53.6%)        | 45 (46.4%)        | 1.89 (.91 - 3.96)             |
| <b>Availability of toilet</b>                                  |                   |                   |                               |
| Yes  | 94 (61%)          | 60 (39%)          | Ref:                          |
| No   | 2 (22.2%)         | 7 (77.8%)         | 0.21 (.03 - 1.35)             |
| <b>Maternal age of marriage</b>                                |                   |                   |                               |
| <= 17  | 2 (33.3%)         | 4 (66.7%)         | Ref:                          |
| 18 =>  | 92 (59.4%)        | 63 (40.6%)        | 0.21 (0.03 - 1.30)            |
| <b>Maternal engagement in remunerated work</b>                 |                   |                   |                               |
| Yes  | 37 (66.1%)        | 19 (33.9%)        | Ref:                          |
| No   | 59 (55.1%)        | 48 (44.9%)        | 0.55 (.25 - 1.21)             |
| <b>Sex of the Child</b>  |                   |                   |                               |
| Female   | <b>48 (66.7%)</b> | <b>24 (33.3%)</b> |                               |
| Male   | <b>48 (52.7%)</b> | <b>43 (47.3%)</b> | <b>2.17* (1.04 - 4.50)</b>    |
| <b>Birth Weight</b>  |                   |                   |                               |
| 2.5 kg+  | 70 (62.5%)        | 42 (37.5%)        |                               |
| <2.5 kg  | 23 (50%)          | 23 (50%)          | 1.93 (.87 - 4.25)             |

**\*p < .05**

### **4.3.2 Neighbourhood level factors and pathways of nutritional inequality**

In this section, I present the findings from counterfactual settlement-level case studies to present how the settlement-level social and physical environment are shaped through historical and contextual factors, which in turn influence community members' everyday life and their ability to mobilise and use socioeconomic cultural capital. The settlement-level case studies unravel the pathways through which the historical factors are modified by settlement-level characteristics that shape the people's livelihood practices, health behaviour, and dietary practices.

#### *4.3.2.1 Neighbourhood level factors within Paniya Community*

There are substantial differences between the two settlements in terms of overall prevalence and severity of undernutrition (Table 14). Among the twelve 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 ten under-5 children, 4 (40%) children had at least two anthropometric failures, and two children (20.0%) had all three anthropometric failures. Anthropometric failures among the *Paniya* community as per the CIAF index in our study was 66.9% in our cross-sectional survey, which means that the LPS and HPS settlements represent better off and worse settlement in child nutritional status among *Paniya* people.

Table 2: Nutritional status of children from two *Paniya* settlement  
Low Prevalence *Paniya* Settlement

| Sl No                                    | Sex    | Weight for Age | Height for Age | Weight for Height | Type of failure                |
|--|--------|----------------|----------------|-------------------|--------------------------------|
| 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 <i>Paniya</i> Settlement |        |                |                |                   |                                |
| 1  | Female | -1.74          | -1.71          | -1.23             | Well-nourished                 |
| 2  | Male   | -1.45          | -1.51          | -.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 S. stunted     |
| 8  | Male   | -3.25          | -3.52          | -1.83             | S. underweight, and s. stunted |
| 9  | Female | -3.35          | -3.94          | -1.21             | S. underweight, and s. 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                             |        | -2.66917       | -2.815         | -1.58545          |                                |

Table 15: Differences in *Paniya* settlement level characteristics

|  | High prevalence settlement* | Low prevalence settlement** |
|--|-----------------------------|-----------------------------|
| No of Household                                    | 33                          | 27                          |
| Children < 5 years                                 | 12                          | 10                          |
| No. of children with low birth weight              | 5                           | 3                           |
| Geographical area                                  | 5.3 acres                   | 3.8 acres                   |
| Type road facility                                 | Tar road                    | Tar road                    |
| Distance from Anganwadi                            | 1 km                        | 1 km                        |
| Distance from PHC                                  | 12 km                       | 2 km                        |
| Distance from District Hospital                    | 15 km                       | 8 km                        |
| Distance from Medical College                      | 123 km                      | 110 km                      |
| Distance from PDS shop                             | 1 km                        | 1 km                        |
| Distance from a Provision shop                     | 150 m                       | 750 m                       |
| Distance from Primary and Upper primary school     | 2 km                        | 1 km                        |
| Distance from higher secondary school and colleges | 13 km                       | 3 km                        |
| Distance from panchayath office                    | 12 km                       | 2 km                        |
| Distance from the tribal development office        | 12 km                       | 8 km                        |
| Distance from the village office                   | 12 km                       | 3 km                        |
| Distance from the police station                   | 12 km                       | 8 km                        |
| Distance from Beverage outlet                      | 13 km                       | 8 km                        |

\* *Paniya* settlement with a high prevalence of child undernutrition.

\*\* *Paniya* settlement with a low prevalence of child undernutrition.

In terms of the geographical location of the settlement, the LPS people were better positioned to access public services than the HPS people. In the subsequent section, I present how and what factors underpin the neighbourhood-level inequality in household access to food, nutritional behaviour and child nutritional outcome between the HPS and LPS *Paniya* settlement (**Table 15**).

#### 1.1.1.1.4 Land ownership and utilisation

Though households in both settlements had almost similar land holdings, the settlement level access to multiple sources of water translated to optimal use of available land, better health behaviours and a healthy environment in the LPS *Paniya* settlement. At the same time, the water scarcity in the HPS *Paniya* settlement limited the cultivation of kitchen gardens and constrained the healthy behaviour and environment of the HPS *Paniya* people.

**LPS *Paniya*:** The LPS *Paniya* settlement constitutes 3.8 acres of land for 27 households (14.07 cents on an average per household) on a hillock's steep terrain with a motorable road passing through the upper side of the settlement, and non-tribal people lived side by side. The households in the LPS *Paniya* settlement received a piped water connection in 1989; they used it until 2013. Additionally, they received a common open borewell from the Panchayath. In the opinion of the non-tribal respondent in the immediate neighbourhood, sufficient water availability since 1989 contributed to substantial changes in personal hygiene and social relationship. LPS *Paniya* were considered unhygienic people before that. However, their personal hygiene practice changed over a period. The settlement households, in general, are known for their hygienic habits, which has contributed to the increasing acceptance of LPS *Paniya* among the non-tribal people. Currently, water is provided by the *Jalanidhi* project through pipes in most of the houses in the LPS *Paniya* settlement and non-tribal people on either side of the road. The remaining households depend on a Panchayath borewell for water. The availability of water for most of the year supported the cultivation of more vegetable varieties in most households. All the households have a toilet and a small pit constructed by the MGNREGA workers for

waste disposal. As the settlement is in a sloppy place, there is no stagnant water. Most of the household surrounding was observed to be neat.

**HPS Paniya:** HPS *Paniya* settlement constitutes five acres of land for 33 households (15.15 cents on average per household), is located on the top of a hillock, and is segregated by barbed wire fencing on three sides and an open agriculture land of non-tribal on one side. There is a motorable road passing through the settlement. HPS *Paniya* people reported severe water scarcity. All the households in the settlement depend on two borewells. Among these two, one well dries up during the summer season, and all the households depend on the other borewell. The community members reported water scarcity as a critical concern that led to poor hygiene and sanitation practices. The settlement level water scarcity compounded the burden of household chores on mothers. Women and girl children have to spend much of their time collecting and storing water. Inadequate water and land availability and population growth within a small and closed-in community for two generations have led to ecological degradation. This unsanitary environment with limited land space is perceived as the primary cause of illness by the community members and KIs. The families that owned more land could not cultivate due to water scarcity. The poor land ownership of the *Paniya* community was also linked with the poor social capital of the HPS *Paniya*. Disputes related to land, water, and domestic animal ownership often triggered conflicts between the households affecting the social cohesion of the settlement. Poor hygiene and living conditions in HPS *Paniya* settlements became an additional source of stigma from the non-tribal people in the neighbourhood. In this way, the ecological characteristics of the settlement made it difficult for the HPS *Paniya* to adopt a healthy lifestyle and dietary practices that promote optimal nourishment of the children in this settlement.

#### 1.1.1.1.5 Livelihood

There were substantial differences between LPS and HPS *Paniya* regarding their livelihood sources. The LPS *Paniya* people's social capital of inter and intra-settlement social network was translated into better livelihood opportunities and acted as a buffer against the household financial shock. At the same time, the lack of kinship and social network outside the settlement limited the domestic employment opportunities of the HPS *Paniya* people. It caused unequal child caring responsibility for the mothers.

**LPS *Paniya*:** The LPS people had a better social network with the non-tribal people in the neighbourhood and could find regular domestic employment opportunities for most households, barring one household. This could ensure household income and sufficient food consumables in most households. People adopted diverse livelihood strategies, including agriculture work, MGNREGA work, cattle rearing, domestic work, and masonry work in the house of non-tribal as coping strategies during the lean agriculture season. While women go for MGNREGA work after sending their children to AWC or school, men work in traditional agriculture under non-tribal households or masonry works. Except for nursing mothers, most of the women are engaged in remunerated activities. The diversification of livelihood enhanced the household's food purchases. The LPS *Paniya* women generally considered their participation in work improved their decision-making capacity at home and enhanced their confidence. While explaining the benefit of engaging in remunerated work, a mother who previously worked as a tribal promoter in the settlement reported:

*“When I started working, we learned to live in the society as the people in the general community do. We bought a gas stove, mixer, TV etc. If we have money*

*in our hands, we can do anything we want. Otherwise, we have to depend on others for everything”.*

The death or illness of the earning members posed a financial crisis to a few of the households. However, kinship and social cohesion moderated the effect of the household financial crunch through cooperation and sharing of household resources which could ensure adequate diet and health for children in most cases.

**HPS Paniya:** The poor social network of HPS people outside the settlement limited their participation in the domestic labour market. Under this context, the male labour force in the settlement depended primarily on the seasonal labour migration for their livelihood. In the absence of men, women had to do all the household chores and child-caring responsibilities alone. Additionally, most of the men who migrated sent their remittances to their families once a month or two and a major portion of their income was diverted to purchasing alcohol. Most adult women, including nursing mothers, had to work as agricultural labourers in the neighbourhood households of non-tribal, which was only available seasonally. The women from this settlement were rarely engaged in MGNREGA work. They reported that the delayed payment and the wage of 240 rupees per day as against the 400 rupees they received outside is inadequate to meet their daily needs. A 27-year-old mother from the settlement reported that:

*“If we work for chettans (Christian) in our neighbourhood, we get our wage at 5 pm, and there is no other say. But in thozhilurappu work, there is no guarantee when we get it. We need money after the work; then we will work”.*

Due to the unstable labour opportunity that the women were engaged in and the limited financial support from the male household members who migrated, the households in the settlement had limited disposable income to access the food commodity from the open market. Also, as nursing mothers have to engage in income-generating activities

in the absence of their spouses, caring for their children is compromised, exposing them to unhygienic and hazardous settlement surroundings.

#### 1.1.1.1.6 Social and institutional capital

The social capital in terms of social cohesion within the settlement differed between the LPS and HPS *Paniya* and was shaped by historical factors. The geographical continuity and kinship among the LPS *Paniya* people fostered social capital in terms of community cohesion and social network outside the settlement. The leadership support of social activists brought community-level mobilisation and political voice leading to better institutional utilisation. Whereas, among HPS *Paniya*, the geographical dislocation and lack of kinship limited the settlement level social cohesion and social network. The lack of basic living conditions further caused community-level conflict.

**LPS *Paniya*:** The ancestors of the LPS *Paniya* people resided in the same geographical area, and all the LPS households belonged to the same clan. The kinship among the LPS *Paniya* fostered social cohesion and a supportive relationship. Though the traditional leadership role of *Mooppan* was weakened in the LPS settlement as well, the AWW, who adopted social activism to bring transformative changes in the settlement, was accepted by all the community members under whom the community began to organise to tackle their problems. Most of the women in the settlement participated actively in community life and took on multiple responsibilities at the household level. Women are part of community-based organisations called Mahila Swasth Sanghatan, Kudumbasree, and Solidarity, which increased their social awareness. LPS people could mobilise their social capital regarding settlement-level social cohesion to challenge the discriminatory and othering attitude of non-tribal

people in the neighbourhood. Now the LPS people challenge the discriminatory attitude of the non-tribal and no longer tolerate the discrimination and claim equal social space with non-tribal people. The following response of community participants (51 years old, Male) reflects how the LPS people challenged the unequal power relation between the tribal and non-tribal and claimed the community space.

*“Earlier, we (LPS Paniya) were made to sit on their (non-tribal in the immediate neighbourhood) verandahs, and the food would be served there. Now, we sit together and have food. They would also come for the functions in our houses and help us in cooking and all”.*

In terms of institutional resources as social capital, LPS *Paniya* had better access to nutritional services, including AWC and PDS, and other welfare schemes. The AWC was started in 1983 under the initiation of the AWW settlement in her Panchayath. She continued serving this AWC for 35 years. The AWC was located almost midway between the two *Paniya* settlements at about 1 km. Most (eight out of fourteen) of the children attending the AWC belong to the *Paniya* community. The AWW extended herself beyond delivering nutritional services. She was involved in bringing basic infrastructure and water facilities to the settlement and played a key role in the education of the children from the settlement. Most of the LPS children attend the AWC regularly. All the households in the settlement received 30 kg of rice monthly from PDS. The ASHA worker in the settlement belonged to the non-tribal community. Though the current tribal promoter belonged to the Tribal *Kurichiya* community, a community member from this settlement was a tribal promoter three years ago. AWC was observed as an occasional meeting place for the frontline workers that helped the identification of sick members of the LPS households and the households that needed more welfare assistance. This meeting, in a way, facilitated the convergence of services from ICDS, Tribal and Health departments. Overall, the LPS *Paniya* case

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study revealed that if *Paniya* people are provided institutional services in a non-discriminatory manner, it leads to better utilisation of the services.

**HPS *Paniya*:** In contrast to the LPS *Paniya*, the households in the HPS *Paniya* settlement are the descendants of five households who received this land in 1982 under a tribal rehabilitation project. The lack of common kinship affected community cohesion, caused frequent gang fights, and damaged common community property. Traditionally, *Moopan* was the head of the settlement in the settlement, who took a leadership role. Currently, the role of *Moopan* was weakened and was limited to the performance of community rituals. In the absence of community leadership, HPS *Paniya* people were generally observed to be less organised and had limited involvement and ownership in all the developmental initiatives in the settlement. This was reflected in the settlement's poor maintenance and damage to common properties. Besides, the developmental programmes failed to ensure primary conditions, including water supply which was the most important priority of the community. In terms of the institutional resources as social capital, HPS *Paniya* shared their experiences of being insulted and discriminated against by the non-tribal people, which in turn caused anxiety and apprehension while interacting with the non-tribal community in the neighbourhood. Consequently, this has led to the limited social network of HPS *Paniya* people outside their settlement and constrained their ability to use public welfare services. HPS *Paniya* people were stereotyped as primitive, drunkards, criminals, sexual offenders, thieves, and lazy people, as echoed in the interviews with KIs from various public service departments. These stereotyped perceptions of public servants shaped how various community welfare programmes were delivered and utilised. The following response from a frontline worker reflects the perception of public servants against the HPS *Paniya*:

*“We get afraid even when we think about the lonely return from there (HPS Paniya settlement). There was a rape case reported six months ago. That case is going on in court. So because of all these things.....”*

The experience of discrimination against HPS people at multiple public institutions has distanced them from critical institutional resources. Similarly, the stigma attached to the HPS people caused the poor quality of the service delivered or no service delivery by the public servants. The AWC for HPS *Paniya* is located almost 1 km away from the settlement. The AWW and the Anganwadi Helper (AWH) belonged to the non-tribal community. The AWW often visited the settlement to take them to AWC. However, due to the unwelcoming interactional milieu, stigma, and discrimination the children faced in the AWC, the HPS children were unwilling to attend the AWC, and the parents were not interested in sending the children. The current TP in this settlement belonged to the *Kurichiya* community and reported hesitance and apprehension to visit the settlement alone. Over the last year, three TPs, who worked in the settlement, resigned after a short period of three to six months. ASHA Worker for this settlement has been in the same place for the past ten years. The ASHA Worker was observed visiting the settlement only during the health camps or when the officials from the health department visited.

#### 1.1.1.1.7 Cultural Capital

The inclusion/exclusion of Paniya people follows their conformity or non-conformity with the non-tribal ways of doing things. In the case of LPS Paniya, settlement level literacy movement, geographical proximity with the non-tribal community, religious conversion, and the use of mobile phones and television in familiarising themselves with non-tribal cultural norms to get a socialisation space with them. On the other

hand, the geographical dislocation and exclusion from the non-tribal people's social circle contributed to the cultural marginalisation of HPS Paniya.

**LPS Paniya:** During the early years of the settlement, the cultural difference between the LPS *Paniya* and the non-tribal communities was visible in terms of lifestyle. The negative stereotype of the LPS *Paniya* people as belonging to the ST community and as belonging to the *Paniya* group was discernible in the responses of non-tribal KIs. This has changed over the course of time. A community-based literacy movement was initiated in the settlement with the active participation of the LPS households and with the support of the non-tribal households in the neighbourhood, political parties, community-based organisations (Solidarity), and Kerala Saksharatha mission (literacy mission) in the early 1990s. The overall responses of the KIs reflected that this literacy movement was a catalyser in the community's transition. Similarly, the LPS people further indicated that the cultural transition of LPS people was possibly mediated by geographical proximity with the non-tribal community, religious conversion of few households, education, and the use of mobile phones and television. LPS *Paniya* people also adopted their dressing style, linguistic dialect, and food consumption more in line with the non-tribal in the immediate neighbourhood. The increasing conformity of LPS *Paniya* with the non-tribal people's lifestyle and the non-tribal people's fear of being questioned and challenged by the LPS people for any unfair treatment facilitated a better cultural integration for LPS *Paniya*. Additionally, the increased use of television in most households brought them more familiar with the non-tribal linguistic dialect and what is accepted among the numerically dominant non-tribal people. The conversion of a few households into protestant Christian denominations further facilitated this process. However, it was noted that the LPS household members who were not converted to the Christian religion were very particular in following

their religious practices and taking pride in their tribal identity. The school-going children and the youngsters do not speak the *Paniya* language. The LPS children could have been forced to adopt the normative values and culture of the numerically dominant non-tribal communities from school. This cultural transition increased the acceptability of LPS people among non-tribal and increased their livelihood opportunities that could ensure household food insecurity. Most of the non-tribal respondents shared the view that LPS *Paniya* is a better off among the *Paniya*. This has resulted in the efficient use of entitlements and institutional resources to meet the health and nutritional needs of the people.

**HPS *Paniya*:** On the other hand, the historically shaped disadvantages locked the HPS *Paniya* into a stereotyped perception of differences and otherness among non-tribal people. Being uprooted from their original geographical location, the HPS *Paniya* was culturally marginalised. From time to time, the households in the settlement had close contact with people from different cultural and religious practices. While some of the households were under Muslim landlords, others were under Hindu Nair or Chetti landlords. Currently, they depend primarily on Christian households in the neighbourhood. While defining a cultural space of their own, HPS people's traditional rituals had changed, and they were between two dominant cultures but did not belong to or were accepted by either. The HPS *Paniya* speak a mix of Malayalam and *Paniya* language, which is different from the Malayalam dialect spoken by the non-tribal. Because of the non-conformity of HPS *Paniya* to the non-tribal people in the neighbourhood based on their caste identity, phenotypical differences, occupation, and geographical segregation, they were subjected to a process of othering. The unhygienic personal habit of HPS *Paniya* due to water scarcity has been stereotyped

as the culture of the community by the frontline workers. The following quote by frontline workers reflected such community stereotypes.

*“They (HP Paniya children) have nobody to give them a bath; they buy dresses but do not wash them properly. The dresses we are donating will continuously be used for one week without washing and changing. And then they won’t use it again. Their culture is like that”.*

A similar perception of HPS Paniya as uncultured people was often reflected during the interview with non-tribal participants. This non-dominant cultural identity of HPS Paniya among the numerically majoritarian non-tribal community is an important aspect of the social exclusion of HPS Paniya that limited their livelihood opportunities. Though several programmes were designed for the educational inclusion of the tribal children, the unwelcome interactional milieu originating from the negative stereotype about the settlement was the critical factor driving the early school drop-out and low AWC utilisation of the settlement children. Additionally, the alcohol consumption and settlement level violence within and between the households made it an unfavourable place to carry out learning activities.

#### 1.1.1.1.8 Health Behaviour

Settlement level changes in knowledge and awareness, livelihood practices, and better social and institutional empowerment of women translated into reduced use of alcohol and tobacco, better water and sanitation behaviour, and maternal and child health practices of LPS Paniya. At the same time, poor livelihood opportunities, labour exploitation, and lack of basic living conditions (water) caused the intersection of alcohol consumption, violence, an unsafe and unhealthy living environment, and suboptimal maternal and child-caring practices in the HPS Paniya settlement.

**LPS Paniya:** Among LPS *Paniya*, unhealthy behaviours, including alcohol and tobacco consumption, declined drastically, and appropriate infant and young child feeding practices, immunisation coverage, and regular utilisation of AWC were observed. As reported by the community members and the non-tribal people in the immediate neighbourhood, alcohol consumption was prevalent in most households in LPS until the early 2000s. Although it has not disappeared from the settlement, the alcohol consumption and tobacco use rate decreased drastically. No women reported consuming alcohol, although it was reported among men occasionally. The Anganwadi teacher was the convener of a local community-based movement against alcohol brewing and selling in the village. She also had a good network with the district exercise department. This helped her mobilise institutional capacity and community participation to reduce alcohol brewing and selling in the local area. Access to multiple water sources and community-level awareness programmes through Anganwadi centres improved the hygiene practices of the community. Community members are generally prompt in care-seeking in case of illness of any household member. Early initiation of breastfeeding, exclusive breastfeeding, and complementary feeding at six months is provided in most households. Respondents from the community and non-tribal participants responded that the incidence of intimate partner violence (IPV) in their home and neighbourhood households had decreased substantially over the many years though this was the order of the day until a few years ago. Both men and women shared the household work and childcaring. The better status of women in economic activities and their shared household responsibility enabled them to follow appropriate breastfeeding practices and caring practices by household members. Though fever was common during the severe monsoon season during the previous months, the LPS *Paniya* were prompt to seek

medical care. While referring to the health care seeking of LPS *Paniya*, a non-tribal participant from the neighbourhood reported:

*“Earlier, I had one Autorickshaw. I then found that these people were found to go to the hospital even for a minor illness. Since they get travel allowance, they mostly go to the district hospital in Mananthawady”.*

The households in the settlement are very prompt in immunisation and growth monitoring. Currently, all the children in the age group of 3 to 5 attend Anganwadi.

**HPS *Paniya*:** Alcohol consumption among men and women was the most commonly reported problem in the settlement. Alcohol consumption was widely observed among older men, women, and male children aged ten and above. In rare cases, community members reported alcohol consumption among pregnant women as well. As per the report of community participants and KIs, regular alcohol consumption has caused neighbourhood violence, death and injuries caused by accidental falls, and suicidal death in this settlement. Alcohol consumption among parents in many households led to neglected childcare, and household assets were damaged in conflicts. Due to regular alcohol consumption among men who chose to migrate, financial support from them was limited in most households. This made the situation more difficult in most households. The mothers had to make a trade-off between family income and child care. Amidst the household work, income-generating activities and collecting water, the mothers too find less time for caring for their children. When both parents were engaged in income-generating activities, children were often seen playing in the mud close to the location used for open defecation by children and domestic animals or near sewage canals, endangering their health. Most of the respondents from this community and the KIs identified the unhygienic living condition as a possible cause of illness and undernutrition. Similarly, an elderly person from the community

reported that in households where men migrated to other places for livelihood, mothers were unable to give medical care to children when falling ill due to the financial burden. Unless the frontline workers from the health department or tribal department assisted, the community members were hesitant to seek care. From the report of KIs, the death that occurred in the settlement over the recent time was primarily due to the delay in treatment-seeking. The kids in the study reported that the maternal death of twin children in the settlement was due to delayed care-seeking. Most of the mothers in the settlement whose partner regularly consumes alcohol reported the experience of Intimate Partner Violence (IPV). Neighbourhood violence affects women and children unequally. When men involved in violence are arrested and imprisoned, the maternal work burden is compounded without any financial support; otherwise, they are received from their partner. Increasing crime in the neighbourhood also produced a sense of fear and insecurity among the women and children in the settlement and the frontline health workers.

Pregnant women in the community continued with their daily routine without any additional support from their family members, and no special care was given to the mothers after delivery. Mothers reported following exclusive breastfeeding for six months to one year before the rice-eating ceremony. Most of the children are given immunisation. However, growth monitoring was rarely done. The mothers were generally hesitant to receive antenatal care (ANC), and there were reported cases of home delivery during the last year. However, a majority of the cases were institutional delivery. Religious rituals influenced the child-feeding practices among HPS *Paniya*. Typically, a newborn child is fed rice in a temple ceremony called a rice-eating ceremony, which is usually conducted between six months to one year, depending on the household's financial status. Children were fed irregularly, and in most houses,

food was consumed only two times. During the fieldwork, children were often left with their food on a plate from which domestic animals were also seen eating it.

#### 1.1.1.1.9 Food security

Access to multiple sources of water in the settlement and better livelihood opportunities ensured the cultivation of more diverse fruits and vegetables and access to open-market food. Additionally, food supplied by PDS is supplemented to make adequate diversity and quantity of food for LPS Paniya people. At the same time, water scarcity and limited livelihood opportunities impeded the HPS people's ability to grow fruits and vegetables in their kitchen garden and access food from the open market. The household largely depended on the polished rice distributed from PDS shops.

**LPS Paniya:** Most of the households in the settlements have 15 cents or above land with a small kitchen garden with spinach, ash gourd, papaya, pumpkin, elephant yam, colocasia, tapioca, purple yam, ivy gourd, banana and fruit plants such as Passion fruit, guava, and grapefruit. The households in the settlement collect a variety of leafy vegetables such as *ponnankanni* (*alternanthera sessilis*), *thavara* (sickle senna), *churuli* (*diplozium esculentum*), the leaves of pumpkin, bottle gourd, ash gourd, *kaattu kaachil* (*dioscorea oppositifolia*), *naarakkizhangu* (*dioscorea pentaphylla*), *vellakkizhangu* (*belophylla Voigt*) etc. grown in the homestead and from paddy field. Though the availability of these leafy vegetables has declined substantially over the years, people can collect them in limited quantities. There are plenty of jackfruit trees and mango trees. In addition to this, the commonly purchased vegetables from the market are green peas, potatoes, lady's fingers, cabbage, and all other vegetables, including carrot, beetroot, and onion. A few houses rear chickens for household

consumption and occasionally catch fish and crabs from the paddy fields and small creek running near the settlement. Most households receive 30 kg of rice per month from the Public Distribution System (PDS) under the Antodaya scheme, the primary staple food source. In addition, households receive food supplies from AWC, mid-day meals provided by schools, and occasional food supplies from the tribal department. Additional rice is purchased from the open market as and when required. Consumption of beef and chicken is reported to have increased in the settlement over the past few years. Consumption of bakery food, including biscuits, cookies, and deep-fried snacks such as chips, was also common among children. With a diverse source of food, most households could ensure a minimum dietary diversity. Currently, all the families prepare food two times a day and consume it three times. Most of the children in the settlement consume three to five times of food per day in less quantity. Children going to school or AWC consume two times of food at home and two times at school or AWC.

**HPS Paniya:** Most households grow pumpkins, and few families grow papaya and bitter gourd in their backyards. The nearby paddy field serves as a good source of different leafy vegetables, crabs, and fish. However, due to the increasing use of fertilisers in rice cultivation, crabs and fish have reduced in recent times. Mushrooms, fruits, and leafy vegetables, including moringa leaves, *thakara* (Senna tora), *chembu thalu* (colocasia leaves), and *ponnangani* (*alternanthera sessilis*) are collected from the neighbourhood. During the summer and early months of monsoon, jackfruit and mangoes are available in plenty and shared among neighbouring households. Currently, most households in the settlement receive 30 kg of rice from PDS under the Antodaya scheme, the primary food source. Rice and a few vegetables, including potato, tomato, onion, and meat such as beef, pork and chicken, are purchased from

the open market. In addition, households receive food supplies from AWC, mid-day meals provided by schools, and occasional food supplies from the tribal department. Few families collect the leftover food from the nearby school and share it with the neighbouring households. During the monsoon season, when alternate food sources from seasonal fruits reduce, the rice received from PDS runs out, and food insecurity increases in a few households. The community members and KIs reported that few households habitually ate mud during the severe food shortage. Though the families in the settlement have different food habits, frequency, and timing, most of the households prepare food only at night, and leftover rice is consumed in the morning. The community members were also observed eating more bakery food such as biscuits, cookies, sponge cakes, or deep-fried snacks such as chips and crackers high in sugar and fat. The parents buy it from the nearby provision shop, only a hundred meters away from the colony.

#### **4.3.3 Neighbourhood-level factors associated with the child's nutritional status within the Kurichiya community**

During my exploratory phase, the counterfactual case of *Kurichiya* settlements with a low prevalence of undernutrition and high prevalence of undernutrition was not identified as most of the KIs responded that *Kurichiya* settlements maintain a reasonable standard of living and have better health and nutritional status. Hence, the *Kurichiya* case studies were identified after the cross-sectional quantitative survey. A cross-sectional survey of the *Kurichiya* community was conducted in 33 settlements. From these 33 *Kurichiya* settlements, settlements with at least eight children aged two to five years were shortlisted in the first phase. This is because a minimum of eight children were expected to obtain two well-nourished cases and two undernourished

cases at the settlement level. There were 18 such settlements. From this list, the settlement which reported the lowest proportion of children undernourished (LPS *Kurichiya* case) and the settlement with the highest proportion of children undernourished (HPS *Kurichiya* case) were selected. In the LPS *Kurichiya* settlement, only three out of 10 (30%) *Kurichiya* children reported at least one form of anthropometric failure. Whereas in the HPS *Kurichiya* settlement, five out of nine (55.5%) children recorded at least one anthropometric failure. Considering the overall prevalence of 41.1% undernutrition among *Kurichiya* children by the CIAF index, the selected case study represents the better-off and worse-off settlement level undernutrition prevalence among the *Kurichiya* community. In terms of geographical location, the HPS *Kurichiya* was better positioned to access most public services than the LPS *Kurichiya* people. However, the major difference between the two settlements was land ownership. The LPS *Kurichiya* owned almost two times higher land areas (100 acres) than the HPS *Kurichiya* (36 acres) (See table 16).

#### 4.3.3.1 *Land ownership and utilisation*

LPS *Kurichiya* had better land holding to begin with, which was distributed equally among all the households ensuring household-level land ownership for livelihood. The multiple sources of water in the settlement facilitated the optimal use of land for agriculture in the LPS *Kurichia* settlement. The HPS *Kurichiya* had only one-third of the land compared with LPS *Kurichia*, and the available land was distributed unequally, keeping one-third of the total land under the tharavad. This led to meagre land holding for HPS *Kurichiya* households. Inadequate water sources and having to depend on external water sources limited the optimal use of land for agriculture.

**Table 16: Differences in Kurichiya settlement level characteristics**

|  | High prevalence settlement* | Low prevalence settlement** |
|--|-----------------------------|-----------------------------|
| No of Household                                    | 29                          | 34                          |
| Children < 5 years                                 | 9                           | 10                          |
| No. of children with low birth weight              | 3                           | 3                           |
| Geographical area                                  | 36 acres                    | 100 acres                   |
| Type road facility                                 | Tar Road                    | Tar Road                    |
| Distance from Anganwadi                            | Within the settlement       | Within the settlement       |
| Distance from PHC                                  | 1 km                        | 2 km                        |
| Distance from District Hospital                    | 20 km                       | 14 km                       |
| Distance from Medical College                      | 110 km                      | 110 km                      |
| Distance from PDS shop                             | 500 m                       | 1 km                        |
| Distance from a Provision shop                     | 500 m                       | 1 km                        |
| Distance from Primary and Upper primary school     | 2 km                        | 4 km                        |
| Distance from higher secondary school and colleges | 2 km                        | 4km                         |
| Distance from panchayath office                    | 2.5 km                      | 7 km                        |
| Distance from the tribal development office        | 3.5 km                      | 8 km                        |
| Distance from the village office                   | 2.5 km                      | 7 km                        |
| Distance from the police station                   | 5 km                        | 7 km                        |
| Distance from Beverage outlet                      | 6 km                        | 15 km                       |

**LPS Kurichiya:** An oral history of the settlement reveals that the households in the settlement are the descendants of a Namboothiri (upper-cast Hindu) woman and a *Kurichiya* man. The household-owned approximately 100 acres of land and a few hundred cattle. The 100 acres of land cover two hillocks and a low-lying wetland between the two hillocks. Until the land reform act in 1963, all the households stayed in one big housing complex known as *nalukette* as a joint family. Under the land reform act of 1963, a person who owned land more than the ceiling of a maximum of

15 acres was required to return it to the government. Under this situation, the land was divided among fourteen families to protect the inherited property. And each family-

**Table 17: Nutritional status of children from two Kurichiya settlement**

| <b>High Prevalence Kurichiya Settlement</b> |                            |                                  |                               |                               |                             |
|---|----------------------------|----------------------------------|-------------------------------|-------------------------------|-----------------------------|
| <b>Sl No</b>                                | <b>Gender of the child</b> | <b>Weight for Height Z-Score</b> | <b>Weight for Age Z-score</b> | <b>Height for Age Z-Score</b> | <b>Type of failures</b>     |
| 1   | Male                       | -1.52                            | -2.74                         | -3.16                         | Underweight and S. Stunting |
| 2   | Male                       | -1.73                            | -2.58                         | -2.44                         | Underweight and Stunting    |
| 3   | Male                       | -2.36                            | -3.10                         | -2.70                         | All three one severe        |
| 4   | Female                     | -1.68                            | -2.25                         | -1.86                         | Only Underweight            |
| 5   | Male                       | -1.67                            | -1.80                         | -1.20                         | Well-nourished              |
| 6   | Male                       | -1.12                            | -1.24                         | -0.91                         | Well-nourished              |
| 7   | Male                       | -0.82                            | -1.31                         | -1.40                         | Well-nourished              |
| 8   | Female                     | -0.38                            | -1.38                         | -2.18                         | Only stunting               |
| 9   | Female                     | -0.52                            | -1.50                         | -1.85                         | No failure                  |
| <b>Mean Z-Score</b>                         |                            | -1.31                            | -1.99                         | -1.97                         |                             |
| <b>Low Prevalence Settlement</b>            |                            |                                  |                               |                               |                             |
| 1   | Male                       | -1.58                            | -2.37                         | -2.3                          | Underweight and Stunting    |
| 2   | Male                       | -1.4                             | -1.62                         | -1.22                         | Well-nourished              |
| 3   | Male                       | -0.83                            | -0.13                         | 0.71                          | Well-nourished              |
| 4   | Male                       | -1.62                            | -1.89                         | -1.41                         | Well-nourished              |
| 5   | Female                     | -0.29                            | -0.88                         | -1.28                         | Well-nourished              |
| 6   | Female                     | -0.25                            | -0.37                         | -0.33                         | Well-nourished              |
| 7   | Female                     | -1.41                            | -1.29                         | -0.63                         | Well-nourished              |
| 8   | Female                     | -2.37                            | -2.25                         | -1.13                         | Underweight and Wasting     |
| 9   | Male                       | -2.05                            | -1.9                          | -1.03                         | Only Wasting                |
| 10  | Female                     | -0.43                            | -1.29                         | -1.76                         | Well-nourished              |
| <b>Mean Z-Score</b>                         |                            | -1.223                           | -1.399                        | -1.038                        |                             |

owned approximately 7 acres of land. Under the leadership of the *karanavar*<sup>6</sup> all the families jointly cultivated a variety of rice, ragi, jowar, pulses, tubers, and vegetables. Currently, there are 34 households residing in the settlement. The settlement has a protected sacred grove with large and wild trees. The settlement household had

<sup>6</sup> Title of male head in Nair families

multiple sources of water, including a community pond, water canals, and borewells in most households, which facilitated better land use for cultivation. Currently, the crops cultivated in the settlement include coffee, pepper, paddy, beetle, rubber, areca nut, coconut, cashew plantain, cardamom, ginger, purple yam, colocasia, elephant yam and tapioca. There is also the cultivation of spices like cardamom, clove, cinnamon, and kokum. Though the land was partitioned among the individual households, there is no clear visible boundary between the household property.

**HPS Kurichiya:** The early inhabitants of this settlement were two sibling brothers and a sister who came to this place from a well-known *Kurichiya Tharavadu* in Wayanad during the 1920s and purchased 36 acres of land from a Muslim landlord. A total of 34 acres of land covers a hillock and the wetland surrounding it. When the land reform act was implemented in the state, 22 acres of land from a total of 36 acres were distributed among the seven families, and 14 acres of land were maintained under the *tharavad*. Though the land is allotted to the families, non-of the 28 families own the title deed (the property ownership documents) in their name. However, they have possession certificates and pay taxes individually. Although the community members could receive all the welfare schemes using the possession certificate, none of the families could access financial loans from banks without their property title deeds. As the land became fragmented among the next generation's children, the household's average landholding is about 60 cents. Now, all the families get piped water connections in their houses supplied through the Jananidhi water project, and some have wells. However, the community members reported that the water supply becomes irregular and limited during summer. Having to depend on the external supply of water during the summer period limited the kitchen garden's cultivation, mainly during the monsoon season. A year ago, three borewells had been dug in the settlement under

the MGNREGA program, which benefited many households nearby. Most houses have compost pits for waste disposal and attached toilets with piped water connections.

#### 4.3.3.2 *Livelihood*

The LPS Kurichiya diversified their agricultural practices with the cultivation of cash crops which earned them better income from the land. The households facing financial difficulties were supported by the other households and could buffer its impact. Better educational status opened them to diverse livelihood opportunities. In contrast to this, due to the meagre land holding, HPS Kurichiya people had to depend on the non-tribal people for their livelihoods which limited their economic savings and the ability to invest in education, limiting their economic mobility and livelihood opportunity.

**LPS Kurichiya:** The cultivation of food crops and cattle rearing was the main occupation of the LPS Kurichiya. Now, most families shifted from food crop cultivation to the cultivation of cash crops. The community realised that money was needed to provide good education, clothing, and household amenities and started searching for more profitable agriculture cultivation. Currently, only a few indigenous varieties of paddy needed for religious rituals and celebrations are cultivated. The households practice co-operate farming, known as *mataal pani*. Each household member works in the land of other households in return for their work from other household members. The community members reported the peak agriculture season of harvesting and planting; they would employ non-tribal people or members from other tribal communities in their work. LPS Kurichiya could mobilise the financial credit loan for their investment in agriculture and in other financial emergencies from public banks and SHGs. The community members perceived their political representation improved their access to credit facilities. However, the unusual flood

that happened a few months ago prior to the data collection, caused severe damage to banana cultivation, which pushed many households into financial stress. However, the multiple livelihood opportunities available to the household members and the support from the other households in the settlement in times of need could buffer the severe impact of crop failure on the individual households. Family members were generally discouraged from working outside the settlement as manual labourers. When the household members got white-collar jobs and started interacting with people outside, rigid community norms regarding occupation and agriculture practices relaxed. Now, many houses have electric gardening tools like grass-cutting machines and chemical sprayers. Most of the homes have either two-wheeler or four-wheeler vehicles. Five households have a computer. Almost all families have a fridge and washing machine. A few community members worked as public servants in the Indian postal service. The LPS *Kurichiya* people have diversified their livelihood strategy, including farmers, sculptors, masons, and carpenters. Each man is proficient in one field or another. Gender division in employment has been relaxed in many houses. Only recently, women started to engage in remunerations to work under the MGNREGA program in the settlement areas.

**HPS *Kurichiya*:** The community practised shifting cultivation and cattle rearing as the main occupation. The number of cattle was considered the main criterion of socioeconomic status in the community. The community members recalled that the *tharavadu* prospered with around 100 cows during the early years of the settlement. However, the community members responded that after the joint family period, when each family started living separately, there was an initial period of the financial crisis during which the community members began working for the non-tribal people for livelihood. The increasing climate change and market fluctuation have increased the

risk of financial loss that many households have experienced for the last three years. In the absence of sufficient land for agricultural cultivation as a primary livelihood, few houses leased land from non-tribal for banana cultivation. However, the crop failed due to the flood that occurred during the monsoon and pushed the households into financial debt. This has further increased the HPS Kurichiya people's dependency on the non-tribal people for their livelihood. The families began to take up all possible manual labour to earn money to support their households. The only government employee in this settlement is the Anganwadi helper. Though many children are in higher secondary and graduate level of education from the settlement, they could not find a white-collar job. Now, apart from agriculture work, the community members are involved in a variety of careers, including domestic work, home nursing, contract workers in Kerala State Electricity Board, security guard, salesperson, poultry farming, driving, electrical work, plumbing, painting, cable tv operator, tailoring, and landscaping artist. Only a few HPS *Kurichiya* women were reported engaging in MGNREGA work. They reported that the wage for the MGNREGA is inadequate to meet their daily needs and preferred it only in the absence of other employment opportunities.

#### *4.3.3.3 Social and institutional capital*

The democratic leadership and decision-making among the LPS Kurichiya helped them achieve better inter and intra-settlement social networks, which further translated into the political mobilisation and voice representation of LPS Kurichiya. The HPS Kurichiya case shows that in the absence of effective settlement-level leadership, the community become less organised and limited their capacity to benefit from social and cultural capital and better utilisation of welfare schemes.

**LPS Kurichiya:** The common lineage among the LPS *Kurichiya* and the community norms of reciprocity, interpersonal trust, and community engagement that existed under the joint family system have continued among the household members through community leadership. The community norms and leadership could maintain solidarity at the settlement level. The present *karanavar* is a secondary school educated and is a retired employee of the Indian postal service who got an award for his service excellence. His professional experience as a public servant has translated into his critical personal competency to deal consciously with the cognitive challenges in the community relationship. At the same time, the ability of LPS Kurichia to reach across the settlement boundary was an important leveraging point for the social capital of the settlement. The local narrative about the settlement people as the descendants of upper-cast Namboothiri grandmothers shaped the way LPS people were perceived by the non-tribal and increased their acceptability. Additionally, the non-tribal people in the neighbourhood reported receiving the support of the LPS *Kurichiya* during the early days of their migration. Both these factors created goodwill in the non-tribal community to the LPS *Kurichiya*. These contextual factors facilitated the political mobilisation of LPS *Kurichiya*. This has supported the elder daughter of the *Karanavar* to be an elected member in the local body election and later got elected to a higher political position. The community members acknowledged the political representation of the community member increased their social acceptance and social networks outside the settlement.

Additionally, LPS Kurichiya land ownership also facilitated their better control over their access to nutritional services. The AWC was located near the main entrance from the public road to the settlement. The land for the AWC was donated by the LPS *Kurichiya* people in 2006. Out of 16 children attending the Anganwadi, 13 were from

this settlement, and three were non-tribal. The AWW belonged to the non-tribal community, and the Anganwadi helper belonged to the *Kurichiya* community from the same settlement. The AWW reported that the support of the Anganwadi helper was essential for her to understand the cultural practices of the *Kurichiya* community, which made her more acceptable to the LPS *Kurichiya*. The Anganwadi helper was observed bringing children from neighborhood households on her way to the Anganwadi center. The tribal promoter was a *Kurichiya* woman from another *Kurichiya* settlement. An informal conversation with TP revealed that her appointment was made based on the political recommendation of the local political leaders in the settlement as well. This made her obliged to LPS *Kurichiya* people.

**HPS *Kurichiya*:** The absence of democratic leadership at the settlement level disrupted social harmony in the settlement. Most of the community members' responses reflected the resentment and distrust against the *karanavar* for his self-centered, high-handedness, and biased attitude. Under this condition, community members selected an alternate community leader in the settlement who officiates as the *mooppan* in the official record. This has given rise to polarisation and political strife between the community members. While the newly elected *mooppan* was an active political party member, the traditional *karanavar* was a follower of the rival party. The HPS *Kurichiya*'s better economic position in the past gain them respect among the non-tribal communities. However, there is limited cooperation between non-tribal and HPS *Kurichiya* people. The community members' network with non-tribal is limited to a few non-tribal households in the immediate neighborhood. The KIs, in general, reported unfavorable views of the community because of their high alcohol consumption and frequent quarrels in the community. The community is perceived as the recipient of undue benefits from government welfare schemes. The

AWC was located within the settlement as the land for it was donated by LPS *Kurichiya*. The AWC currently belongs to a non-tribal community. Fourteen children attended the AWC. Eight of these children were from the HPS *Kurichiya* settlement, and six were from non-tribal households in the immediate neighborhood. The Anganwadi helper was observed supporting the children of working parents to attend the AW and taking care of the children at her home after the regular AW hours till the parents came after work. The present ASHA worker in the settlement belonged to the non-tribal community. As per the report of community members, the ASHA worker rarely visits the settlement. The community members largely depend on private hospitals located seven kilometres away from the settlement. The TP in the settlement belongs to the *Kurichiya* community. Though the TP lives approximately two and a half kilometres away from the settlement, the report of the community members revealed that the TP was accessible at any time and would respond immediately in times of crisis.

#### 4.3.3.4 *Cultural Capital*

LPS *Kurichiya* people could integrate with the non-tribal people while maintaining their cultural practices and identities. They could leverage the community's cultural capital to improve social and political capital leading to improved livelihood opportunities. Though HPS *Kurichiya* people could integrate with non-tribal people in the neighbourhood, the lack of social cohesion weakened their ability to leverage the cultural capital to achieve better livelihood opportunities and institutional accessibilities.

**LPS *Kurichiya*:** Traditionally, the community worshipped natural forces, stones, and trees and followed a unique cultural practice. However, several culturally specific

practices have been changed, including the matrilineal inheritance system, early marriage, community-specific attire, hairstyle, and linguistic dialect. The linguistic style and attire of the community members are now similar to that of non-tribal community members. A few traditional practices related to childbirth, puberty, marriage, death, and common community festivals are continued. The LPS Kurichiya could access various institutional funding sources to improve the community members' traditional skills, including archery. The community members are traditionally adept in archery, which has brought the community many accolades at the state and national levels and earned them fame among all caste groups' communities. The customary practices associated with childbirth, marriage, and the celebration of festivals are held at *tharavad*. This traditional practice is maintained to foster community cohesion. The *Karanavar* of the *tharavade* insisted on the education of all the children in the settlement. On the school opening day of each year, all the school-going children are assembled in the *tharavadu*, and the *Karanavar* officiate a prayer. Following this, the *Karanavar* will give a short sermon to the children on responsible behaviour and conduct of students at school. Earlier, the community was reluctant to educate the girl child. However, now all the children go to school. The affinity of LPS *Kurichiya* with that of the upper caste Nair community, educational improvement, and traditionally inherited knowledge and skills (eg: archery) gave them social acceptance and status, which further facilitated increased interaction with non-tribal people. There are six graduate and two post-graduate educated people in the settlement. LPS *Kurichiya* participants attributed these changes to the improvement in educational status, increased interaction with the non-tribal people, and exposure to information media which further translated into political capital. Better educational

achievement and political capital improved better livelihood opportunities and living standards.

**HPS Kurichiya:** The community members' response reflected that the popular community cultural celebrations, including *puthari maholsthavam*, *thulapathe*, and *vishu associated with agriculture practices* under the joint family system, were the essential markers of community culture. After the joint family system's desolation, all the family members used to assemble in the *tharavad* to celebrate these festivals for a few years. However, this practice has declined slowly, with reduced community participation. The community members reported that the alcohol consumption and the profane language used by the *karanavar* during such occasions as the reason for the reduced participation of community members in such celebrations. The community members reflected that the decline of the community's celebration of cultural events adversely affected the community's network with other *Kurichiya* settlements. Usually, during such a celebration, community members renew their relationships with relatives from other settlements. The lack of joint community celebrations has affected community cohesion, participation, and mutual cooperation. The community members reported that now the community's culture in terms of their traditional language dialect, dressing, and food consumption has changed drastically. The younger generation in the settlement is unfamiliar with the community's language dialect. Most households have a TV and mobile. TV, mobile, and the internet have drastically shaped the community's lifestyle. Mothers have reported that they learned to cook new food recipes by watching YouTube and cookery shows on tv channels. They started to cook pasta, noodles, oats, etc., for their children who were not part of their traditional food. The community members also started purchasing a dress from the online platform. The community members got exposure to the broader world

outside the community through TV and social media use. Though HPS *Kurichiya* were skilled in archery, the community members reported that they could not showcase their skills and earn social recognition or hone their skills through training and support due to the lack of political support. The young couples' and older adults' educational attainment was limited to secondary or higher secondary school, and none were employed in public sectors. However, the community members are currently showing interest in education, and few students from the settlement attend graduate and post-graduate-level programs.

#### 4.3.3.5 *Health Behaviour*

Community cultural capital of better education and awareness programs in LPS *Kurichiya* translated to improved maternal and child health care practices and behaviour. Easy access to transport facilities and economic position contributed to immediate treatment-seeking in case of illness. Whereas among the HPS *Kurichiya*, the cultural taboos regarding child feeding practices continue to prevent optimal infant and young child feeding practices. Additionally, the increasing incidence of harmful use of alcohol diverted household income and caused conflict at the community level.

**LPS *Kurichiya*:** Traditionally, the community members used to consume country-made alcoholic beverages in small quantities during community festivals, and on other occasions, alcohol consumption was prohibited in the community. However, this began to change, and more people started the occasional consumption of alcohol. Tobacco chewing habit, which was common among the community, is declining among LPS *Kurichiya*. The KI reported that all the households in the settlement are keen to maintain hygienic surroundings during their visit, which was confirmed during my fieldwork. The community had a local medicine to administer after the delivery.

After the child's delivery, the mothers were given a special gruel prepared using broken rice, pepper, cumin, garlic, and some other spices in the days after the delivery. Prelacteal feeding of honey was common in the community. On the 28<sup>th</sup> day, children were given semi-solid food made of milk, ragi powder, and jaggery. Currently, all these practices have been changed. Traditional practices related to childbirth have changed in line with the advice of healthcare workers. Mothers are not assigned any heavy work during pregnancy, and the mothers generally follow doctors' instructions during their ANC visits. All the deliveries during the recent years were conducted in public or private hospitals. Most of the mothers were given ayurvedic post-natal care that included a variety of *arishtam*, and locally made *chyawanprasham*. Exclusive breastfeeding is commonly continued for six months. Though traditionally, child-caring was considered the responsibility of the mother alone, this view has been changed among many younger couples who expressed it as a shared responsibility. The household used to practice indigenous medicine for minor ailments. Traditionally, illness was associated with the violation of community rituals and the wrath of gods. However, as people got their education, such beliefs were changed, and people started consulting modern medicine. Currently, people utilise homeopathic medicine, allopathy, and Ayurveda. Most of the children receive Anganwadi services regularly. All nursing mothers with children below three years are not engaged in any remunerated work. Generally, the household and neighbourhood environment was safe and healthy for the children in the community. The frontage of the settlement is the main road, with frequent public bus services available. Motorable mud roads connect all the houses in the settlement. With easy access to transportation, the geographical location made public services readily available, including maternal and child health services.

**HPS Kurichiya:** Regular alcohol consumption among men has increased over recent years. It was reported as a problem that causes physical and verbal conflict among the household members and has created insecurity among women and children in the settlement. Domestic violence due to alcoholism is reported in a few houses. Alcohol consumption is reported to have increased the political strife in the settlement. The men who regularly consume alcohol are less involved in household responsibilities. Community members reported that increasing alcohol availability and interaction with non-tribal communities are factors associated with increasing alcohol consumption among the community members. Chewing tobacco is common among older people in the settlement. However, it has come down drastically among younger and middle-aged people. Depending on the household's easy accessibility to PHCs, pregnant women are sent to their home in the 7<sup>th</sup> month or continue in their husbands' families. All the childbirths have been conducted in either public or private hospitals. On the 28th day, the child is given semi-solid food made of ragi, cow milk, and jaggery as part of a religious ceremony. As both parents are engaged in income-generating activities outside the settlements, children over three years of age are brought to the Anganwadi. The little ones are left under the care of the grandparents or the other family members who do not go to work. Some parents remain at home to take care of their children. In a few instances, catastrophic health expenditure for adult household members led to the neglect of maternal and children.

#### *4.3.3.6 Household Food Security*

LPS Kurichiya ensures diverse food supplies from multiple sources, including the PDS, open market, and homestead kitchen garden, because of the better landholding and availability of disposable income. However, the limited landholding and water

scarcity in the settlement limited the cultivation of homestead kitchen gardens in the HPS Kurichiya settlement. Additionally, the financial shock and inadequate disposable income limited access to food from the open market.

**LPS Kurichiya:** During the joint family system, the community had a diverse source of food. This included varieties of rice, ragi, tubers, vegetables, and leafy vegetables grown on their homestead. Hunting wild animals was an important part of the community ritual. However, with the Wildlife Protection Act of 1972. The food system changed drastically with the community's shift from food crop cultivation to cash crops. However, this shift was reflected largely in the cultivation of cereals' which has declined drastically. The community continues to grow various vegetables, tubers, and fruits cultivated in the kitchen garden. Under *Kudumbasree* SHG, vegetable seeds were distributed in the settlement, and women were encouraged to grow vegetables on their homesteads. For domestic use, all the houses have a kitchen garden with various plants, including pumpkin, ash guard, cucumber, string bean, ladies-finger, brinjal, turkey berry, bitter guard, snake guard cabbage, cauliflower, tomato, red spinach, moringa, breadfruit, and banana. Few households cultivate string beans and bitter guards in the wetland on a commercial basis. Tubers include colocasia, elephant yam, purple yam, and tapioca. Fruits, including mango, jack fruit, sapota, custard apple, java apple, passion fruit, papaya, orange, pomegranate, pineapple, and guava, are available seasonally. Additionally, fruits, including grapes, apples, and oranges; vegetables, including potatoes, onions, and tomatoes, are generally purchased from the open market. Rice supplies from PDS shops compensated for the decline in cereal cultivation in the settlement. With the surplus income obtained from the cultivation of cash crops, the households could access more diverse food supplies from the open market. Multiple sources of food ensured sufficient food diversity and quantity in

most households. On a typical day, the community members cook two main courses, including breakfast (rice or wheat dish), and the cooked rice is consumed for lunch and dinner. Tuber, banana, and jackfruit are consumed with evening tea.

**HPS *Kurichiya*:** Under the joint family system, the whole community consumed a variety of rice and ragi gruel as a staple food and consumed it three times a day. Apart from the three meals, the individual households were allowed to cook food independently. After the harvest and sowing season, men used to fish and hunt animals when there were no farming activities. Fish and wild animal meat was shared among all the members. Water scarcity during the summer season limited vegetable cultivation to the monsoon season. Tubers, including tapioca, elephant yam, colocasia, purple yam, and sweet potato, are generally planted during the monsoon season and harvested during summer. Leafy vegetables have been used in all seasons. However, community members reported that the quality of food plants in the settlement is now degraded due to chemical fertiliser use. Currently, rice provided by PDS is the leading staple food. The households' access to food supplies from the open market varies between households. In many instances, the financial shock due to crop failure or health expenditure limited the household's ability to access food from the open market.

#### **4.3.4 Household, parental and individual-level factors associated with child nutritional status**

This section presents how the advantages or disadvantages of LPS and HPS settlements in *Paniya* and *Kurichiya* communities vary between the households. Though the settlement level factors contribute to a pattern of household and parental level attributes and behaviour that shapes the child's nutritional status's proximate determinants, its impact on the child's nutritional status is variable. This is because while the structurally shaped resources and conditions in the settlement limited or

provided the opportunities for individual choices, the way individuals responded to the choices and constraints varies from individual to individual. How sociocultural and economic capital translates to health and dietary practices depends on how individual household members exercise their agency to the available resources and resource constraints. The cross-case comparison of 16 embedded case studies from the *Paniya* and *Kurichiya* communities allows us to identify the heterogeneous pathways through which the household or parental level factors have moderated or amplified the settlement. The nutrient status of children in each selected case study is given in table 18.

#### 4.3.4.1 LPS Paniya Embedded Cases

Table 18: Nutritional status of children in Embedded Cases from LPS and HPS *Paniya*

| Case ID             | Gender | Age in months | Birth Weight in Kg | WHZ   | HAZ   | WAZ   |
|---------------------|--------|---------------|--------------------|-------|-------|-------|
| LPS Embedded case 1 | Male   | 47            | 3.15               | -0.83 | 0.71  | -0.13 |
| LPS Embedded case 2 | Female | 52            | 2.4                | -0.25 | -0.33 | -0.37 |
| LPS Embedded case 3 | Female | 58            | 2.8                | -2.37 | -1.13 | -2.25 |
| LPS Embedded case 4 | Male   | 47            | 2.35               | -1.58 | -2.3  | -2.37 |
| HPS Embedded Case 5 | Male   | 25            | 2.8                | -1.52 | -3.16 | -2.74 |
| HPS Embedded Case 6 | Male   | 52            | 2.8                | -2.36 | -2.7  | -3.36 |
| HPS Embedded Case 7 | Male   | 24            | 3.25               | -1.67 | -1.2  | -1.8  |
| HPS Embedded Case 8 | Female | 54            | 2.2                | -0.52 | -1.85 | -1.5  |

The LPS *Paniya's* well-nourished case studies show that the empowerment of community members, particularly women, can contribute to building the resilience of the household against the general socio-economic backwardness and ensure household food security and a healthy environment. However, the undernourished cases show that multiple economic shocks and exclusion of the household from the social network can constrain the individual-level agency of the parents to provide adequate care and food sufficiency to their children leading to suboptimal growth.

The settlement level advantages in terms of the type of land and resource available, social capital, community empowerment, and cultural assimilation benefitted the households in general. However, there is heterogeneity in the way the settlement level advantages contributed to the household level food security and healthy behaviour needed for the nourishment of the children. The households in cases 1 and 2 had access to food consumables from multiple sources, including open market, homestead kitchen garden, and PDS, which ensured sufficient household-level food security essential for child growth. The household members reported the inter and intra-settlement network, organisational membership, and kinship support, which increased the domestic employment opportunities for multiple household members. The employment of multiple household members translated to household-level disposable income, which enabled the household to access food from the open market and was reflected in household assets' ownership and access to information media. Similarly, the same households could access multiple water sources in the settlement, resulting in good hygiene and sanitation practices and the cultivation of varieties of vegetables on their homestead.

The mothers in both cases reported better education status (secondary school), which translated into increased social participation, employment opportunities, and mothers' participation in household decision-making. In both the well-nourished cases, both the parents shared the child-caring responsibilities. In the context of multiple earning members and supportive family members, the mothers could consciously choose childcaring over remunerated activities. The mothers in both cases stopped working after the delivery to look after the child in both cases. After the child reached the age of three and started attending the AWC, the mothers began engaging in remunerated activities. The favourable household and parental attributes are also reflected in

individual-level factors. The parents could ensure minimum food diversity, exclusive breastfeeding for six months, immunisation of the child, and immediate health care to the child in case of illness which are the conditions for optimal growth of a child. The AWW and ASHA worker reported the mothers in both cases were in good health status and received antenatal care during their pregnancy. This has resulted in better birth outcomes, as in cases 1 and 2.

In contrast to case no 1 and 2, the undernourished cases (case no 3 and 4) from LPS *Paniya* shows that the settlement level advantages are attenuated by household or parental level factors and failed to translate into ensuring food security and health care and environment for the child nourishment. Unlike other LPS *Paniya* households Case, no 4 reported clustering of multiple disadvantageous factors and was largely excluded from the social network within the settlement. This is the only household in the LPS *Paniya* settlement where paternal labour migration, regular alcohol consumption, and domestic violence were reported. The index child, in this case, has six siblings, and the eldest two children are engaged in remunerated work in the nearby towns and visit the household once in two weeks. The fifth child in the family suffers from paraplegia and needs the mother's constant attention. This is in addition to the caring responsibility of two below five-year-old children. Though the household had multiple earning members, the household did not have disposable income and suffered food insecurity because of the inadequate support of the earning members. The income from paternal employment is diverted to the consumption of alcohol. This has forced the household to depend on the neighbours in times of health needs, causing the neighbourhood households' displeasure. Being excluded from the settlement households, case no 4 lived in their paternal grandparent's house in another settlement in a nearby village for a few months. The AWW reported that when the children in

case 4 return from their grandparent's house, they are often found severely undernourished and infected with scabies. The household could not access the piped water connection supplied under *Jalanidhi* Project due to the inability to pay for the monthly maintenance charge. This household was located almost in the corner of the settlement, which made it difficult to access common water sources. This has resulted in the poor maintenance of toilets and household conditions. The children's personal hygiene was also observed as suboptimal, with soiled clothes, unwashed hair, and face. Though the child, in this case, was born with normal birth weight, the maternal constraints due to the multiple care burden limited the optimal breastfeeding for the child. Additionally, the child was reported with a recent history of illness and delayed treatment. Combined with this, not receiving adequate food diversity and frequency due to household-level food insecurity limited the nourishment of the child.

Even though case 3 shared several household and parental level advantages with a well-nourished child's household, the recent history of illness of the child's grandfather and catastrophic health expenditure in case 3. In addition to the economic resource required for the treatment, the human resources needed to support the diseased parents during the hospital stay, bereavement, and the grief of the child's parents diverted their time and resources leading to compromised caring of the child. The report of the AWW further revealed that the child, in this case, could not receive the Anganwadi for nearly two months of services due to the ceremony associated with the death of deceased grandparents. Adding to this, the limited care paid to the child due to the health crisis in the extended family constrained the optimal caring and nourishment of the index child. The child reported frequent infection during the past two months and suffered mild fever at the time of the study. However, due to financial constraints, the child's treatment was often delayed. As per the report of KI, the

parents, in this case, had an early marriage. The index child was the second child, and both children were born with lower birth weights.

#### 4.3.4.2 HPS Paniya Embedded Cases

*The HPS undernourished case studies show how the contextual disadvantages in the settlement shaped the household and parental level constraints in ensuring healthy environments and food diversity for children. At the same time, the well-nourished cases show that even in the context of multiple adversities, individuals can exercise their personal agency and leverage their personal or social capital to overcome the other disadvantages to ensure food and a healthy environment.*

#### **Undernourished cases (cases 5 and 6)**

In case no 5, these conditions were shaped because of the exclusion of this household from the social network within the settlement, lack of employment opportunities, parental alcoholic consumption, and domestic violence. While most households depended on the labour migration outside the state for their livelihood, this opportunity was limited for the household in case no five due to the poor social network within the settlement. This household was stigmatised within the settlement due to regular alcohol consumption, parental conflict, and violence. Being insulted and discriminated from other households in the settlement, the household members in case no 5 stay with the maternal grandparents during the lean season, who live a few kilometers away from the settlement. During this time, the household was disconnected from nutritional services and other welfare schemes. The household was disconnected from the regular PDS services and reported frequent food shortages. The household depended on the domestic labour opportunity, which is seasonal in nature. During the workdays, the child was often taken to the workplace with the parents and left unattended the work.

The water scarcity in the settlement added to this situation leading to poor living conditions in the household. As per the report of the ASHA worker, the mother, in this case, was reported with severe anaemia. The household and parental level disadvantages added on to the individual level disadvantages. The index child was born prematurely in the 7<sup>th</sup> month with a low birth weight (1.7 kg). Additionally, the child received sub-optimal breastfeeding practices due to low milk supply during breastfeeding. The child was reported with frequent episodes of illness. In the absence of disposable household income, the child's treatment was often delayed. Additionally, inadequate dietary diversity due to household food insecurity and unhealthy household conditions limited the child's nourishment.

In case no 6, the important theme that affected most other factors was the child's mother's death. The child's mother died due to ankle and foot tuberculosis after two months of childbirth. The child's father, a seasonal migrant labourer, was emotionally shattered by the mother's death and visited the household once in two months. The index child was younger in twin birth. The twin children and the eldest child, who is six years old, were under the care of the grandparents. The grandfather used to work outside to earn a livelihood, and the grandmother used to take care of the children. However, the child's grandparents died a year ago due to an injury caused by an accidental fall. Currently, the children are under the care of their grandmother. Though this household owns relatively better landholding (50 cents), this was not translated into household-level advantages in the absence of water sources and human resources for agriculture work. The only household income is the occasional remittance sent by the child's father. The child's father consumes alcohol almost regularly, and a major portion of household income is diverted to its purchase. The household depends mainly on the 30 kg of rice per month received from PDS free of cost. However, this

rice is often insufficient for the four-member family. An older woman from her neighborhood collected leftovers from the school's mid-day meal from the nearby school and shared the primary source of support with her. Overall, illness and poverty created a vicious circle leading to the household's impoverishment and unhealthy living conditions. In addition, the child was born with a low birth weight (2 kg), and the mother's death deprived the child of breastfeeding. Household-level food insecurity limits the child's dietary intake, and unhealthy household surroundings are more vulnerable to infection and undernutrition.

### **Well-nourished cases (cases 7 and 8)**

The commonality among the HPS *Paniya* well-nourished cases was observed only at the individual-level factors of consumption of minimum frequency and diverse food. However, there are different pathways through which these two conditions were met in cases 7 and 8. In case 7, the elder child of twin siblings in case no six reported similar parental and household-level characteristics. However, this child was born with a slightly better birth weight (2.3 kg) than the younger twin sibling. This child did not report any history of illness during the last two months and no major illness requiring hospitalization since his birth. The child reported better milestone development in motor skill development and language and social skills. The child was observed playing with other children in the neighborhood and sharing food with others. This means that the child could leverage his biological advantages to obtain more resources available in the household and extended families to overcome household and parental level disadvantages and grow well-nourished. While serving food at home, the grandmother brings this child from a relative's house and equally serves all the children. The food consumed by extended families is supplemented to meet the adequate frequency and diversity in food consumption required for the

nourishment of the child and to protect from the occasional food insecurity at the household level.

Unlike other households in the settlement, case 8 had a different socio-economic development trajectory. The household started living in the settlement only recently (seven years ago). In this case, the parents and their extended family members were born and brought up elsewhere and internalized different practices and norms regarding livelihood practices, food consumption, and hygienic practices. The household members speak the Malayalam dialect, which resembles that of non-tribal people in the neighborhood, and have a better social network with non-tribal people. The hygienic habit of the household members and the linguistic dialect increased their acceptability among the non-tribal people. Though the household was excluded from the social network within the settlement due to the land dispute, this household is generally perceived as a better household in the settlement by non-tribal people in the neighbourhood and frontline workers. The child's father could find domestic labour opportunities because of the better social network with non-tribal people outside the settlement. Additionally, the household is supported by paternal grandparents who live next door. Though the child's father occasionally consumes alcohol, the regular domestic employment opportunity could ensure disposable income for the household. The father and mother were involved in child-caring, and household work, financial decisions, and resource allocation were taken together. The individual level characteristics also reflected the household and parental level advantages. Unlike other children from the HPS *Paniya* settlement, the child in case no 8 is the only child who regularly utilises AWC. The paternal involvement in childcaring and household work were enabling factors for the mother to follow the appropriate breastfeeding practices. Though the child reported a recent history of illness, the mutually supportive parenting

and disposable income made it possible to provide immediate care to the child. The child could access food from multiple sources, including homemade food, AWC, and extended families who could meet the nourishment need of the child.

|                             | Case No                                      | LPS Paniya |   |   |   | HPS Paniya |   |   |   |
|-----------------------------|--|------------|---|---|---|------------|---|---|---|
|                             |  | 1          | 2 | 3 | 4 | 5          | 6 | 7 | 8 |
| Household economic Position | Land ownership (15=> cent)                   | ✓          | ✓ | ✓ | x | x          | ✓ | ✓ | ✓ |
|                             | Multiple Earing members in the household     | ✓          | ✓ | ✓ | ✓ | ✓          | x | x | x |
|                             | Household access to information media        | ✓          | ✓ | ✓ | x | x          | x | x | ✓ |
|                             | Catastrophic health expenditure of household | x          | x | ✓ | ✓ | ✓          | ✓ | ✓ | x |
|                             | Disposable household income                  | ✓          | ✓ | x | x | x          | x | x | ✓ |
| Social Capital              | Inter-settlement network of household        | ✓          | ✓ | ✓ | x | x          | ✓ | ✓ | x |
|                             | Intra-settlement network of household        | ✓          | ✓ | ✓ | x | x          | x | x | ✓ |
|                             | Organisational membership                    | ✓          | ✓ | ✓ | x | x          | x | x | x |
|                             | Household supported by relatives             | ✓          | ✓ | ✓ | ✓ | ✓          | ✓ | ✓ | ✓ |
|                             | Permanent residential status of household    | ✓          | ✓ | x | x | x          | ✓ | ✓ | x |
| Housing Condition           | Access to piped water connection at home     | ✓          | ✓ | ✓ | x | x          | x | x | x |
|                             | <100 meters to water source                  | ✓          | ✓ | ✓ | x | x          | ✓ | ✓ | x |
|                             | Availability of toilet                       | ✓          | ✓ | ✓ | ✓ | x          | ✓ | ✓ | ✓ |
|                             | Open defecation                              | x          | x | x | ✓ | ✓          | ✓ | ✓ | x |
|                             | Over-crowding (>5 family members)            | ✓          | x | ✓ | ✓ | x          | ✓ | ✓ | x |
|                             | Hygienic maintenance                         | ✓          | ✓ | ✓ | x | x          | x | x | ✓ |
| Household Food Availability | Household kitchen garden                     | ✓          | ✓ | ✓ | x | ✓          | ✓ | ✓ | ✓ |
|                             | Access to PDS                                | ✓          | ✓ | ✓ | ✓ | x          | ✓ | ✓ | ✓ |
|                             | Access to Open market                        | ✓          | ✓ | ✓ | x | ✓          | x | x | ✓ |
|                             | Household food security                      | ✓          | ✓ | ✓ | x | x          | x | x | ✓ |
|                             | Food consumed => 3 times a day               | ✓          | ✓ | ✓ | ✓ | x          | x | x | ✓ |
| Maternal Level Factors      | Remunerated employment of the mother         | x          | ✓ | x | x | ✓          |   |   | x |
|                             | Maternal literacy                            | ✓          | ✓ | ✓ | ✓ | ✓          |   |   | ✓ |
|                             | Experience of IPV                            | x          | x | x | ✓ | ✓          |   |   | x |
|                             | Maternal health                              | ✓          | ✓ | x | x | x          |   |   | ✓ |
|                             | Antenatal care                               | ✓          | ✓ | x | x | x          | x | x | ✓ |
|                             | Maternal consumption of alcohol              | x          | x | x | x | ✓          |   |   | x |
|                             | Multiple work burden                         | x          | x | ✓ | ✓ | ✓          |   |   | x |
|                             | Paternal migration                           | x          | x | x | ✓ | x          | ✓ | ✓ | ✓ |
|                             | Paternal involvement in household work       | ✓          | ✓ | x | x | x          | x | x | ✓ |

|   |  |          |          |          |          |          |          |          |          |
|---|--|----------|----------|----------|----------|----------|----------|----------|----------|
| Paternal Level Factors                            | Paternal literacy                              | ✓        | ✓        | ✓        | ✗        | ✗        | ✗        | ✗        | ✓        |
|   | Paternal regular employment                    | ✓        | ✓        | ✓        | ✓        | ✗        | ✓        | ✓        | ✓        |
|   | Paternal consumption of alcohol                | ✗        | ✓        | ✗        | ✓        | ✓        | ✓        | ✓        | ✓        |
| Individual Level Factors                          | Utilisation of AWS                             | ✓        | ✓        | ✗        | ✗        | ✗        | ✗        | ✗        | ✓        |
|   | Early initiation of breastfeeding              | ✓        | ✓        | ✓        | ✗        | ✓        | ✗        | ✗        | ✓        |
|   | Exclusive breastfeeding for six months         | ✓        | ✓        | ✓        | ✗        | ✗        | ✗        | ✗        | ✓        |
|   | Completed immunisation                         | ✓        | ✓        | ✓        | ✓        | ✓        | ✓        | ✓        | ✓        |
|   | Semi-solid food introduced after 6 months      | ✓        | ✓        | ✓        | ✗        | ✗        | ✗        | ✗        | ✓        |
|   | Minimum food diversity                         | ✓        | ✓        | ✗        | ✗        | ✗        | ✗        | ✓        | ✓        |
|   | Minimum food-frequency                         | ✓        | ✓        | ✗        | ✗        | ✗        | ✗        | ✓        | ✓        |
|   | History of illness in the last two months      | ✓        | ✗        | ✓        | ✓        | ✓        | ✓        | ✗        | ✓        |
|   | Immediate medical care provided during illness | ✓        | ✓        | ✗        | ✗        | ✗        | ✗        | ✗        | ✓        |
|   | Normal birthweight (=> 2500 g)                 | ✓        | ✓        | ✗        | ✓        | ✗        | ✗        | ✗        | ✓        |
| <b>The nutritional outcome of the child</b>       |  | <b>1</b> | <b>1</b> | <b>0</b> | <b>0</b> | <b>0</b> | <b>0</b> | <b>1</b> | <b>1</b> |
| 1= Well-nourished child, 0 = Undernourished child |  |          |          |          |          |          |          |          |          |

#### 4.3.4.3 LPS Kurichiya Embedded Cases

*The LPS Kurichiya well-nourished embedded case study shows the household with more access to at least one form of capital, including political capital (as in case 9) or cultural capital (as in case 10), could buffer other household-level disadvantages to provide adequate nutritional related resources and practices and ensure better nourishment of children. The undernourished case studies show that the parental physical and mental constraints fail to translate the household and settlement level advantages into healthy and nourishing conditions for the child.*

#### **Well-nourished cases (cases 9 and 10):**

*Kurichiya* Historical advantages of land ownership and multiple livelihood opportunities benefitted most of the LPS *Kurichiya* households. This is reflected particularly more so in well-nourished cases. Both households had different sets of social capital, which translated into either economic capital or cultural capital in

nutritional-related knowledge and practices. In case no 9, the father was a local political activist. The political capital of the father translated into achieving a temporary job position for the mother as AWW before the child was born. The mother's knowledge and skills as AWW influenced appropriate child-feeding practices and taking care of her health during the prenatal period. Whereas in case no 10, the cultural capital of the child's father in terms of expertise in archery and representing the state in the national game earned him the social recognition to expand his social network. His part-time occupation as an archery trainer also earned him economic support. Additionally, both the well-nourished household cases inherited one acre of land where they cultivated multiple crops. The availability of land and water sources was an essential condition that enabled both households to grow a variety of tubers, vegetables, fruit plants, and trees that ensured food diversity. Both households availed of 25 kgs of rice freely from PDS and had access to food from the open market. In both houses, there was no catastrophic health expenditure. However, both households suffered financial setbacks due to crop failure in the last two years due to the crop failure. Case no 10 had additional debt due to the construction of a new house four years ago. However, both households had multiple earning members and the support of extended family members. The multiple livelihoods strategy adopted by both households could buffer such financial loss. The settlement level social capital, including co-operative agriculture farming called *mattalpani*<sup>7</sup> helped the households to continue farming even in unstable financial positions. In this way, the settlement level social, economic, and cultural capital in terms of land ownership, political

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<sup>7</sup> Co-operative farming in which farmers exchange agriculture labour each other.

network and traditional expertise in archery percolated down to the household level social and economic capital.

Mothers in both cases received at least three antenatal care during the pregnancy of the index child. However, poor maternal health was reported in case no ten and coincided with the index child's low birth weight. Better household-level characteristics and caring practices compensated for these disadvantages. The mothers in both cases were involved in remunerated activities after they sent their children to AWCs. The household work was shared among both parents. The mothers did not report excessive care burden or experience of IPV. Paternal alcohol consumption was rare and occasional and was not reported as a significant problem by any household members. The household and parental level advantages are also reflected in the individual-level factors, including regular utilisation of AWS, exclusive breastfeeding, complete immunisation, food diversity, and frequency, all of which are associated with child nutritional outcomes. The child in case 9 reported a recent history of illness, but the child was given immediate medical care and protected from adverse effects. Similarly, child case 10 reported slightly low birth weight (2.4 kg) and delayed initiation of breastfeeding, the other advantages compensated for this disadvantage, and the child grew well-nourished.

**Undernourished cases (cases 11 and 12):**

Though LPS *Kurichiya* undernourished cases shared settlement-level advantages of better land ownership, this did not translate into better household disposable income due to different combinations of household disadvantages. Both the undernourished cases lacked important social capital like inter and intra-settlement networks and membership in any organisation. Interestingly, both households were in the corner of

the settlement with limited social interaction with other families. This geographical seclusion and disconnect from the other household rendered them more vulnerable to the impact of the flood that happened during the same year. In contrast to the well-nourished cases, a lack of social networks limited the employment opportunities of both the undernourished cases. Both households suffered financial indebtedness due to catastrophic health expenditures. In case no 11, the father suffered from mild psychiatric illness and was under medication. In addition to the financial burden posed by the treatment, the mother's report further revealed that the child's father's mental illness was stigmatised among the community members, which limited his employment opportunity and social network. Additionally, the child's mother reported the experience of IPV during the father's illness, which also affected the mother's mental and physical health. In case no 12, the child's mother is his father's second wife. The first wife suffered from cancer and died after treatment for five years. The treatment has impoverished the family, and they continue to struggle with limited economic opportunity. The death of his first wife affected him emotionally. Additionally, the father was diagnosed with diabetes, reported joint pain, and occasionally suffered fever and cold. The poor health of the father limited the household income. Both households reported financial setbacks due to crop failure in the previous years.

Though both households have access to water and toilets in their home, due to the mental and physical constraints experienced by the parents, these facilities were not translated into better household living conditions. In case no 11, the family was constructing a new house and was living in a temporary shed with limited facilities. The hygienic practices were suboptimal in the house, with dampening floors and a leaky roof. The house in case 12 is the oldest in the settlement. A portion of the house

was demolished, and the remaining portion was in a dilapidated condition. The living conditions in both households are unhygienic. Paternal involvement in household work was nil. Childcaring and household work were considered the sole responsibility of the mother. This has increased the mother's care burden, which affects a mother's caring practices. Unlike other undernourished cases, the LPS *Kurichiya* undernourished cases were secure food households. The rice from PDS and the fruits and vegetables grown in the kitchen garden could ensure food diversity and frequency despite the financial difficulties. Both families were able to access the food from the open market.

At the individual level, the essential themes that emerged in the undernourished cases were the history of morbidity, delayed medical care, and irregular use of AWS. In case 11, the child suffered severe pneumonia and fever at the age of two and was under medication for two months. Additionally, the child suffered a fever a month ago, and the cough persisted at the time of the interview. Due to the illness, the child was irregularly to the Anganwadi center. As per the report of AWW, the child lost weight after illness. In case 12 as well, the parents reported that the child falls ill occasionally, and a week prior to the data collection, the child had an episode of fever and cold. A runny nose persisted at the time of data collection. This has caused anorexia, and she regularly skipped dinner. Additionally, in case no 11, the mother followed suboptimal feeding practices, whereas in case 12, the low birth weight of the child was the other individual-level risk factor.

#### *4.3.4.4 HPS Kurichiya Embedded Cases*

The HPS *Kurichiya* undernourished cases show that parental capacity to provide childhood nourishment could be constrained by inequitable gender norms and/or by

financial shocks. At the same time, equitable gender norms and better economic and cultural capital translated into child nourishment and growth of the children in well-nourished cases.

### **Undernourished Cases (cases 13 and 14):**

The undernourished HPS *Kurichiya* reported a different set of household-level configurations. Though both households shared approximately 1.5 acres of unpartitioned land with other parental siblings, case no 13 suffered financial difficulties and debt, whereas case no 14 reported disposable household income. This is because the household in case 13 suffered multiple financial shocks, one after the other. The child's father and grandfather suffered illness for a prolonged time and were hospitalised. The illness caused the loss of income from daily labour and incurred additional debt for the treatment. One of the main income sources for this family was banana cultivation. However, the crop failed due to the flood that occurred a few months ago. These two crises pushed the household into a severe financial crisis. The household depended only on the income from the maternal employment under MGNREGA work which was received irregularly. This financial crisis limited the household's ability to access food from the open market, and they depended only on the rice provided through PDS shops. In contrast to this, in the household in case no 14, both the father and mother had regular employment and income from the agricultural crops. The household has disposable income and access to food items from multiple sources, including diverse food items grown in the kitchen garden and purchased from the market. However, the better household financial and social status did not translate into better household living conditions in case no 14. Though in case no 14, both the parents were engaged in regular work outside, the occasional dispute between the parents limited the support of the child's father in household work and

childcaring. The mother, who was regularly engaged in remunerated work, had to compromise for childcaring and household work.

The parental-level disadvantages in both cases are reflected in the individual child-level factors. Both the children were irregular to AWC, did not receive exclusive breastfeeding, semi-solid food was introduced before the age of six months, suffered illness during the last two months, and the treatment was delayed. The excessive responsibility taken by the mothers in household chores and income-generating activities constrained the mother's ability to provide adequate breastfeeding in both cases. As per the report of AWW, the children in both cases were brought by the Anganwadi helper. However, this is not practiced regularly due to AWW's time constraints and other responsibilities. Poor living conditions at the household level and the parents' suboptimal feeding and caring practices are the known risk factors for illness and poor nourishment.

**Well-nourished cases (Cases 15 and 16):** The two well-nourished households differed substantially in their household-level assets and economic position. The child in case no 15 is the grandson of the settlement *karanavar*. The household owns 14 acres of inherited land with cash crops and food crops. The whole family enjoyed the acceptance and social network among the settlement households and non-tribal people. This has contributed to obtaining regular employment opportunities for the child's father. With access to food from the open market, PDS, and household kitchen garden, the household could ensure diversity in their food basket. Additionally, with multiple sources of income, this household could secure assets, including two-wheeler vehicles, electric kitchen equipment, tv, and smartphones. This household and its premises are considered a sacred place where the ancestors' bodies are buried. Hence, the household and its premises are maintained neatly. This is the only household that

practices ritualistic purity in the settlement. The household members follow the practice of taking a bath on return from outside the settlement and regular washing of hands and face on return from outside the house. These cultural practices have also contributed to a healthy and hygienic environment for the child.

On the other hand, case no 16 owns only thirty-five cents of land. The primary income for this household is from the employment of multiple household members outside the settlement. Moreover, this household suffered a financial setback due to the illness and treatment expenses of the child's father. Both households received rice from PDS and a kitchen garden with diverse fruits, vegetables, and tubers, ensuring the child's food diversity, sufficiency, and frequency. However, the household in case 16 is a joint family of 11 members of two generations and has four regular earning members. The younger brother of the child's father married from a non-tribal community. This has caused the whole household to be excommunicated from the *Kurichiya* community's religious and cultural practices. While this household has a limited network within the settlement, the household enjoyed better social networks with non-tribal communities outside the settlement. This social network buffered the financial shock the home experienced during the illness of the child's father. The family got financial support from neighborhood self-help groups and local political leaders outside the settlement. Moreover, the household members consisted of more educated members of the settlement. The child's aunt, who lives in the same household, is a graduate; other adult members were secondary school educated. The better educational status was also translated into better hygienic practices and childcaring of the household members. Multiple adult members in the household also contributed to better caring for the index child. The household maintained good hygienic practices in terms of neatly maintaining the household surroundings.

At the parental level factors, both cases shared almost similar characteristics. Parents in both households were higher secondary school education. Mothers in both cases received occupational training (tailoring in case 16, ayurvedic nursing in case 15). However, maternal employment status was determined by the larger household's economic status. In case no 15, the household earned a significant share of their income from the agricultural land they owned; the additional income from the child's father's regular employment could ensure the household's financial security. Under this context, the mother, in this case, did not engage in remunerated work. Whereas, in case 16, where the household depended only on the income from the household members' employment, the mother decided to engage in remunerated work. In both cases, childcare responsibilities and household work were shared among all household members. The different household-level contexts determined the childcaring behaviour in both cases. In case 15, household-level availability of various food items from the household-owned land and from the open market and the maternal education as an ayurvedic nurse shaped the knowledge and practices on appropriate childcare and determined the appropriate child feeding practices and caring, leading to the better nutritional outcome for the child. In case 16, the index child was the first grandchild in the family. The mutual support between the parental siblings and the grandmother's support ensured the child was under the care of an elder member of the household in the absence of parents. The better education status of the other household members also improved the child feeding and healthcare-seeking practices. In both cases, the parental and household capacity to provide adequate care for the index child resulted in early initiation of breastfeeding, exclusive breastfeeding, immunisation, semi-solid food after six months, and minimum food diversity, quantity, and quality of the child. Though both the children reported a history of illness in the last two months, the child

was given immediate medical care, which could minimise the adverse impact on child growth. Unlike other children in the case studies, the children in these two cases regularly attend private kindergarten schools. The parents perceived that the private kindergarten school provided better early education and feeding to their child than the AWC in the settlement.

|                             | Case No  | LPS <i>Kurichiya</i> |    |    |    | HPS <i>Kurichiya</i> |    |    |    |
|-----------------------------|--|----------------------|----|----|----|----------------------|----|----|----|
|                             |  | 9                    | 10 | 11 | 12 | 13                   | 14 | 15 | 16 |
| Household economic Position | Land ownership (15=> cent)                                       | ✓                    | ✓  | ✓  | ✓  | ✓                    | ✓  | ✓  | ✓  |
|                             | Multiple Earning members in the household (or sources of income) | ✓                    | ✓  | ✓  | ✗  | ✓                    | ✓  | ✓  | ✓  |
|                             | Household access to information media                            | ✓                    | ✓  | ✓  | ✗  | ✓                    | ✓  | ✓  | ✓  |
|                             | Catastrophic health expenditure of household                     | ✗                    | ✗  | ✓  | ✓  | ✓                    | ✗  | ✓  | ✓  |
|                             | Disposable household income                                      | ✓                    | ✓  | ✗  | ✗  | ✗                    | ✓  | ✓  | ✗  |
| Social Capital              | Inter-settlement network of household                            | ✓                    | ✓  | ✗  | ✗  | ✓                    | ✓  | ✓  | ✗  |
|                             | Intra-settlement network of household                            | ✓                    | ✓  | ✗  | ✗  | ✗                    | ✓  | ✓  | ✓  |
|                             | Organisational membership  | ✓                    | ✓  | ✗  | ✗  | ✓                    | ✓  | ✓  | ✓  |
|                             | Household supported by relatives                                 | ✓                    | ✓  | ✓  | ✓  | ✓                    | ✓  | ✓  | ✓  |
|                             | Permanent residential status of household                        | ✓                    | ✓  | ✓  | ✓  | ✓                    | ✓  | ✓  | ✓  |
| Housing Condition           | Access to piped water connection at home                         | ✓                    | ✓  | ✓  | ✓  | ✓                    | ✓  | ✓  | ✓  |
|                             | <100 meters to a water source                                    | ✓                    | ✓  | ✓  | ✓  | ✓                    | ✓  | ✓  | ✓  |
|                             | Availability of toilet   | ✓                    | ✓  | ✓  | ✓  | ✓                    | ✓  | ✓  | ✓  |
|                             | Open defecation  | ✗                    | ✗  | ✗  | ✗  | ✗                    | ✗  | ✗  | ✗  |
|                             | Over-crowding (>5 family members)                                | ✗                    | ✗  | ✗  | ✗  | ✓                    | ✓  | ✗  | ✓  |
| Hygienic maintenance        | ✓  | ✓                    | ✗  | ✗  | ✗  | ✗                    | ✓  | ✓  |    |
| Household Food Availability | Household kitchen garden   | ✓                    | ✓  | ✓  | ✓  | ✓                    | ✓  | ✓  | ✓  |
|                             | Access to PDS  | ✓                    | ✓  | ✓  | ✓  | ✓                    | ✓  | ✓  | ✓  |
|                             | Access to Open market  | ✓                    | ✓  | ✓  | ✓  | ✓                    | ✓  | ✓  | ✓  |
|                             | Household food security  | ✓                    | ✓  | ✓  | ✓  | ✗                    | ✗  | ✓  | ✓  |
|                             | Food consumed => 3 times a day                                   | ✓                    | ✓  | ✓  | ✓  | ✓                    | ✓  | ✓  | ✓  |
| Maternal Level Factors      | Remunerated employment of the mother                             | ✓                    | ✓  | ✗  | ✗  | ✓                    | ✓  | ✗  | ✓  |
|                             | Maternal literacy  | ✓                    | ✓  | ✓  | ✓  | ✓                    | ✓  | ✓  | ✓  |
|                             | Experience of IPV  | ✗                    | ✗  | ✓  | ✗  | ✗                    | ✗  | ✗  | ✗  |

|                                     |  |          |          |          |          |          |          |          |          |
|-------------------------------------|--|----------|----------|----------|----------|----------|----------|----------|----------|
|                                     | Maternal health                                | ✓        | ✗        | ✗        | ✓        | ✗        | ✗        | ✓        | ✓        |
|                                     | Antenatal care                                 | ✓        | ✓        | ✓        | ✓        | ✓        | ✓        | ✓        | ✓        |
|                                     | Maternal consumption of alcohol                | ✗        | ✗        | ✗        | ✗        | ✗        | ✗        | ✗        | ✗        |
|                                     | Multiple work burden                           | ✗        | ✗        | ✓        | ✗        | ✓        | ✓        | ✗        | ✗        |
| Paternal Level                      | Paternal migration                             | ✗        | ✗        | ✗        | ✗        | ✗        | ✗        | ✗        | ✗        |
|                                     | Paternal involvement in household work         | ✓        | ✓        | ✗        | ✗        | ✗        | ✗        | ✓        | ✓        |
|                                     | Paternal literacy                              | ✓        | ✓        | ✓        | ✓        | ✓        | ✓        | ✓        | ✓        |
|                                     | Paternal regular employment                    | ✓        | ✓        | ✗        | ✗        | ✓        | ✗        | ✓        | ✓        |
|                                     | Paternal consumption of alcohol                | ✓        | ✗        | ✓        | ✓        | ✓        | ✓        | ✗        | ✗        |
| Individual Level Factors            | Regular utilisation of AWS                     | ✓        | ✓        | ✗        | ✓        | ✗        | ✗        | ✓        | ✓        |
|                                     | Early initiation of breastfeeding              | ✓        | ✗        | ✗        | ✓        | ✓        | ✓        | ✓        | ✓        |
|                                     | Exclusive breastfeeding                        | ✓        | ✓        | ✗        | ✓        | ✗        | ✗        | ✓        | ✓        |
|                                     | Completed immunisation                         | ✓        | ✓        | ✓        | ✓        | ✓        | ✓        | ✓        | ✓        |
|                                     | Semi-solid food introduced after six months    | ✓        | ✓        | ✗        | ✓        | ✗        | ✗        | ✓        | ✗        |
|                                     | Minimum food diversity                         | ✓        | ✓        | ✓        | ✓        | ✓        | ✓        | ✓        | ✓        |
|                                     | Minimum food-frequency of                      | ✓        | ✓        | ✓        | ✓        | ✓        | ✓        | ✓        | ✓        |
|                                     | History of illness in the last two months      | ✗        | ✓        | ✓        | ✓        | ✓        | ✓        | ✓        | ✓        |
|                                     | Immediate medical care provided during illness | ✓        | ✓        | ✓        | ✗        | ✗        | ✗        | ✓        | ✓        |
|                                     | Normal birthweight (=> 2500 g)                 | ✓        | ✗        | ✓        | ✗        | ✓        | ✓        | ✓        | ✓        |
| <b>Nutritional outcome of child</b> |  | <b>1</b> | <b>1</b> | <b>0</b> | <b>0</b> | <b>0</b> | <b>0</b> | <b>1</b> | <b>1</b> |
| 1= Well-nourished child             |  |          |          |          |          |          |          |          |          |
| 0 = Undernourished child            |  |          |          |          |          |          |          |          |          |

## 5. DISCUSSION

This chapter aims to discuss the implications of the study findings for the advancement of child nutritional equity in the tribal communities in India and how this study contributes to the growing body of knowledge on tribal health and nutritional equity. This chapter is organised into four sections. The first three sections are organised in line with the three objectives of the study. The first section revisits this study's first objective: to examine the child nutritional inequality between the Paniya and Kurichiya tribal communities in the Wayanad district. This section will highlight the importance of going beyond categorising tribal communities as homogenous groups and examining the gradients of nutritional inequality within the tribal population. In the second section, an attempt is made to explain how the disparity in the known risk factors of child undernutrition is produced and sustained through historically generated social processes. Section three will discuss the multi-level pathway and mechanisms underlying the child nutritional inequality within the Paniya and Kurichiya community. Section four will discuss the recommendations to address the tribal nutritional inequalities and reflect the further research needed to advance tribal nutritional equity.

### ***5.1 Intersectional nutritional inequality within the tribal communities***

The first objective of this study was to examine the child nutritional inequality between the Paniya and Kurichiya tribal communities in the Wayanad district. This study shows that Paniya children bear almost double the burden of child undernutrition (52.3% stunted, 58.9% underweighted, and 25.2% wasted) compared with that of the

Kurichiya community (28.2% stunted, 30.1% underweight, and 12.3% wasted). This pattern was reported to widen in case of severe anthropometric failures. NFHS-4 (2015-16) data reports that among tribal communities in Kerala, 24.1% of children are stunted, 20.6% are wasted, and 23.6% are underweight. According to the current study, 39.8% of the children in the Paniya and Kurichiya tribal communities were stunted, 43.9% were underweight, and 18.5% were wasted. At the national level, among the tribal communities, 44%, 45%, and 27% of the children were stunted, underweight, and wasted, respectively. This means that the assessment of tribal nutritional status based on the averages and central tendencies demonstrates a slightly better status of Kerala tribal children compared with the national average. However, such estimates mask the nutritional inequality within the tribal community in Kerala. The community-wise nutritional inequality between Paniya and Kurichiya points towards the gradients of inequality within the tribal population. The tribal community is treated as a homogenous community in national surveys, which invisibilises the neediest population group within the tribal community (Ravindran, Khanna, Liang, et al., 2018).

This finding has important implications for advancing health equity in the state of Kerala. Even though the state of Kerala has achieved better health status, life expectancy, literacy status, and ranked higher in the human development index and was much acclaimed by the developmental economist as Kerala model development (Sen, 1999), this model refers to the averages and central tendency of the health and developmental indicators. The high prevalence of undernutrition among the Paniya tribal compared with the state and the national averages of tribal communities points towards communities that stand as outliers in Kerala's successful developmental stories. The developmental narratives on the Kerala model development as success

stories based on the state-level central tendencies can lead to the exclusion of the most marginalised communities like Paniya (Paul, 2017). Previous studies have reported that while the better-off ethnic groups within the tribal community in Kerala claim the majority of constitutional benefits meant for the tribal communities, the most marginalised tribal groups, including Paniya and Adiya tribal communities, are left with very little benefits of such affirmative actions (Paul, 2017; Susamma, 2013).

In India, 705 ethnic groups are officially recognised as scheduled tribal in India. In nationally representative health and nutritional surveys, these communities were represented as Scheduled Tribes (ST), which does not consider the diversity within the tribal communities. The majority of the nutritional inequality analysis in India that was reviewed in the literature review chapter was conducted based on the National Family Health Survey data. Although these analyses consistently reported a higher burden of undernutrition among the tribal community, these analysis masks the nutritional inequalities within the tribal communities in India. Policies and programmes based on a such analysis view tribal communities in India as homogenous communities. The cross-sectional studies reviewed as part of this study looked at the nutritional inequalities between tribal and non-tribal children (Das et al., 2021; Tiwari et al., 2011), and the other studies examined the nutritional status of children from a particular community. While reviewing the literature, very little was found on the nutritional inequality between the different ethnic groups in tribal communities in India. The result of this study is consistent with the findings from the systematic review of the nutritional status of tribal children in India, indicating that severe nutritional inequality exists within the tribal community (Dey and Bisai, 2019b). An analysis conducted by the scholar using NFHS-4 (2015-16) reported that children from tribal communities bear the highest burden of undernutrition; this high burden is not

uniformly distributed across the tribal communities when disaggregated by economic wealth quintiles, rural and urban places of residence and gender. Within tribal communities, significant nutritional inequality was reported by economic wealth quintiles and place of residence (Sabu et al., 2021). Additionally, the tribal population in India is usually characterised as people living in hilly and forest regions with much more autonomy and access to forest and land resources and are relatively protected from caste-based oppression (Bang, 2018; Lerche and Shah, 2018). However, this study shows the multiple and varied forms of oppression that few tribal communities experienced. The child nutritional disparities observed between the ethnic groups within the tribal communities in this study point towards an urgent need to go beyond the averages of health and nutritional indicators and caution against the simplistic formulation of one size fit for all nutritional programmes. Identifying the most vulnerable ethnic groups within the tribal communities will help in better targeting nutritional programmes for the neediest within the tribal communities (Joe et al., 2013).

Most studies examining nutritional inequality in India used the conventional indicators of stunting, wasting, and being underweight. According to WHO, these three indices reflect distinct biological conditions, and any single index cannot be a proxy for these distinct biological phenomena (WHO, 1995). While categories of undernutrition based on one of the three indices are helpful diagnostic parameters, the individual estimates of stunting, wasting, and underweight can lead to an underestimate of the overall burden of undernutrition in a community as these indicators may overlap. The use of CIAF in this paper has the advantage of unequivocally demonstrating the inequality in the overall magnitude of undernutrition and severity of undernutrition between the two communities, which would not have been possible with the use of

conventional anthropometric measurements of individual aspects of undernutrition. The significantly higher risk of CIAF among children from the Paniya community again underscores the need for more focused nutritional intervention among the Paniya community. This is critical from the point of view of equity for prioritising nutritional interventions where a large proportion of children experience multiple and simultaneous failures and deserve prioritised intervention.

### ***5.2 Historical accumulation of advantages and disadvantages***

The study's second objective was to understand the historical and contextual factors that lead to significant differences in child nutritional status between the Paniya and Kurichiya communities in the Wayanad district, Kerala. The historical background of the Paniya and Kurichiya communities helps us understand the long-time social process that shaped the underlying causes of neighborhood conditions, households and parental ability to provide quality care to children with adequate dietary provision and protection from illness (UNICEF, 1990). This section discusses how the diverging patterns, advantages, and disadvantages were accumulated by the Paniya and Kurichiya communities, shaping the inequality in the immediate and underlying causes of child undernutrition.

Though Paniya and Kurichiya communities shared the identity of being tribal or Adivasi, which posed certain disadvantageous social positioning among the numerically non-tribal majority society, both the communities stand at two extremes in terms of their experience of their power relation with non-tribal people. The different dimensions of contextual factors, including socio-economic and cultural capitals, formed a complex maze of power relationships within and across both

communities. Overall, the Paniya people suffered from material and non-material deprivation because of the historical exploitation and injustice they experienced in the caste-based social structure. On the other hand, the Kurichiya people were a privileged ethnic group with land ownership and political association with the local rulers, both of which acquired them an elitist social position within the tribal communities of Wayanad. The historical and contextual factors associated with the high prevalence of child undernutrition among the Paniya community resonate with the reproduction of historical injustice and structural inequalities explained by Nuti (2019) (Nuti, 2019). On the other hand, the Kurichiya community could sustain its historical privilege through the elite capture of resources meant for the betterment of the tribal community as a whole (Musgrave and Wong, 2016). The findings of this study corroborate with other studies and reveal multiple ways the unjust historical exploitations against the Paniya people were accumulated and reproduced through establishing an unjust social system. On the other hand, Kurichiya people could accumulate multiple advantages over the Paniya community through the elite capture of resources and through the interaction of multiple forms of capital (Bourdieu, 2005). The inequality in power between Paniya and Kurichiya people seems to be linked to their economic capital, as explained by the Maxian economic relationship, the cultural capital, as explained by Kurkheim and the socio-political capital by Max Weber.

### **5.2.1 Historical and contextual factors of the higher burden of child undernutrition among Paniya**

This section first explains how the Paniya people's historical marginalisation of landholding, poor livelihood opportunities, larger changes in the agriculture practices, and exclusion from food security schemes limited the Paniya children's access to a

diverse diet needed for optimal growth. Secondly, this section will explain how the unhealthy neighborhood conditions that pose risks to child health in the Paniya settlement are shaped historically, and thirdly, how the structural conditions constrain the Paniya parent's ability to provide adequate child care.

The Paniya people in our case studies perceived their history of bonded labour as the main reason for the community's poverty. This result is supported by previous studies (Mohindra, Narayana, Harikrishnadas, et al., 2010b; C P Vinod, 2009). Though the bonded labour system was legally abolished and does not exist today in its historical forms, the evidence from this study and from other studies consistently reports that the unequal power relationship operated under this system and the material deprivation continued to operate in the subsequent periods. The historical injustice against the Paniya people was reproduced in multiple ways in different historical periods. Studies have reported that the migrant non-tribal settlers appropriated the Paniya people's land through fraudulent ways by giving alcohol and by forging counterfeit land documents (Bijoy and Raman, 2003; Paul, 2017). Again, the Paniya people were excluded from the developmental reforms initiated in the state after its formation. For example, the land reform act of Kerala has been implemented to redistribute the land to the state's landless people. However, the land reform act did little justice to the Paniya people. When Kerala's land reform act of 1963 was enacted and amended in 1969, the landlords and other settlers who owned more land had sufficient time to transfer the landholding to their relatives and trustworthy dependents to escape the land ceiling laws. Consequently, the bulk of the land transfer during this time favoured the non-tribal population (Paul, 2017; Prashanth, 1985). Again, the Kerala Scheduled Tribes Restriction of Land Transfer and Restoration of Alienated Lands Act 1975 was passed a few years later in order to restore the lands taken from tribal people. However, this

act was diluted with a clause that exempted land restoration under two hectares (Chemmencheri, 2018; Paul, 2017). During the subsequent period, the Paniya people, who lost the land that they traditionally occupied, were pushed to rehabilitation settlements called 'colonies' with inadequate basic facilities (C P Vinod, 2009), which means that the Paniya people's land alienation was structurally shaped. This historical process of land alienation explains the meager land holding of the Paniya people in this study. The cross-sectional survey of this study reported that nearly three-fourths of the community members hold less than five cents of land. Land alienation of the Paniya people is linked with the Paniya children's health and nutritional status through multiple pathways. The land alienation contributed to the economic marginalisation of Paniya, which constrained their ability to purchase diverse food baskets needed for their children's optimal growth. It also constrained their ability to grow adequate household fruits and vegetables. Again, the meager land holding shaped the unhealthy neighbourhood posing risk to the health of the children and adults.

Most Paniya people in this study were agricultural labourers, and their representations in skilled labour are almost absent in cross-sectional surveys and case studies. This finding seems to be consistent with the previous studies that reported more than 90% of Paniya people to work as daily wage labourers in the unorganised sector (Rajaseenan et al., 2016). Paniya people's landlessness rendered them landless agriculture labours under the dominant upper caste or land-owning communities. They had to depend on the non-tribal people in their neighbourhood for their livelihood practices. However, the overall shift in the agriculture practices and the economic activities in the district amplified the Paniya people's livelihood insecurities and vulnerabilities to further exploitations. Paniya people in this study and from previous studies consistently reported being exploited by the non-tribal through a debt trap (Mohindra, Narayana

and Haddad, 2010b; Mohindra, Narayana, Harikrishnadas, et al., 2010b; Susamma, 2013; C P Vinod, 2009). This means that the Paniya people are not free labours today. As it existed under the bonded labour system, the Paniya people's freedom to choose their work and bargaining power was limited because of the growing uncertainty in the agriculture-based livelihood opportunity.

To cope with the growing uncertainty in their livelihood opportunities, the Paniya people in this case study adopted seasonal labour migration and employment opportunities under MGNREGA. However, the seasonal migration of the Paniya people has further increased their economic precarity. As seasonal migrant labourers, the Paniya people were treated even worse than it was in their village. Additionally, our study respondents consistently attributed the excessive alcohol consumption among the Paniya men to their labour migration to Karnataka. Alcohol consumption diverted the little available income of the households. A similar result was reported in the ethnographic report on the Paniya people's livelihood practices (Chemmencheri, 2019). Additionally, scholars have reported sexual exploitation (JOSE et al., 2011), physical abuse, and death (Chemmencheri, 2019; Paul, 2017) of Paniya people as migrant labours in Karnataka. What is even more alarming is the recent studies reporting that the non-tribal farmers who provided labour opportunities to the Paniya people as migrant labours in their place of a destination now depend more on the local workforce from the lower caste community, which is challenging even the migration opportunities in Karnataka (Chemmencheri, 2019). The MGNREGA was the other coping strategy of the Paniya people. However, the Paniya community with severe economic precarity could not opt to choose MGNREGA as a livelihood option in our study. Because to adopt this as a coping strategy, one needs to have some financial backup to cope with the delay in the disbursement of wages. Other studies have

reported that Paniya people attending MGNREGA experienced severe forms of discrimination and insult from their non-tribal colleagues (Chemmencheri, 2019). This means that the Paniya people have already lost their traditional livelihood opportunities, and now they are losing out on the adaptation strategies to cope with the growing livelihood insecurities that limit their capacity to provide adequate dietary diversity and care to their children.

In addition to the economic precarity that constrained the Paniya people's ability to access food from the open market, several other historically shaped disadvantages further amplified the Paniya people's vulnerability to household food insecurity. The shift in the agricultural practices of non-tribal people from food crop cultivation to cash crop cultivation limited the availability of several indigenous food items that the Paniya people were traditionally dependent on. A similar finding was reported by other scholars (C P Vinod, 2009). The household's ability to grow food items in the home garden is a known protective factor against household food insecurity (Girard et al., 2012). While 95% of Kurichiya people could grow household kitchen gardens, it was only 60% among Paniya households. The availability of land and water sources were the critical factors in this case study that determined the ability of the households to grow kitchen gardens. The meager land holding of Paniya provided little space for them to grow household kitchen gardens. Additionally, water scarcity in the Paniya settlement also constrained their ability to grow various food items in their home garden.

As the traditional sources of food items, we declined for the Paniya people; the food security schemes, including the PDS service and Anganwadi services, were the main food sources that could buffer the loss of traditional food sources. However, this study reported that a relatively lower proportion of households could access PDS and ICDS

services than the Kurichiya community. The case studies unravel how the historically shaped structural constraints shaped inequality in access to some of these services. While the geographical location of AWCs in both the case studies was 1 KM away from the Paniya settlements, in the case of Kurichiya case studies, AWCs were located within their settlement. The better land ownership of the Kuchiya community allowed them to donate their land for AWCs within their settlement territory, facilitating community ownership of the Anganwadi centre and better utilisation of its services. On the contrary, the marginal landholding of the Paniya community, rooted in their historical exploitation, limited their capacity to donate land for the Anganwadi centre. Though the AWW interviewed in the study shared their good intentions to serve the Paniya people, their responses also reflected the unconscious prejudices, stereotypes, and judgment against the Paniya community as "thieves", "liars", and "lazy". Similar to this, other studies also reported the non-tribal perception of Paniya in similar cultural stereotypes (Susamma, 2013). This means that the negative stereotypes against Paniya people by non-tribal people got institutionalised when they became the service delivery actors of the government institutions. This stereotyped perception of public servants also shaped the way services were delivered to the Paniya people, often characterised by rude and discriminatory behaviour. The stigma and discrimination experienced by the Paniya people are other factors that contributed to the inequality in service utilisation by the Paniya people (Chemmencheri, 2018).

While land alienation, poor livelihood opportunities, and exclusion from the food and security schemes and services explained the household food insecurity that limited the children's dietary intake, poor neighborhood condition explains the poor health status of Paniya children. The cross-sectional survey reported that Paniya children bear a disproportionately higher burden of infection (cough and fever) and low birth weight.

Unhygienic environments and sanitation practices are known risk factors for infectious diseases (Aiello and Larson, 2002; Landrigan et al., 2018). As per the neighborhood observation checklist used in the cross-sectional survey, in the majority of the Paniya settlements, the hygienic condition was very unsatisfactory or unsatisfactory, characterised by no drainage facilities, accumulation of garbage in open space, and a high level of a vermin infestation. As discussed earlier, the marginal landholding of the Paniya people is rooted in their historical exploitation. The population growth of the Paniya people over the two generations caused a further shrink in the land available to individual households. The population growth of the Paniya people within segregated geographical settlements without basic facilities over generations has contributed to ecological degradation. This finding of this study is also supported by other studies conducted among Paniya people (Mohindra, Narayana, Harikrishnadas, et al., 2010b; Subudhi et al., 2019). Thus, the poor living condition and unsatisfactory hygienic conditions of the Paniya settlement increased the Paniya children's exposure to pathogenic environmental conditions leading to frequent infections and illnesses among children.

The other health concern of Paniyua children is the higher incidents of low birth weight of babies. Low birthweight babies have a higher risk of infection, low milestone development, and continued undernourishment (Kogan, 1995). Meta-analysis on the risk factors of low birthweight babies reports that maternal experience of physical and emotional abuse during pregnancy (Murphy et al., 2001) and maternal anaemia (Rahmati et al., 2017), maternal consumption of alcohol and substance before and during pregnancy (Patra et al., 2011), and poor maternal diet before and during pregnancy (Gete et al., 2020). Though this study did not assess the health and nutritional status, the anecdotal evidence from the Kis indicated the high prevalence

of maternal anaemia among the Paniya mothers in this study. As with children, household food insecurity could contribute to poor maternal nutrition and low dietary diversity. Additionally, 23.2% of mothers reported consuming alcohol and 34.4% of mothers reported having experienced domestic violence. The findings from this study and the previous studies confirms that alcohol and substance use among the Paniya people was started as coping mechanisms against physical pain of hard labour during the bonded labour period and during the subsequent period labour exploitation under the non-tribal migrant settlers (Sadath et al., 2019; C P Vinod, 2009). In line with this finding, the studies conducted among the communities with similar historical exploitation and trauma also reported higher use of alcohol and tobacco to cope with their day-to-day adversities (Sotero, 2006). The risk factors of the higher burden of low birthweight babies are rooted in the historical marginalisation of the Paniya community.

The third pathway of how historical disadvantages affected the Paniya children's nutritional status is through the parental capacity to provide adequate care to their children that protects them from adverse health conditions and ensures their children eat healthy and adequate food. In this Paniya case study, the low literacy level, parental consumption of alcohol, and domestic violence were the factors that adversely affected the parental ability to provide adequate care to their children. Parental education, specifically maternal education, is a critical factor contributing to better child-caring practices for the parents. While the state of Kerala has been credited with its impressive educational achievement with nearly a cent per cent literacy level, this study data shows that the Paniya community stood outside such achievement. When the overall literacy rate in Kerala was 94% as per Census (2011), it is only 64.2% among Paniya mothers. Paniya people's poor education status has been consistently

reported by other scholars as well (Mohindra, Narayana, and Haddad, 2010b: 4; Paul, 2017; C. P. Vinod, 2009).

Despite several measures initiated by the tribal department to improve the education status of the tribal communities, the Paniya children's in our case studies refused to attend school in many instances. The case study findings explained the persisting inequality in educational status between both communities. In many instances, this stereotype operates unintentionally and unconsciously in our key informants. The studies conducted by Joe and Shanuga (2018) reported that the unwelcoming interactional milieu and the experiences of '*being othered*' by the non-tribal people at school were the main deterrents for *Paniya* children to attending schools (Jose and Shanuga, 2018). *Paniya* people's lifestyle was considered primitive and uncivilised by the non-tribal respondents in our study. Jose and Shanuga (2019) reported that the *Paniya* language and art forms were not entertained in the public schools they attended, which was one of the reasons for the early dropout of *Paniya* children from schools (Jose and Shanuga, 2018). This structural exclusion of *Paniya* people from school could possibly limit the *Paniya* parent's capability to provide adequate care to their children through multiple pathways. Firstly, it could limit the parental knowledge of the appropriate child feeding and caring practices. Secondly, it constrained the parental livelihood opportunity for adequate household income and access to food from open market and health care services to their children.

The second factors that constrained the ability of *Paniya*'s parents to provide adequate care to their children were alcohol consumption and domestic violence. The historical rootedness of the *Paniya* people's alcohol consumption is already discussed. This study reported that alcohol consumption is the primary cause of domestic violence against the *Paniya* mothers, which is a known risk factor that adversely affect the

Paniya mothers' physical and mental health that could constrain the maternal ability to care for their children (Mohindra, Narayana and Haddad, 2010b). Parental alcohol use in this study was also reported to amplify household vulnerability to food insecurity as the income available for food and other necessities was diverted to the purchase of alcohol.

### **5.2.2 Historical and contextual factors of better child nutritional status among Kurichiya communities**

A comparison of Paniya and Kurichiya case studies resonates with what Merton (Merton, 2016) described as Matthew Effect “*Unto everyone that hath shall be given, and he shall have abundance; but from him, that hath not shall be taken away even that which he hath*” (Matthew 25:29). Firstly, Kurichiya people were privileged in terms of their economic, social and cultural capital which is reported by other scholars as well (Menon, 2022; Thilakan, 2018). The evidence from the Kurichiya case study and the cross-sectional survey indicate that Kurichiya people’s early advantages in the multiple forms of capital accumulated incrementally through the interaction between these capitals as postulated by Bourdieu (2005) in capital interaction theory. In contrast to Paniya, the Kurichiya people were historically privileged due to their political affiliation with the local rulers and land ownership. The Kurichiya people's historical association with the local rulers for their military service granted them a large tract of land. Land as the primary means of economic production through agriculture activities and cattle rearing ensured them better economic capital and livelihood opportunity. The better economic capital of the Kurichiya people allowed them to invest in their children's education, leading to better cultural capital and improved their employment opportunities in secure government

jobs. Thus, economic investment in education improved cultural capital and also fed back into economic capital. Kurichiya people's cultural capital in terms of their expertise in archery increased their acceptance among the local rulers leading to the ownership of land. Kurichiya's traditional celebration facilitated a feeling of belonging. Thus the cultural capital also translated into improving social capital with social cohesion within the community and widening the social network outside the community. Kurichiya people had a close affinity with the Hindu upper caste Nair community in terms of their matrilineal joint family system, and the practices of untouchability against other marginalised tribal communities and Dalit communities acquired them a higher social status within the tribal community and better social acceptance among the upper caste non-tribal population. The accumulative interaction of multiple forms of capital among the Kurichiya people is the one possible mechanism that the early historical advantages of the Kurichiya community are sustained or accumulated overtime leading to better access and control over the resources needed to ensure the food diversity and protection from adverse health conditions of their children.

Kurichiya people's accumulation of economic, social and cultural capital gained them an 'elite' status within the tribal communities of Wayanad. Kurichiya people's better representation in political positions and government jobs and their relatively better utilisation of health and food security services also point towards the elite capture of public welfare resources by the Kurichiya community (Dutta, 2009). As per the Kerala Panchayat Raj Act (1994), marginalised social groups, including members of Scheduled Castes (SC), Scheduled Tribes (ST), and women, are required to be represented in local self-government institutes on a proportional basis. The Kurichiya member's higher social status, better educational achievement, and social

network with non-tribal provided them with better acceptance among the non-tribal community and the added advantages of being a better candidate in electoral politics. In a similar line, other scholars have reported that Kurichiya community members hold the majority of the seats reserved for the tribal communities in the Panjanyath Raj institutions. Chemmencheri (2019) additionally pointed out that the Kurichiya leaders' representation in politics as a proxy for the whole tribal community often misrepresents the priorities and concerns of Paniya or other similarly marginalised communities.

Additionally, all the frontline workers from tribal communities in our case study belonged Kurichiya community. Consistent with the previous studies, this study also reported Kurichiya people's representation in state and central government jobs (Nimisha, 2018b). This means that through the Kurichiya people's better representation in Panchayath Raj institutions, frontline workers, and various government jobs, the community could exercise major control over the resources distributed through public welfare schemes meant for tribal communities. This means that the Kurichiya people, as the elite group with the tribal communities Wayanad, could capture the majority of the political space and public employment opportunities reserved for the tribal community because of their better educational and social status. Using such positions, they could also control the resource distribution through the welfare institutions in favour of their community. This could be the plausible reason for the Kurichiya people's better utilisation of food security schemes of PDS and Anganwadi services, the better infrastructure facilities, and living conditions in Kurichiya settlements.

Though the Paniya people form the numerical majority among the tribal population in Wayanad, their representation among public servants and political representation is

very limited. A possible explanation for this lack of political representation could be because of lower community-level social cohesion. The lower social capital in the form of social cohesion and community network of Paniya people has translated into other disadvantages. The lower social cohesion and voice representation of the Paniya people in the welfare programme also could be the reason for the Paniya people's lower utilisation of welfare schemes. Similarly, the justification for excluding Paniya people from public servant jobs is the lack of formal educational qualification among the Paniya community that meets the requirements even for frontline workers. Thus, through the construction of merit criteria, the fact that an unjust historical structure limited the Paniya people's educational attainment is overlooked. As Merton (2016) pointed out, the inequality in the social determinants of child nutrition observed between the Paniya and Kurichiya communities was shaped by the unequal societal distribution of resources of economic productivity that advantaged Kurichiya people and disadvantaged the Paniya people (Merton, 2016). The inequality in landownership between Paniya and Kurichiya communities further translated into the inequality in livelihood opportunities.

### **5.2.3 Pathways and mechanism of inequalities in child nutritional status between Paniya and Kurichiya**

Examining the social pathways and mechanisms of child nutritional inequality between tribal communities is critical to advance nutritional equity because it helps identify the problem's root causes. This allows policymakers to address the underlying factors that contribute to nutritional inequality, such as poverty and unequal access to health care and nutritional services (Gaitonde, 2018). The Diderichsen framework on the mechanism of social inequality in health provides a useful framework to explain the Paniya and Kurichiya inequality in child nutritional status (**Figure 12**). First, the

social stratification within the tribal, based on the inequality in socio-economic and cultural capitals, is the primary mechanism of the nutritional inequality between the Paniya and Kurichiya communities. This has meant that the Paniya people have suffered from a history of bonded labour, land appropriation, and exclusion from development reforms, resulting in their poverty and meager land holdings. Whereas the Kurichiya people's historical connection with the rulers and the land they received in return for their military services positioned them as an elite within the tribal communities in Wayanad and could enjoy a higher share of public welfare schemes and education opportunities. This historical process created a context of social stratification within the tribal communities in Wayanad, where the Paniya's historical disadvantages pushed them to the bottom of the stratification, and the historical privileges of Kurichiya positioned them higher in their social ladder.

Second, socio-economic and cultural capital inequality causes differential exposure to the risk factors of child undernutrition, such as exposure to unhealthy environmental conditions and poor dietary practices. The population growth in a congested area with inadequate water and sanitation facilities underlies the poor and unhealthy environmental conditions of the Paniya. Similarly, the Paniya people's land alienation, livelihood precarity, and lack of freedom of choice and bargaining power forced them to adopt coping strategies such as seasonal labour migration and MGNREGA by both parents to survive. Both increased the exposure of Paniya children to unhealthy surroundings causing frequent infections. Their lack of land ownership has prevented them from accessing diverse food baskets and growing their own fruits and vegetables, contributing to their food insecurity. Their lack of education has hindered their ability to provide adequate care and nutrition to their children. These factors show how social inequality has adversely impacted the health and nutrition of the Paniya people.

Kurichiya people with better land ownership could grow diverse fruits and vegetables on their own land, and with a better economic position, they could access food from open markets. Multiple sources of food could ensure household food insecurity. Access to better water and sanitation facilities, neighbourhood environmental hygiene, and parental care protected the Kurichiya children from unhealthy environmental conditions.

The third mechanism underlies the nutritional inequality between the Paniya and the Kurichiya communities is their differential vulnerability. Children who suffer fetal growth retardation is known to be more vulnerable to infection. This vulnerability is exacerbated by exposure to a pathogenic environmental condition in which they live and grow. The impact of the exposure to pathogenic environmental conditions and household food insecurity of Paniya children is exacerbated by another health risk, including low birth weight. The higher rate of morbidity among the Paniya also interacts with other institutionalised stereotypes and economic precarity, both of which increase the vulnerability to undernutrition. This study highlighted that non-tribal people had institutionalised cultural stereotypes such as "thieves", "liars", and "lazy" towards the Paniya. This has led to discrimination and stigma against Paniya children when accessing services, thus further contributing to delay in treatment-seeking when children are ill, which increases the Paniya children's risk of undernutrition from illness. Whereas the prevalence of low birth weight is lower among Kurichiya, they provide immediate medical care to their children when they are ill and could minimise the impact of illness on the nutritional outcome.

The fourth mechanism is through unequal social consequences of illness and undernutrition. While undernutrition and infection are known to interact viciously, the economic and livelihood precarity and poor social network of the Paniya people

amplify its impact on the household's food security and mental health. At the same time, the better livelihood opportunities and the social capital of Kurichiya people buffer the social impact of illness. As Paniya men mostly depend on labour migration, the children's illness burdens the mothers. As financial support from the men who migrate is limited in most cases, Paniya mothers have to work for income. The illness of the children put her into a difficult trade-off between her wage and household food security and the treatment of the child. Treatment of the child causes her wage loss, which worsens the household's food insecurity, thus creating a downward spiral of food insecurity, undernutrition, and illness.

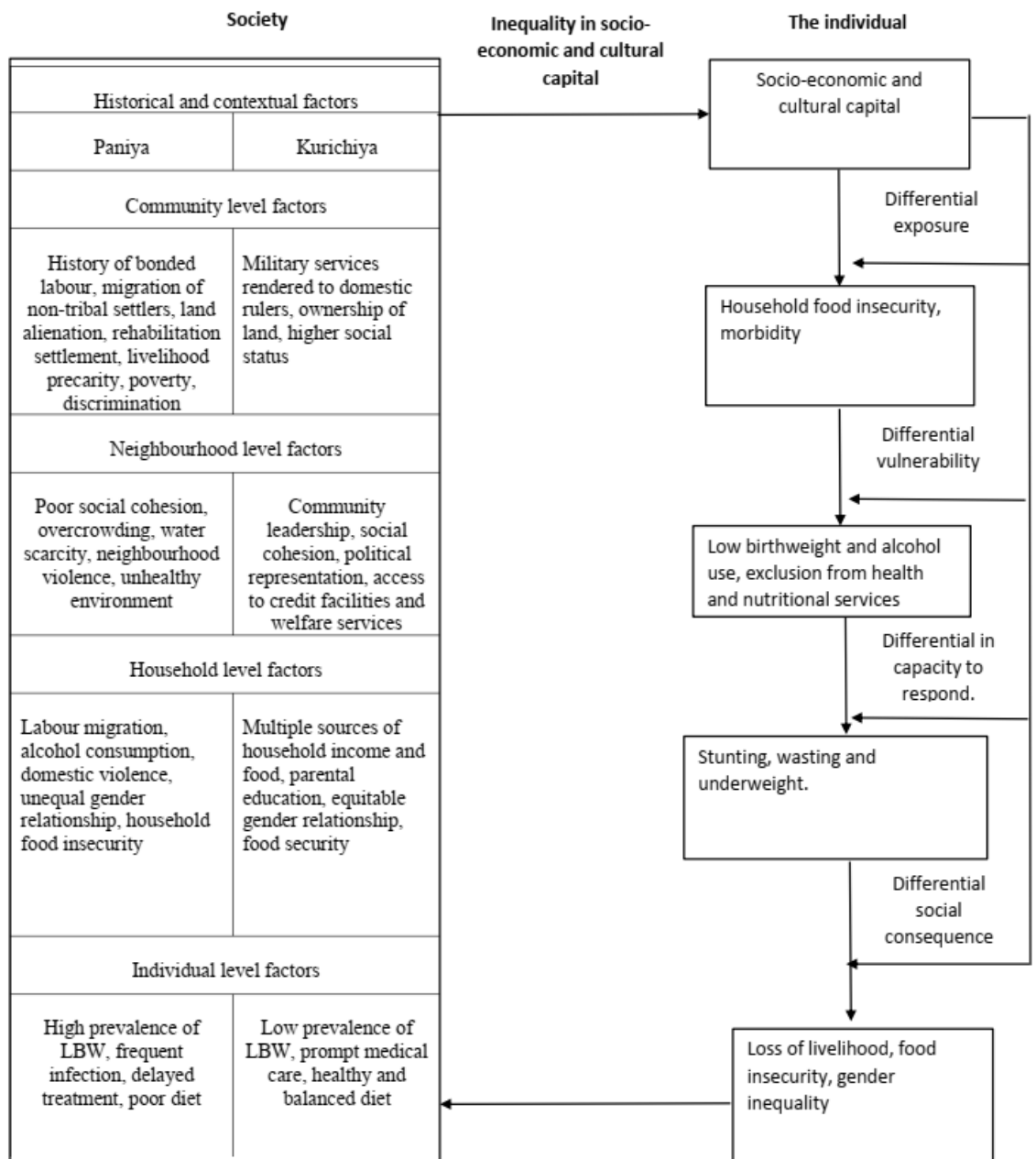


Figure 12: Pathways and mechanism of child nutritional inequality between Paniya and Kurichiya tribal communities (Adapted from Diderichsen et al., 2001).

### ***5.3 The factors and pathways of influence on differentials in child nutritional status within the Paniya and Kurichiya communities***

#### **5.3.1 5.3.1 Nutritional inequality Within Paniya**

The differentials in the factors associated with child nutritional status between Paniya and Kurichia communities further indicate the possible syndemic interaction between child undernutrition, infectious diseases, and household-level poverty among Paniya people and Kurichiya people's protective factors against child undernutrition (Figure 13). Among the Paniya and Kurichiya people, the availability of fruits and vegetables was a common factor positively associated with child nutritional outcomes. However, the low birth weight of children and the history of morbidity (cough and fever) were the significant risk factors among the Paniya children. Whereas, among the Kurichiya people, sex difference was the only other significant risk factor. The synergetic relationship between child undernutrition and infectious diseases is well-recognized in syndemic literature. Undernourished children are more vulnerable to infectious diseases due to their compromised immune function. Similarly, repeated and frequent infectious 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 (Bennett, 2017). This finding indicates this synergetic relationship between infection and undernutrition among the Paniya people. Similarly, the significant association between low childbirth weight and current undernutrition also could indicate the possible synergetic relationship between the high prevalence of alcohol consumption, the maternal experience of domestic violence, household food

insecurity reported among the Paniya people leading to poor maternal health and adverse birth outcome (Alhusen et al., 2013; Rosen et al., 2007; Xavier Hall and Evans, 2020). The positive association between child nutritional status and the household kitchen garden is enhanced in the case of the Kurichiya community compared with the Paniya people. At the same time, while 95% of Kurichiya households have a kitchen garden, nearly 60% of the Paniya households have a kitchen garden. While the land availability with sufficient water sources enabled the majority of the Kurichiya people to grow household kitchen gardens, the landlessness and water scarcity limited the Paniya people's ability to do so. This difference also reflects how the Kurichiya people's historical advantages of land ownership contributed to the current nutritional status and vice versa for the Paniya people. The usual female advantages in child nutritional status observed globally (Robert E Black et al., 2013; Chirande et al., 2015; Khan et al., 2015; Martorell and Young, 2012; UNICEF, 2013) are amplified in the case of the Kurichiya community, whereas among the Paniya people this female advantage reported a reversing trend which needs further exploration to understand.

The community-level advantages and the disadvantages observed between the Kurichiya and Paniya people are not uniformly distributed within the community. The settlement-level case studies further unpacked the neighbourhood sub-group level mechanisms of how social and biological advantages and disadvantages are accumulated unevenly within the community. The settlement-specific socio-economic cultural capitals, including the neighbourhood living conditions, social cohesion, livelihood opportunity, access to educational opportunity, and health behaviour which can potentially lead to the onset of vicious or virtuous interactions, are accumulated over time in all the settlement level case studies. The settlement-level Paniya case

studies unravel the social mechanisms that shaped the accumulation of multiple adversities of HPS Paniya and the potential protective factors that could save a community from falling to the syndemicity of adverse social and biological conditions. Furthermore, it also reveals how the intersection of multiple advantages and disadvantages shapes diverse experiences and vulnerability of syndemic conditions that the community and individual households within the community experience in spatial and temporal dimensions.

### **5.3.2 Neighbourhood level factors**

The cross-case comparison of settlement-level Paniya case studies explains how adverse social conditions of oppressive social relationships, poor livelihood opportunity, food insecurity, and unhealthy living conditions lead to the high burden of undernutrition and other co-morbidities and their interaction varies across the Paniya settlement, why some people fall into the structurally shaped social vulnerability to the syndemic interaction between undernutrition, infectious disease, food insecurity and unhealthy living conditions and behaviours, while others could build resilience against this.

The factors underlying the high prevalence of child undernutrition among HPS Paniya settlements are more in line with the syndemic theory. Though the Paniya people in both case studies shared the common historical disadvantages of bonded labour history and land alienation leading to their current economic marginalisation, the basic differences between the two Paniya settlements were in terms of their social capital. The chronic disadvantages in multiple spheres of life, including socio-economic 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 economic marginalisation of the Paniya people, in

general, is rooted in their historical exploitation and structural violence. However, 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 Paniya.

The interaction between poor social and economic capital (land and other material resources) shaped the poor living condition observed in the settlement. For example, the failure to ensure basic living conditions like insufficient water supply amplified this social disruption through the dispute and violence over the limited water resources. The frequent violence in the HPS settlement is also reported to cause a sense of fear and insecurity among women and children, which shows the mental health impact of settlement violence. 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 (Workman *et al.*, 2021). The dispute and violence over the scarce water resources perpetuated further damage to the available scarce resources. The social disruption and water insecurity underlie the poor living conditions characterised by unsanitary environmental conditions, which is a known risk factor for infectious diseases for both adults and children (Budge *et al.*, 2019; Vilcins *et al.*, 2018). Additionally, water scarcity limited the HPS Paniya people's capacity to grow household kitchen gardens which is a significant protective factor against child undernutrition in our analysis. Other studies also indicate that having limited access to safe water can significantly impact household food preparation, putting them at risk of contamination with enteric pathogens (Workman *et al.*, 2021).

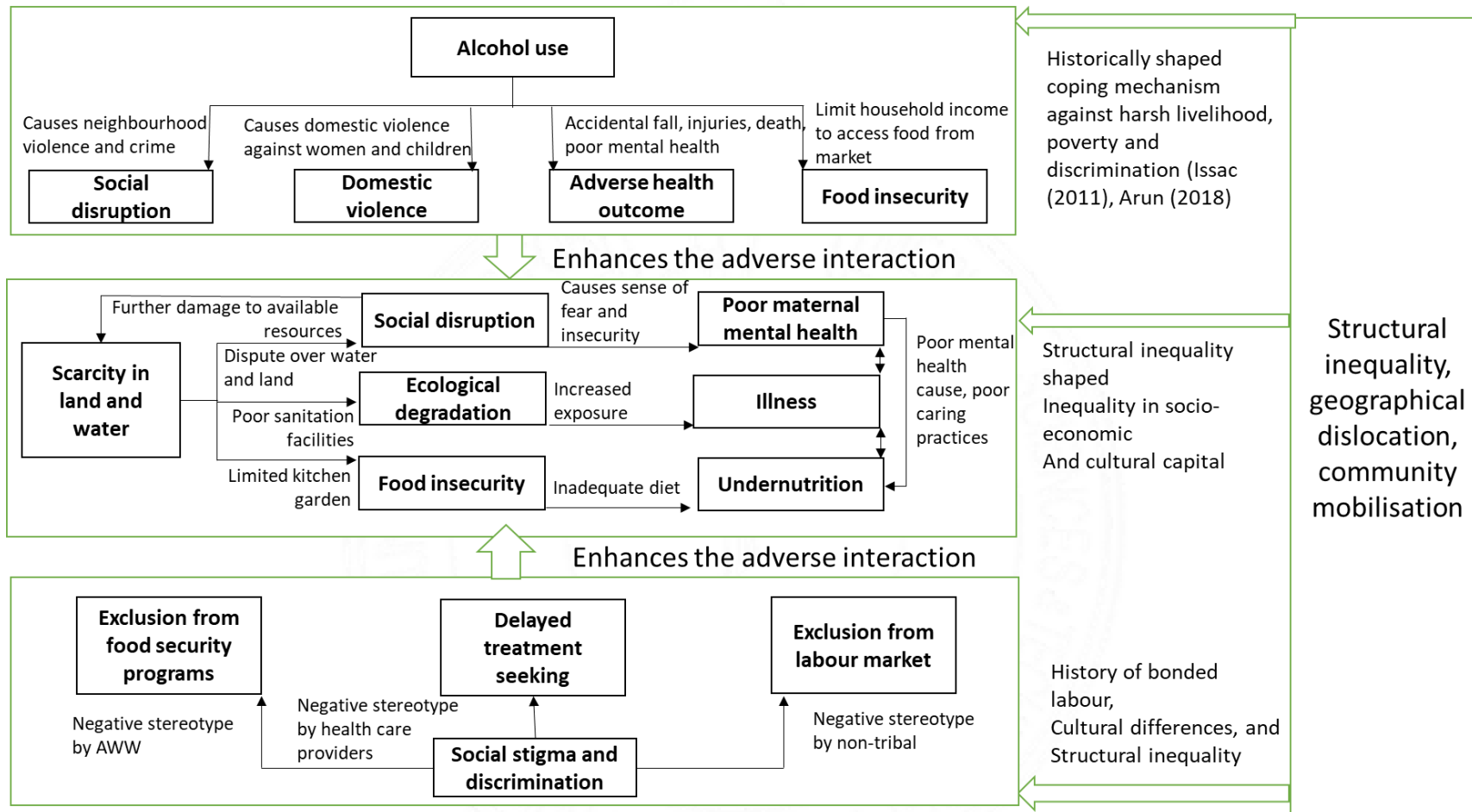


Figure 13: Syndemic interaction of undernutrition, illness, and structural inequality (adapted from Mendenhall et al., 2017)

Alcohol and tobacco use among the HPS Paniya is the other health condition that enhanced the adverse interaction between resource scarcity, violence, food insecurity, infectious diseases, and social cohesion. Previous studies have reported that alcohol and tobacco consumption among the Paniya people is rooted in the history of exploitation, social inequality, and poverty (Susamma, 2013; C P Vinod, 2009). Among the HPS Paniya people, alcohol consumption, violence, conflict, food insecurity, and diseases were mutually exacerbating. Alcohol consumption was reported as a direct cause of violence between and within the household members, accidental falls, injuries, and death. In this way, alcohol consumption takes a heaving toll on HPS people's health. Additionally, alcohol consumption-related violence further enhanced the social disruption in HPS Paniya. The vicious interaction of alcohol consumption, violence, and social disruption is also known to cause poor mental health in other studies (Xavier Hall and Evans, 2020). As the major portion of the limited income available to the HPS Paniya people is diverted to the purchase of alcohol and tobacco, their ability to access food from the open market is also constrained, which further increases their vulnerability to food insecurity. Parental alcohol consumption and domestic violence, coupled with other socio-economic stresses, contribute to neglected parenting practices among the HPS Paniya as reported in similarly vulnerable populations (Boateng et al., 2020; Brewis et al., 2020).

Prejudice and stereotypes against HPS Paniya based on their history of bonded labours, sociocultural differences, and poverty also exacerbated interaction between child undernutrition, infection, and household food insecurity. The KIs who represented the frontline service providers in the HPS community consistently shared their perception of HPS Paniya people as primitive, drunkards, criminals, and sexual

offenders. These perceptions of service providers perpetuated discriminatory attitudes and behaviour against HPS Paniya people. Delayed treatment seeking and the poor utilisation of AWS of HPS Paniya people were because of their previous experiences of discrimination and insult while using such services, which could have otherwise moderated the impact of the children's illness and household food insecurity. Additionally, non-tribal people's stereotypes against the HPS Paniya also limited their livelihood opportunities and exclusion from educational institutions, further compounding the economic and cultural marginalisation of HPS Paniya.

The LPS Paniya people shared similar historical disadvantages of labour exploitation, land alienation, and economic marginalisation with HPS. However, the settlement level differences of geographical continuity, social capital, and support of external leadership seem to have triggered a social mechanism that 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. While geographical discontinuity and the lack of kinship among the households became major barriers to social cohesion among the HPS Paniya people, the geographical continuity and the common kinship among the households within the LPS Paniya settlement facilitated a feeling of belonging and social cohesion. As explained in the paradox of embedded agency (DiMaggio, 1988), 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. Additionally, in both the Paniya settlements, traditional leadership was weakened. In this context, 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-tribal. The support of the Anganwadi worker as an external leader and the work of literacy mission and CBOs in the LPS Paniya settlement could create a community space to express their voice that was suppressed historically and in contemporary society in most places. This seemed to have triggered a social mechanism of enabling community members to exercise their agency. LPS Paniya's social mobilisation and participation in CBOs expanded their social awareness and organised them against non-tribal exploitation and oppression. This community-level mobilisation protected the LPS Paniya against the discriminatory behaviour and attitude of non-tribal people and also improved their utilisation of health, nutrition and welfare services which moderated the impact of economic deprivation of LPS Paniya.

The reduction in alcohol and tobacco use was also the result of the community awareness-building programme and collective community action, which limited the domestic availability of alcohol. The LPS people's better social networks and acceptance among the non-tribal people were the results of their social empowerment, which has also improved their domestic livelihood opportunities. The better social capital of LPS Paniya, in this way, translated to better economic capital through improved livelihood opportunities. Fundamentally, the clustering of multiple disadvantages interlocked the HPS people into a syndemic interaction of mutually exacerbating disadvantages; the LPS Paniya people got better chances to acquire social and cultural capital moderated the impact of economic deprivation and build resilience against the syndemic interactions of adverse social conditions that existed early in the settlement.

This early advantage in the social capital among LPS Paniya people translated into acquiring better cultural capital and economic capital and accumulated multiple social and behavioural advantages compared with HPS Paniya over the generations. For example, the support of the external leadership in ensuring basic living conditions such as water availability was critical in shaping hygienic practices and better use of available land for a household kitchen garden which contributed to enhanced household food security. The better hygienic habit improved the LPS Paniya people's acceptability and social network among the non-tribal people. The increased interaction with non-tribal people improved their cultural competencies with behavioural and communication skills expected from the non-tribal community. The better social network with the non-tribal people improved the domestic livelihood opportunity of LPS Paniya. Addressing the key material resource scarcity (water) in the LPS Paniya settlement triggered a chain of effects in this way. The scarcity of resources among the HPS Paniya amplified the syndemic interaction of adverse social conditions. From Weberian's (1978) perspective, the Paniya people's agency and behavioural choices (hygienic behaviour in this case) are shaped by the material resources and normative rules of the settlement (Webber, 1978). Moving further, the comparison of both LPS and HPS Paniya cases shows that the material resources of water availability shaped the normative rules regarding hygienic practices in both settlements. In the HPS Paniya settlement, the water scarcity seems to have established lower normative values with respect to hygienic practices, while the water availability in the LPS Paniya settlement seems to have established a higher standard of normative values of hygienic practices.

The LPS Paniya case study points towards what social conditions need to be created to increase the agency of the community members to strive for changes to bridge the

structurally imposed inequality in child nutritional status. The early initiatives of water supply, community mobilisation, and empowerment programmes, and alcohol prevention programmes undertaken by the AWW and CBOs promoted the exercise of the community agency to transform the social structure. The process of creating structural opportunities in the LPS Paniya settlement improved their ability to exercise agency to be an active agent in their structural transformation. This is reflected in their ability to question and challenge discrimination and exploitation from the non-tribal community. Whereas, in the case of HPS Paniya, we see the stereotyped perception of key stakeholders ended up blaming the community's unhygienic surroundings and habits as their culture and lack of knowledge, so the approach they have taken was teaching the community to appropriate hygienic practices and behaviour, whereas the HPS Paniya people's choices to exercise the water scarcity limited their agency. Without the underlying determinants of healthy behaviour and dietary practices being addressed, the HPS people were victims blamed for their behaviour. However, in the case of LPS Paniya, provision for water supply in the settlement provided an opportunity for making choices for hygienic practices, growing fruits and vegetables, and keeping their neighbourhood neat and clean. Multiple factors in the LPS settlement enabled the LPS people to take control over the determinants of health and nutrition. As Sen (1999) pointed out, community development should focus on addressing the factors that limit the freedom and opportunity of people to exercise their reasoned agency. In this process, the community is not just considered as a passive recipient of any intervention, but as an active agent of change whose priorities, values, and aspirations are realised through the freedom to choose. Though both LPS and HPS Paniya people experienced the deprivation of economic capital in the form of land alienation and limited livelihood opportunity, the early inequalities in social

capital between LPS and HPS translated into inequality in other forms of capital which was accumulated over time. This inequality in this social capital formed the basis for the inequality in health care practices and household food security among the Paniya.

### **5.3.3 5.3.2 Nutritional inequality Within Kurichiya**

Household availability of fruits and vegetables and the gender of the child were the only significant factors associated with the child's nutritional outcome in the quantitative analysis. The female advantage in child nutritional outcomes reported among the Kurichiya people is consistently reported worldwide (Thurstans et al., 2020). Recent evidence indicates biological predisposition underlies the sex difference in a child's nutritional status (Alur, 2019; Thurstans et al., 2022). The household's ability to grow fruits and vegetables is an important protective factor against child undernutrition in Paniya and Kurichiya communities. The household kitchen garden ensures the availability of diverse food baskets needed for child nourishment and is known as an effective intervention against adult and child undernutrition (Girard et al., 2012). However, similar to the Paniya case study finding, land and water availability seem to be the important factors determining the household's ability to grow kitchen gardens. While better availability of land and multiple sources of water provided the opportunity to cultivate diverse food items in all the seasons in the LPS Kurichiya settlement, the lesser availability of land and water scarcity limited the ability of HPS Kurichiya to grow diverse food items in all the seasons.

While the Kurichiya people shared historical advantages in terms of socioeconomic and cultural capital and could control the socio-political resources, Kurichiya is not a homogenous community in the exercise of their elite power. The cross-case comparison of the Kurichiya case study reveals that there is considerable inequality between the settlements within the Kurichiya community in terms of socio-

economic and political power that again reproduces the social hierarchy within the Kurichiya community. The settlement with better socio-economic, cultural, and political capital could gain an elite position within the Kurichiya community and could control the social and welfare resources to maximise their benefit.

Because of the LPS people's better economic and social capital in the beginning, they could achieve an elite status within the Kurichiya community. The early economic advantage of LPS Kurichiya solidified into other forms of advantages across the generation. Better land availability and multiple sources of income to save more translated into the accumulation of other forms of capital. The better economic and social capital of LPS Kurichiya triggered a social mechanism that accumulated multiple social advantages. As LPS Kurichiya could provide financial or food support to the non-tribal people during lean season or employment to non-tribal or tribal people, LPS Kurichiya could wield power over the tribal and non-tribal people in their neighbourhood, which later translated to their political privileges. This political privilege wielded them the power to access and control the economic and cultural resources compared with the HPS Kurichiya people. At the same time, they could leverage their socioeconomic and cultural capitals to achieve social mobility. The social process that underlies the accumulation of multiple forms of advantages is through the interaction of socio-economic and cultural capital (Bourdieu, 2005). For example, the better landholding of LPS Kurichiya improved their social status among the non-tribal people. Also, it allowed them to invest in the education of community members. This earliest opportunity to better educational status further improved livelihood opportunities of community members as public servants in government departments and also improved their social status among the non-tribal people. As in the case of the LPS Kurichiya community leader, the exposure and opportunity that

he received during his service in the public department acted as an external trigger factor to developing critical thinking and leadership skills for social entrepreneurship, which challenged the conventional social norms of the Kurichiya community (Weik, 2011). His social position as the head of the settlement households acquired the legitimacy to the deviation from the conventional social norms among the LPS Kurichiya people. For example, LPS Kurichiya people gave up several traditional taboos related to maternal and child health practices and now follow health care and child feeding practices that align with modern medical knowledge. Similarly, the gender norms related to women's educations and social status that prevented women from obtaining education and their participation in social forums changed with increased women's participation in education, remunerated jobs, and political activism.

The representation of the community member in the critical political position was a leveraging point that the LPS Kurichiya people could gain significant control over the structural determinants that shaped the proximate determinants of child undernutrition. The LPS Kurichiya peoples could influence the decision-makers in the selection of Anganwadi workers, ASHA workers, and tribal promoters serving the settlement, ensuring better community acceptance and service delivery from the frontline workers of health and nutritional services. LPS Kurichiya's better utilisation of health services, health practices, and the ability to follow appropriate child feeding practices with adequate food diversity leads to the better nutritional status of the LPS Kurichiya children. Similarly, the LPS Kurichiya people political power improved their access to financial credit institutions. The cultural capital of the community as improved educational status also translated into better health care practices. For example, the early initiation of complementary feeding practices as part of the

community's traditional practices was changed, and currently, community members largely follow the maternal and child caring practices based on their knowledge gained from health care service providers. Similarly, although traditional dietary practices and food sources have changed, the community members' involvement in local SHGs and the availability of land and water sources facilitated the cultivation of diverse food items to ensure household food diversity. The better utilisation of PDS, AWS, and access to food from the open market with better financial capability further supplemented household food security.

The early inequality in land ownership between LPS and HPS Kurichiy was the critical factor that accumulated other forms of inequality between the LPS and HPS Kurichiy. In addition to the relatively lower availability of land for HPS Kurichiy, the absence of a title deed for the land and water scarcity limited their ability to take full advantage of the available land. The crop failure due to the catastrophic climate even again compounded the HPS Kurichiy people's livelihood challenges pushing them into a debt crisis. This disadvantage was further exacerbated by the undemocratic leadership, which disrupted the community cohesion and the continuity of the Kurichiy people's cultural practices. The mutual support and social cohesion that existed under the joint family system were ruptured due to the polarisation of the HPS Kurichiy households under two community leaders. The increasing trend in alcohol use is also reported to amplify this social divide leading to community-level disputes and violence. Lack of social cohesion seems to have weakened the political representation and community voice representation of HPS Kurichiy. Poor social networks and political power also limited the community's ability to translate educational achievement into improved livelihood practices. In this way, multiple disadvantages seem to be accumulated over time among the HPS

Kurichiya community, leading to increasing inequality between HPS and LPS Kurichiya. The accumulation of multiple disadvantages is also reflected in the failure of the HPS Kurichiya people to translate the sociocultural capital to appropriate health practices. Overall, the unfavourable community dynamics in the HPS Kurichiya people constrained the translation of economic and cultural capital to positive health behaviour and dietary practices.

Overall, there is a complex dynamics of power and privileges between their settlements in terms of socio-economic and political power, creating a social hierarchy. Those with better capital could acquire an elite position and control resources to maximise their benefit. The LPS Kurichiya had better economic and social capital from the start, which allowed them to accumulate further advantages across the generations (see Figure 14). This included better land availability and multiple sources of income, which allowed them to gain political privileges and access and control economic and cultural resources. This enabled them to acquire social mobility, increased educational opportunities, and better livelihoods, which challenged traditional social norms and allowed more women to acquire education and take part in social forums. The community leader with entrepreneurial thinking could use these advantages to address community-level constraints and progress the community. Because of a critical political position, the LPS Kurichiya people could acquire control over the determinants that shaped the proximate determinants of child undernutrition. This enabled them to influence the selection of frontline health and nutritional service workers, leading to better service delivery. Their cultural capital and access to financial institutions improved their access to healthcare practices and food sources, improving their children's nutritional status. Furthermore, they could

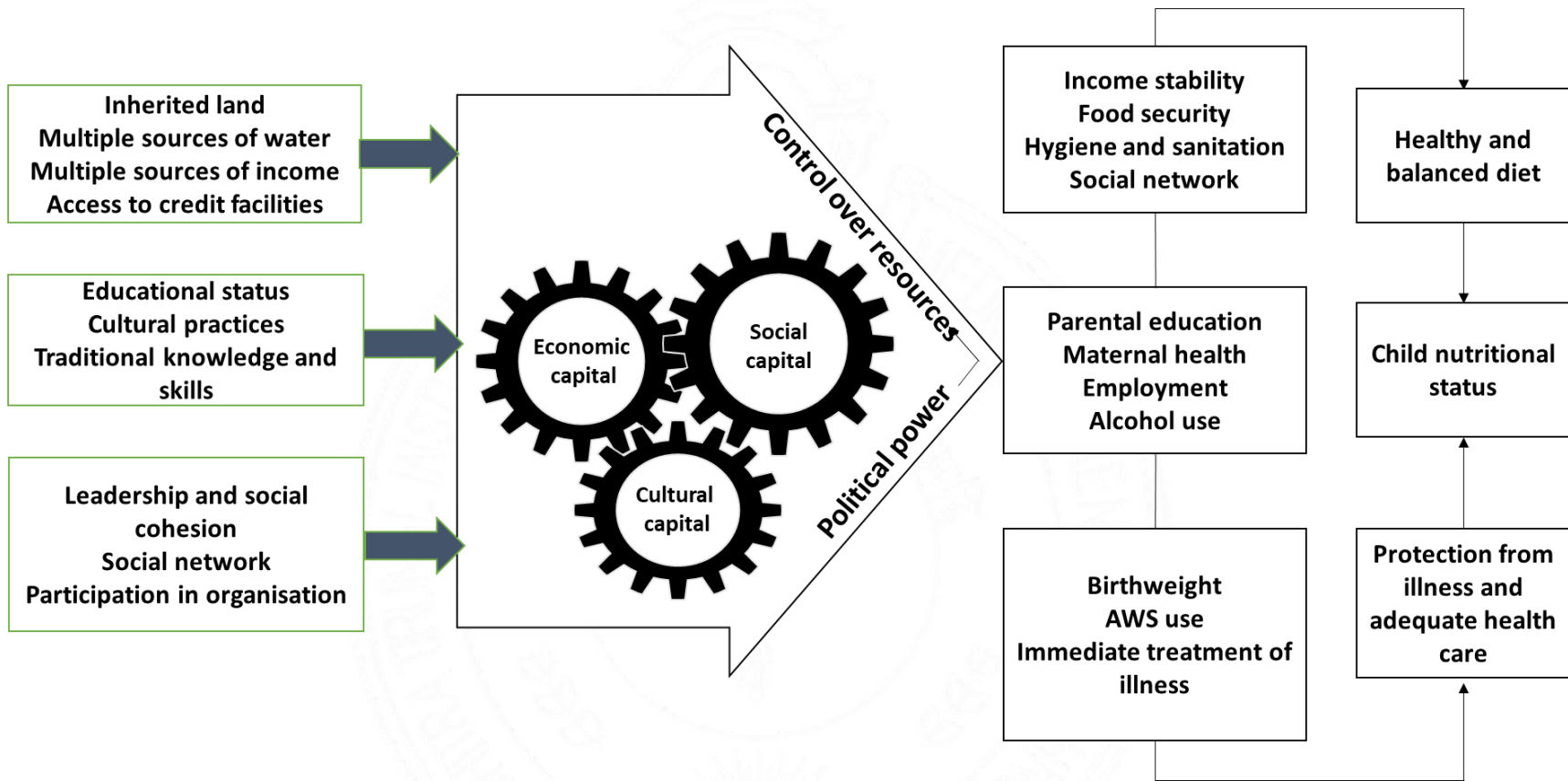


Figure 14: Interaction of socioeconomic and cultural capital and child nutritional inequality within the Kurichiya community

avail of PDS, AWS, and open markets, with better financial capability, leading to increased household food security. The early inequality in land ownership appears to have had a lasting impact on the HPS Kurichiya people, limiting their ability to take advantage of the land and leading to crop failure and debt. This was compounded by undemocratic leadership, the use of alcohol and a lack of social cohesion, resulting in weakened political representation and an inability to translate educational achievement into improved livelihoods. All these factors have contributed to an accumulation of multiple disadvantages among the HPS Kurichiya, leading to increased inequality between HPS and LPS Kurichiya, the translation of economic and cultural capital to positive health behaviour and dietary practices.

A comparison of LPS settlements from Paniya and Kurichiya brings out a few common patterns. Mobilisation of the community members in both settlements occurred through democratic leadership, allowing them to express their voices. In the case of LPS Paniya, the community is actively involved in the CBOs and SHGs. Through this participatory engagement, the LPS Paniya could transform the structural constraints that they previously experienced (e.g.: challenging the non-tribal discrimination and exploitative relationships). The community could Both the settlements community members in both settlements actively.

#### **5.3.4 5.3.3 The structure and agency interaction: embedded case studies**

While the settlement level factors shaped either conducive or constraining contextual conditions for the child's health protection and healthy diet, the settlement level factors work through the choices that individuals in each of the households make to determine the nutritional status of the children. The household level factors such as economic and social capital, food security, and hygiene and parental level attributes such as;

employment status, education, the experience of IPV, health status and health behaviour, and parental involvement in household work and child care are the factors that primarily shape the parental ability to ensure adequate food diversity and health protection of children. The household's ability to provide adequate care depends on the individual parental attributes, the interaction of the household members, and the household's economic resources.

In the LPS settlements, the parental capacity to provide adequate care also requires acknowledgement of the key household-level constraints that were shaped by the catastrophic health expenditure and parental-level physical and psychological disabilities. The undernourished cases from Paniya and Kurichiya LPS settlements show that the parental capacity to care for their children is constrained by the catastrophic health expenditure or caring need for the illness or disability of close family members. This has increased the maternal care burden and is reported in poor maternal health as in cases 3, 4, and 11. The patriarchal social norms which put the caring responsibility of the sick and old members of the household on the women could be a plausible explanation for the increased maternal care burden in these cases (Bhan et al., 2020; Bhattacharya, 2022; Ferrant et al., 2014). Though multiple water sources were available in both LPS settlements, this did not translate into better household-level hygiene due to constraints experienced by the parents. Similarly, the poor social capital of most of these households, barring case no 3, also indicates that parental mental constraints limited their social interaction, which could have otherwise buffered their mental strain. Most of the undernourished cases from LPS settlements barring one case (case no 4), could ensure household food security. However, the availability of food did not translate into minimum food diversity and frequency for the child as in case no. 3. Poor hygiene is a know risk factor for infectious diseases,

which is consistently reported in all undernourished cases and could probably be the reason for the frequent infection of the index child, which is a known risk factor for child undernutrition. In all these cases, the treatment for the child was delayed due to financial constraints, which could further amplify the risk of undernutrition from illness.

The well-nourished cases in the LPS settlements consistently reported better economic capital, and non of these households reported catastrophic health expenditure in the recent past. This was further conditioned by the social network of the household within and outside the settlement. The absence of financial and emotional constraints due to the adverse health condition of the family members positioned the households in the well-nourished cases to catalyse the settlement-level advantages of social and cultural capitals. All the well-nourished cases from LPS settlements reported active social and organisational participation, which have translated into better employment opportunities and better knowledge and awareness regarding appropriate child-caring practices. . This social network could buffer the economic shock due to the failure of the crops, as in case no 10. Additionally, the household-level advantages also seem to foster more equitable gender relationships among these households where household work and child caring responsibility were shared among both parents. These favourable household-level conditions enabled the parents to ensure household hygiene and appropriate child-caring practices. These household and parental advantages could moderate the individual-level disadvantages of morbidity history, and These household-level positive factors could explain the parental capacity to catalyse the settlement-level advantages to ensure a healthy and safe living environment to protect the child from adverse health conditions and ensure adequate food diversity and frequency for their children. The well-nourished children from the

LPS settlement consistently reported being fed with minimum dietary diversity and frequency. Though children the case of 3 and 9 reported a recent history of illness, the children were given immediate medical treatment, which could minimise the risk of undernutrition. Similarly, though case no 10 reported low birth weight, the household's better household-level resources and parental ability to protect the child from illness and appropriate feeding practices and health care protection catalysed better child growth.

The well-nourished cases from Paniya and Kurichiya HPS settlement unveiled how the individual household buffer the settlement level disadvantages. The commonality in all the well-nourished cases from the HPS settlement was the index child's minimum dietary diversity and frequency. However, this was achieved through diverse pathways in each of these cases. In case eight from HPS Paniya and case 16 from HPS Kurichiya, at least one of the child's parents was brought up elsewhere and has internalised different social norms and practices. Additionally, while both of these two cases were excluded from the settlement households, these two households' exposure and contact with communities outside the settlement could build resilience to overcome the settlement-level disadvantages and ensure regular employment opportunities and access to food from the open market. Similarly, the household member's mutual support in household work and child caring ensured the child was sufficiently fed and could maintain household hygiene. In case no 15, the child was the grandson of the settlement leader who won nearly one-third of the whole property in the settlement, which could ensure sufficient food availability and disposable household income. Barring case no 7, parents in all the well-nourished HPS cases could access food from multiple sources and ensure household food security and ensure utilisation of Anganwadi services. Though children in these households reported a recent history of

illness, the parents could ensure immediate treatment and minimise its impact on the child's growth. In case no 7, though the child shared the household and parental level disadvantages with other undernourished children, being born as an elder child with a slightly higher birth weight in a twin birth provided an early advantage which accumulated other advantages of better milestone development, food consumption, protection from illness.

The household and individual-level factors in HPS undernourished cases (cases no 5, 6, 13 and 14) shared several characteristics. However, these characteristics were determined in different ways across these two communities. The general social discrimination and limited domestic employment opportunities of HPS *Paniya* were more so with the undernourished cases than with the other households. Both cases reported an intersection of several disadvantages at household, parental and individual levels that compounded the impact of settlement level disadvantages and limited the individual level choices and agency to acquire conditions necessary for child nourishment. At the same time, settlement-level factors of poor social cohesion percolated to the household-level poor social network in undernourished cases, limiting their employment opportunities. Similar to the pattern observed in the undernourished cases from LPS settlements, in all the undernourished cases from HPS settlements too, the household also experienced catastrophic health expenditure because of the illness of the household members. This diverted the available household financial resource. Similarly, the water scarcity reported in the HPS settlement was experienced more severely by the households in the undernourished cases because of the location of the households in the corner of the settlement, as in the case of 5, and because of the multiple care burden of the primary caretaker of the children as in case 6, 13 and 14. This has hampered the household living conditions with an unhygienic

living environment. Similar to the undernourished cases in LPS settlements, the unequal gender norms that put the caring responsibility of children on mothers alone were also consistently reported in HPS undernourished cases. In addition to this, the alcohol consumption of fathers and domestic violence against the mothers further hampered the maternal mental and physical health, which could adversely affect the quality of childcare practices. This has been reflected in the poor breastfeeding practices of the majority of the HPS undernourished cases. The index child suffered frequent infections in the past two months in the undernourished cases. However, because of the multiple constraints, the treatment of the children was much delayed. In household case studies where multiple factors could potentially risk a child's nutritional status, it seems difficult to disentangle particular pathways of influence from the community to the individual level.

## 6. CONCLUSIONS AND RECOMMENDATIONS

The findings from the three objectives of this study contribute to some critical knowledge towards advancing child nutritional equity in India. This study set out to examine the child nutritional inequality within the tribal community in Kerala. The study's finding has shown a significant disparity in child nutritional status between two selected tribal populations in this study. And this disparity seems to be widening in the severe categories and in terms of multi-dimensional anthropometric failures. This finding suggests that our nutritional programmes need to adopt community-specific strategies to address the unique needs of different populations and overcome the disparities in nutrition outcomes. Homogenisation of tribal communities in India is problematic for achieving health and nutritional equity because it fails to take into account the unique needs of each tribal community. As the study revealed, every tribe has its own unique culture, language, and customs that have evolved over centuries. Attempting to homogenise tribal communities disregards these important distinctions while also ignoring the unique dietary, dietary health, and nutritional needs of each tribe. Without considering these differences, it is difficult to provide the necessary support and resources to ensure the health and nutritional equity. In addition, the homogenisation of tribal communities can lead to the erosion of traditional knowledge and practices that are essential for the health and well-being of tribal communities.

The relevance of understanding the historical process shaping the inequality in the determinants of child undernutrition is supported by this study. The historical oppression and bonded labour of the Paniya tribal community are directly related to their poor socio-economic status and marginalisation. Paniya communities have been

denied access to land, education, and other resources, leading to a cycle of poverty and deprivation, which underlies the inequality in the social determinants between the Paniya and Kurichiya people. This means that addressing the child nutritional inequity within the tribal communities and between the tribal and non-tribal people requires addressing the inequity in the land, education, livelihood opportunities, and access to social welfare resources. Additionally, the intervention should focus on actively involving the members of the tribal communities in decision-making processes, promoting indigenous culture and language, and creating awareness among the members of the tribal communities of their rights and entitlements.

The evidence from the cross-sectional survey and the case studies suggest that land alienation of the Paniya people is the basic cause that determined the increased exposure of Paniya people to household food insecurity and increased morbidity burden compared with that of Kurichiya. Access to land is essential for the Adivasi communities' traditional livelihoods and food sources, which are important for their physical health. The limited land availability underlies the ecological degradation of the Paniya settlement, which increased the children's exposure to pathogenic environmental conditions. Similarly, poor landholding and water scarcity in their settlement constrained their ability to grow homestead fruits and vegetables, which is reported as an important protective factor. Land alienation of the Paniya people is reflective of the land alienation that tribal people in India face today. It is the process by which tribal land is taken away from them and given to non-tribal people or companies. This is often done through government policies, such as the Forest Rights Act of 2006, which allows for the transfer of forest land to private companies for industrial use. The displacement of tribal communities from their ancestral lands is often done without their consent and has led to a loss of their traditional livelihoods

and social systems. As in the case of the Paniya people in this study, the loss of land has also led to an increased vulnerability of tribal communities to exploitation and marginalisation. This problem has been further exacerbated by the increasing economic and social disparities between tribal communities and non-tribal people (Benbabaali, 2022; Negi and Azeez, 2022; Rupavath, 2015). The findings of this study underlie that, to address the inequity in the child's nutritional status between tribal and non-tribal people and within the different tribal communities described in the literature review, there is an urgent need for the Indian government to protect the rights of tribal communities, and to ensure that their land is not taken away without their consent (Bang, 2018).

This study's findings on the exclusion of Paniya people from health and nutritional services point toward the importance of framing child nutrition from social justice and equity. Because framing child undernutrition from an equity and social justice perspective acknowledges that tribal populations are disproportionately affected by undernutrition and that structural inequities and power imbalances prevent them from accessing nutritional services. Recognising and respecting the rights of tribal children, such as their right to food, health, education and a healthy environment, it is possible to ensure that tribal children are able to access nutritional resources, services, and opportunities to improve their health and well-being. This approach also serves to empower tribal communities, giving them greater control over their development and creating the conditions for sustainable and equitable progress. By understanding and addressing the underlying causes, nutrition interventions can be tailored to better meet the needs of these populations, enabling them to access the nutritional resources they need to thrive. Similarly, the study underscores that the one size fits all approach to tribal health and nutritional programmes fail in the Indian context because it ignores

the power differentials and unique cultural, social, economic, and political differences between different tribes. In addition, the approach overlooks the fact that different tribes have different needs and access to health services. Furthermore, the approach does not take into account the diverse needs of different tribal communities to ensure a healthy and balanced diet and protection from illness of their children. It fails to address the underlying root causes of poor health outcomes.

The third important finding of this thesis shows the potential syndemic interaction of multiple factors, such as poor livelihood opportunities, food and water insecurity, and unhealthy living conditions leading to the high burden of undernutrition and other co-morbidities in the HPS Paniya case study. The interplay between these factors suggests that the nutritional intervention for the poor and marginalised communities needs to address the multiple needs of a tribal population, leading to improved nutrition and health outcomes. For example, to address the syndemic interaction between water and food insecurity and ecological degradation, nutritional interventions need to involve tackling these multiple problems together. This could involve initiatives such as providing access to clean water, increasing the availability of nutritious food, and creating educational materials to promote healthy eating and water conservation. Other tactics include advocating for food and water rights, creating policies that provide economic incentives for sustainable farming, and engaging in public awareness campaigns to increase understanding of the issues (Workman et al., 2021). To address the interconnectedness of alcohol consumption, violence, and social disruption, our interventions need to focus on reducing or eliminating these issues' underlying social and economic drivers. This includes addressing poverty and inequality, improving education, and providing access to housing, healthcare, and employment services. Additionally, the syndemic condition

recommends on creating safe and supportive communities, promoting healthy lifestyles through education and awareness campaigns, and providing access to treatment and other services. The Syndemic condition advocates for policies that reduce access to alcohol and other substances and are designed to prevent and address violence and social disruption. This recommends working with multiple stakeholders, including frontline nutritional and healthcare providers, policymakers, and community members, to create solutions tailored to the population's specific needs. Furthermore, this approach seeks to create an environment of respect and understanding in order to reduce stigma and increase access to nutrition and medical care (Bennett, 2017). Additionally, this study highlights the critical roles of intervention in promoting the marginalised population's social capital. By promoting social relationships between members of the target population, these programs can create a sense of solidarity, which can lead to greater collaboration, support, and advocacy. This can lead to increased access to resources, such as employment, education and housing, and can ultimately improve the quality of life for individuals within the marginalized population.

The overall finding of this study revealed the complex, multi-dimensional nature of the inequality of determinants of child undernutrition within the tribal community. The result recommends more studies on tribal health and nutritional inequality from an intersectional perspective. Because the intersectionality framework looks at how multiple factors, such as gender, class, caste, geographical location, and ethnicity, interact to shape the nutritional disparities among tribal communities, it can help identify the unique needs of different groups, such as those facing socio-economic disadvantages or those in geographically isolated areas, and how these needs can be addressed. In addition, an intersectional perspective can help identify and address the

structural factors that perpetuate nutritional inequality within tribal communities, such as inadequate access to nutrition education and health services. This study reported a complex mix of social, economic, cultural capital and environmental factors, which interact at multiple levels, including individual, household, neighbourhood and community levels. The multi-level nature of nutritional inequality reported in this study suggests designing nutritional programmes tailored to the specific contexts in which they operate and can effectively address the root causes of nutritional disparities. Such programmes can then be better targeted to ensure that those most in need of nutritional assistance receive it.

### ***6.1 Strengths and Limitations of the study***

The main limitation of the study is that study is not based on longitudinal data. Hence the causal relationship between the historical and contextual factors described in the study could not establish a causal relationship. Furthermore, the information presented in this report is only from a single point in time, which restricts us from concluding any cause-and-effect relationships between the main variables. The major part of the case study data was collected using in-depth interviews with the study participants themselves, which could result in an underestimation of activities that are unacceptable or a tendency to provide information that is not entirely accurate. However, the data collected from direct observation and from multiple stakeholders of each case study is expected to mitigate such deficiencies. It is also critical to acknowledge that our results may not be generalisable to a variety of contexts. The syndemic interaction of co-morbidities and adverse social vulnerabilities reported in this study points towards its likelihood. Hence, this needs to be tested using more

rigorous statistical modelling. The cross-sectional data collected as part of this study does not allow for this statistical modelling.

However, the use of the multiple case study design provided a comprehensive view of the situation by looking at multiple cases. This design allowed us to explore the nuances of the situation across a variety of contexts and to identify patterns and trends that may not be evident in single-case studies. Additionally, the selection of the counterfactual case study allowed the scholar to compare two similar contexts, one of which has experienced nutritional inequality and the other which has not. By comparing the two contexts, the scholar could identify the causal factors that have resulted in nutritional inequality in one context but not in the other. This approach provides a more rigorous and systematic way to evaluate the relative impact of various factors that may contribute to nutritional inequality, including structural factors such as economic inequality and access to resources, socio-cultural capital such as educational attainment and dietary preferences, social cohesion, and public health interventions. The scholar gained a deeper understanding of the issue at hand through a combination of qualitative and quantitative data collection. Qualitative methods such as interviews, focus groups, and participant observation allow researchers to gain insight into the social contexts and experiences that lead to nutritional inequality. The cross-sectional survey data analysis helped the scholar to identify patterns and trends in the data and provide a more comprehensive view of the issue. By combining the strengths of both qualitative and quantitative methods, the mixed-method designs of this study provided a more comprehensive approach to understanding the causes of nutritional inequality.

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## ANNEXURES

| SL No | <i>List of publications from the thesis</i>  |
|-------|--|
| 1     | Sabu K Ulahannan, T K Sundari Ravindran, Prashanth Nuggehalli Srinivas. Factors associated with inequality in the composite index of anthropometric failure between the Paniya and kurichiya tribal communities in Wayanad district of Kerala. <i>Indian J Public Health</i> . 2020;64(3):258. doi: 10.4103/ijph.IJPH_340_19 |
| 2     | Ulahannan, S. K., Wilson, A., Chhetri, D., Soman, B., and Prashanth, N. S., 2022. Alarming level of severe acute malnutrition in Indian districts. <i>BMJ global health</i> , 7 (4), e007798. <a href="http://dx.doi.org/10.1136/bmjgh-2021-007798">http://dx.doi.org/10.1136/bmjgh-2021-007798</a>                          |
|       |  |
|       |  |

**RESUME**



**EDUCATION**

JAN 2016 – Till Date

**Ph. D Scholar in Public Health**  
Sree Chitra Tirunal Institute for Medical Sciences and Technology,

AUG 2010 - MAY 2013

**M.Phil. in Social Work**  
Nagpur University

**NET (National Eligibility Test for Lectureship) 2012, December**  
(Roll No:13100173)

JUN 2008 - MAY 2010

**MSW (Medical & Psychiatry)**  
Nagpur University

AUG 1999 - MAY 2002

**Bachelor of Arts (English Lit)**  
Kannur University

**FELLOWSHIP**

Received Emerging Voice For Global Health Fellowship 2020  
<http://www.ev4gh.net/emerging-voices-for-global-health-2020/>

Selected for India Health Policy and System Research Fellowship Programme 2021  
<https://indiahsr.fellowships.org/>

# SABU K U

Phone: 7012453006

Email: sabu@iohnds.org

Address: A2 Staff Quarters, Malabar Medical College, Modakkallur PO, Atholi via, Calicut, Kerala

## CAREER OBJECTIVE

To work towards an equitable and ecologically sustainable world where health and nutrition for all is a reality

## RESEARCH INTERESTS :

- ✦ Poverty and Child Nutrition
- ✦ Tribal Health Inequality
- ✦ Planetary Health: Eco-system, Food and Nutrition Security Linkage
- ✦ Health System Research
- ✦ Social Exclusion of Marginalized Communities such as Tribal, Dalit, Disabled, Sexual minorities.

## CURRENT STATUS :

Currently, I am a post-doctoral fellow under CTRITH Project in Institute of Public Health Bangalore. I am in the final stage of my doctoral thesis preparation titled "*Inequalities in Nutritional Status of Two to Five-Year-Old Children Belonging to Paniya and Kurichya Tribal Communities in Wayanad District of Kerala*" pursuing from Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum.

## WORK EXPERIENCE

1 JAN 2019 – 31 DEC 2020

**Designation** : Project Supervisor in Wayanad  
**Institution** : Institute of Public Health, Bangalore

**Brief Description:** Contributed to organizing stakeholders meeting, development and implementation of primary data collection tools, cleaning, manipulation and analysis of primary data, preparation of project report and journal articles

JUN 2013 - JUN 2015

**Designation** : Research Officer  
**Institution** : SOCHARA, Bangalore.

**Brief Description** : Contributed to the research on poor health and nutritional status among migrant worker, slum dwellers in Bangalore and tribal communities Madhya Pradesh.

## PUBLICATIONS

### Journal Article:

- Sabu K Ulahannan et al. (2022) 'Alarming level of severe acute malnutrition in Indian districts', *BMJ global health*, 7(4), p. e007798.
- Sabu, K.Ulahannan. et al. (2022) 'The Case of a Coastal Community in Kerala: COVID-19 and Multiple Inequalities', *Economic and Political Weekly*, 57(30), pp. 7–8.
- Sabu K Ulahannan et al. (2021) An intersectional analysis of the composite index of anthropometric failures in India. *International Journal for Equity in Health* 20(1): 155. DOI: 10.1186/s12939-021-01499-y
- Sabu K Ulahannan, T K Sundari Ravindran, Prashanth Nugehalli Srinivas. Factors associated with inequality in composite index of anthropometric failure between the Paniya and kurichiya tribal communities in wayanad district of Kerala. *Indian J Public Health*. 2020;64(3):258. doi:10.4103/ijph.IJPH\_340\_19
- Sanjeev RK, Nugehalli Srinivas P, Krishnan B, Basappa YC, Dinesh AS, Sabu K U. Does cereal, protein and micronutrient availability hold the key to the malnutrition conundrum? An exploratory analysis of cereal cultivation and wasting patterns of India. *Wellcome Open Res*. 2020 Jun 2;5:118. (<https://doi.org/10.12688/wellcomeopenres.15934.1>)
- Rajan JC, Anand T, Nagaraja SB, Sabu K Ulahannan, Sagili K, Sarojini MM. Tuberculosis Treatment Completion for Tribal Patients in Kerala: Needs Constant Push! *J Tuberc Res*. 2019 Oct 28;7(4):185–201
- Jose JP, Sabu K Ulahannan. Conceptualising Psychosocial Model of Social Exclusion: A Preliminary Debate. *Indian J Soc Work*. 2018;79(2):177–192.
- Book:** Jose JP, Varghees V, Sabu K Ulahannan. *Tribal Unwed Motherhood in South India: The Causes, Process and Consequences in Perspective*. Saarbrücken: VDM Verlag Dr. Müller; 2011. 336 p.
- Blogs:** Caught between the virus and poverty: Impact of the COVID-19 lockdown on indigenous communities in India. (<https://blogs.bmj.com/bmj/2020/10/27/caught-between-the-virus-and-poverty-impact-of-the-covid-19-lockdown-on-indigenous-communities-in-india/>)  
The long road to transformation: Addressing social determinants to achieve healthy communities (<https://www.internationalhealthpolicies.org/featured-article/the-long-road-to-transformation-addressing-social-determinants-to-achieve-healthy-communities/>)  
A Reflection on the Inclusiveness of International Conferences on Health and Social Justice (<https://www.internationalhealthpolicies.org/blogs/a-reflection-on-the-inclusiveness-of-international-conferences-on-health-and-social-justice/>)  
An Elephantine Matter (<http://healthinequity.com/an-elephantine-matter/>)  
The Promised Land (<http://healthinequity.com/the-promised-land/>)

## REFERENCES

### PROF. SUNDARI RAVINDRAN T K

Professor, AMCSCTIMST  
PI of Closing the Gap: Health  
Equity Research Initiative India

E: ravindransundari@gmail.com  
P: 09447757974

### PROF. BIJU SOMAN

Professor, AMC,SCTIMST  
Thiruvananthapuram,  
Kerala

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P: +91 471 252 4230

### DR. PRASHANTH N S

Head of the cluster on health equity  
and evaluation at Institute of Public  
Health, Bangalore

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P: 9449599566



श्री चित्रा तिरुनाल आयुर्विज्ञान और प्रौद्योगिकी संस्थान, त्रिवेन्द्रम  
तिरुवनन्तपुरम - ६९५०११, केरल, इंडिया

SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES AND TECHNOLOGY, TRIVANDRUM  
Thiruvananthapuram - 695 011, Kerala, India  
(An Institute of National Importance under Govt. of India)

Grams : Chitramet, Phone : +91-471-2443152, Fax : +91-471-2550728 / 2446433, E-mail : sct@sctimst.ac.in, Website : www.sctimst.ac.in

**Institutional Ethics Committee**  
(IEC Regn No. ECR/189/Inst/KL/2013)

SCT/IEC/1193/APRIL-2018

24.04.2018

Mr. Sabu K U  
Ph D Student  
AMCHSS,  
SCTIMST, Thiruvananthapuram

Dear Dr. Sabu,

Thank you for submitting documents related to your proposal titled "INEQUALITIES IN NUTRITIONAL STATS OF TWO TO FIVE-YEAR-OLD CHILDREN BELONGING TO PANIYA AND KURICHIYA TRIBAL COMMUNITIES IN WAYANAD DISTRICT, KERALA" (IEC/1193) to the IEC for review.

**List of documents:**

1. Covering letter addressed to the Chairperson, IEC, SCTIMST dated 21.03.2018 with check list
2. TAC Approval Letter
3. IEC Application Form
4. Project Proposal
5. Forwarding letter from Guide
6. Data Collection Tool in English and Malayalam
7. Informed Consent Form in English and Malayalam
8. Permission Letter from Tribal Developmental Department
9. Declaration Form
10. CV of Principal Investigator

**IEC Recommendations**

1. Include the fathers among the stakeholders for interviewing as part of the case study
2. For members of the tribal community you may use oral witnessed consent instead of written or consent with thumb impression
3. In page 16 of the sample size, specify that the information will be collected from mothers and not children
4. In the questionnaire, in question number MPC5, there is no allowance for responses regarding all illnesses. Make allowance for these.
5. Questions relating to alcohol use – ie. MF12 to MR13c, do review and reword to give less offense. You can ask whether ladies drink alcohol in your settlement.

One set of all the documents including those revised may be submitted. The covering letter should indicate the revisions made.

Sincerely,

Mala Ramanathan  
Member Secretary, IEC





**Technical Advisory Committee: TAC (AMCHSS)**

**Certificate of clearance**

**Title of the proposal:** “Inequalities in Nutritional Status of Children Three to Five Year Old Belonging to Paniya and Kurichiya Tribal Communities in Wayanad district, Kerala”.

**TAC-Registration No.:** AMCHSS/2018/1/001

**Principal Investigator (Name and address):** Mr Sabu K U, PhD student, AMCHSS, SCTIMST

**Co- Investigator/Guide:** Prof T K Sundari Ravindran, AMCHSS, SCTIMST

**Date of TAC Meeting:** February 8, 2018

**Members present:** Dr V Raman Kutty, Dr R S Jayasree, Dr S Harikrishnan, Dr P S Sarma and Dr Manju R Nair

**Risk classification of the project:** Minimum

**Requirement of DSMB:** Not required

**Documents submitted:**

1. Proposal in prescribed format
2. Quantitative tool 1: Interview Schedule(English)
3. Quantitative tool 2: Information documentation schedule for tribal settlement (English)
4. Qualitative tool 1: In-depth interview guideline for mothers of three to five year old children (English)
5. Qualitative tool 2: In-depth interview guideline for Anganwadi worker, ASHA Worker, ANM and Tribal Promoter (English)
6. Qualitative tool 3: In-depth interview guideline for tribal head and elderly women (English)
7. Qualitative tool 4: Non-participant observation checklist (English)
8. Qualitative tool 5: Participant observation checklist (English)
9. Qualitative tool 6: Check list for timeline and trend analysis (English)
10. Quantitative tool 1: Interview Schedule (Malayalam)
11. Quantitative tool 2: Information documentation schedule for tribal settlement (Malayalam)
12. Qualitative tool 1: In-depth interview guideline for mothers of three to five year old children (Malayalam)
13. Qualitative tool 2: In-depth interview guideline for Anganwadi worker, ASHA Worker, ANM and Tribal Promoter (Malayalam)
14. Qualitative tool 3: In-depth interview guideline for tribal head and elderly women (Malayalam)
15. Qualitative tool 4: Non-participant observation checklist (Malayalam)
16. Qualitative tool 5: Participant observation checklist (Malayalam)
17. Qualitative tool 6: Check list for timeline and trend analysis (Malayalam)
18. Annexure 1 \_Consent form for Participation in Cross Sectional Survey Interview
19. Annexure 2 \_Consent form for Mothers of three to five year old children for Participation in In-depth Interview
20. 22 Annexure 3 \_Consent form for tribal head or elderly women for Participation in In-depth Interview
21. Annexure 4 \_Consent form for Anganwadi Worker or ASHA or ANM or Tribal Promoter for Participation in In-depth Interview
22. Annexure 5 \_Protocol for Case Study
23. Anexture\_1 Malayalam-Consent form for Participation in Cross Sectional Survey Interview
24. Anexture\_2 Malayalam \_Consent form for Mothers of three to five year old children for Participation in In-depth Interview

25. Anexture-3 Malayalam\_Consent form for tribal head or elderly women for Participation in In-depth Interview
26. Anexture-4 Malayalam\_Consent form for Anganwadi Worker or ASHA or ANM or Tribal Promoter for Participation in In-depth Interview
27. List of Amendments made.

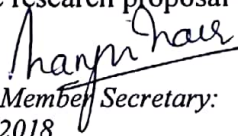
**Documents reviewed:** All of the above

**Comments**

- The following change in title may be considered: "Inequalities in.....of three to five year old children....."
- Sample size estimation: The section may be separated into two sections – one for qualitative and the other for quantitative.
- The terms "primary" cases and "embedded cases" are not clear. What is the study design of the qualitative component – eg: embedded case study design? Single case study with embedded units?
- Sample selection: A flow chart will be useful to illustrate the selection process. As per the description it appears that from six panchayats, 12 colonies each and from each selected colony 5 children would be selected, which would total up to 360 children; whereas the total sample calculated indicate only 324. Clarify.
- In addition, it is not clear from the plan given in page 16 about how will it be further ensured that the sample selected will be from 33 Paniya and 33 Kurichiya colonies
- Sample selection: A flow chart will be useful to illustrate the selection process for both qualitative and quantitative components
- Brief background information related to the number and nature of settlements and the expected number of children in each settlement may be provided.
- Page 15: In the sample size estimation section of the qualitative component – is the sample size calculated enough to give valid prevalence rates for the individual settlements
- Page 17: Section on anthropometry is written in the past tense and may be modified to suit the study population (eg: .....child's shoes and socks..."). If it is quoted verbatim from any source, it may be indicated.
- Age group of the study population is written mostly as 3-5 in the document, but is 2-5 in certain sections. (Eg: interview schedule).
- Quantitative data analysis: Page 19...pair wise chi square .....d2 to d4. Clarify what is d2 to d4
- The purpose of GPS is not clear. This is not mentioned in the methodology section on page 14. Similarly the 'head circumference' indicated in the interview schedule; the purpose and the methodology are not described in the section on anthropometry.
- There are several versions of the tools provided including translated and back translated ones. Only the final version of the tools needs to be submitted. The process of validation (eg. back translation etc) may be described in the methodology section
- Participant information sheet and consent form in Malayalam not attached
- There is no mention about the consent for anthropometric measurements in the consent form
- Table of contents: errors noted in page 3 of the hard copy
- Several spelling and grammatical errors noted. Eg: Kurichiya not spelt uniformly throughout the document; under nourished etc Suggested language edition
- The proposal cannot be recommended for expedited review as per section 9.1 (involving vulnerable population) of the SOP of the IEC

**Recommendation for the consideration of IEC:**

- The resubmitted proposal has been revised to include the suggested revisions satisfactorily and is cleared by the TAC
- The research proposal is recommended for consideration by the IEC for review.

  
Signature of Member Secretary:  
Date: 14/03/2018

നം.ICDS-A3-8018/18

വനിതാ ശിശു വികസന ഡയറക്ടറേറ്റ്,  
പുജപ്പുര, തിരുവനന്തപുരം.  
തീയതി: 26.04.2018  
ഇ മെയിൽ : [swdicds@gmail.com](mailto:swdicds@gmail.com)  
ഫോൺ നം: 0471- 2346534.

വനിതാ ശിശു വികസന ഡയറക്ടർ.

ഹെഡ് ഓഫ് ദി ഡിപ്പാർട്ട്മെന്റ്,  
അച്യുതമേനോൻ സെന്റർ ഫോർ ഹെൽത്ത് സയൻസ് സ്റ്റഡീസ്,  
ശ്രീ. ചിത്തിര തിരുനാൾ ഇൻസ്റ്റിറ്റ്യൂട്ട് ഫോർ  
മെഡിക്കൽ സയൻസ് & ടെക്നോളജി,  
തിരുവനന്തപുരം.

സർ,

വിഷയം: വനിതാ ശിശു വികസന വകുപ്പ് - ഐസിഡിഎസ് - പഠനത്തിന്റെ ഭാഗമായി അങ്കണവാടികളിൽ നിന്ന് ട്രൈബൽ വിഭാഗത്തിലെ കുട്ടികളെ സംബന്ധിച്ചുള്ള വിവരങ്ങൾ ശേഖരിക്കുന്നതിന് അനുമതി നൽകുന്നത് - സംബന്ധിച്ച്.

സൂചന: താങ്കളുടെ സ്ഥാപനത്തിലെ റിസേർച്ച് സ്കോളറായ ശ്രീ. സാബു കെ.യു. 18.04.2018 ൽ ഈ കാര്യാലയത്തിൽ സമർപ്പിച്ച അപേക്ഷ.

സൂചനയിലേക്ക് ശ്രദ്ധ ക്ഷണിക്കുന്നു. സൂചന പ്രകാരം വയനാട് ജില്ലയിലെ നൂൽപ്പുഴ പഞ്ചായത്ത് ഉൾപ്പെടുന്ന സുൽത്താൻ ബത്തേരി ഐസിഡിഎസ്, കോട്ടത്തറ പഞ്ചായത്ത് ഉൾപ്പെടുന്ന കൽപ്പറ്റ ഐസിഡിഎസ്, പനമരം പഞ്ചായത്ത് ഉൾപ്പെടുന്ന പനമരം ഐസിഡിഎസ്, തിരുനെല്ലി, തവിഞ്ഞാൽ പഞ്ചായത്തുകൾ ഉൾപ്പെടുന്ന മാനന്തവാടി ഐസിഡിഎസ്, എടവക പഞ്ചായത്ത് ഉൾപ്പെടുന്ന മാനന്തവാടി അഡീഷണൽ ഐസിഡിഎസ് തുടങ്ങിയ പ്രോജക്ടുകളുടെ കീഴിൽ വരുന്ന അങ്കണവാടികളിൽ നിന്നും, താങ്കളുടെ സ്ഥാപനത്തിലെ റിസേർച്ച് സ്കോളർ ആയ ശ്രീ. സാബു കെ.യു. 2018 മെയ് മുതൽ 2019 ജനുവരി വരെയുള്ള കാലയളവിൽ ട്രൈബൽ വിഭാഗത്തിലെ കുട്ടികളെ സംബന്ധിച്ചുള്ള വിവരങ്ങൾ ശേഖരിക്കുന്നതിനുള്ള അനുമതിയ്ക്ക് അപേക്ഷിച്ചിട്ടുണ്ട്. ടി അപേക്ഷ പരിഗണിച്ച് ചുവടെ ചേർക്കുന്ന നിബന്ധനകൾക്ക് വിധേയമായി ടി വിവര ശേഖരണത്തിനുള്ള അനുവാദം നൽകുന്നു.

1. അങ്കണവാടി പ്രവർത്തനത്തിന് തടസ്സം വരാത്തവിധത്തിൽ വിവരശേഖരണം നടത്തേണ്ടതാണ്.
2. വിവരശേഖരണവുമായി ബന്ധപ്പെട്ട് അങ്കണവാടികളിൽ ഒരു വിധത്തിലുള്ള ഫോട്ടോഗ്രാഫ്സും എടുക്കാൻ അനുവദിക്കുന്നതല്ല.
3. കുട്ടികളുടെയും മാതാപിതാക്കളുടെയും സ്വകാര്യത ഉറപ്പാക്കി വിവരശേഖരണം നടത്തേണ്ടതാണ്.

4. അങ്കണവാടി വർക്കർമാർ, ഐസിഡിഎസ് സൂപ്പർവൈസർമാർ എന്നിവരുടെ ഔദ്യോഗിക കൃത്യനിർവ്വഹണത്തിന് തടസ്സമുണ്ടാകരുത്.
5. ഫീൽഡ് വർക്കിൽ ശേഖരിക്കുന്ന വിവരങ്ങളും റിപ്പോർട്ടും പഠനാവശ്യത്തിന് മാത്രം ഉപയോഗിക്കേണ്ടതാണ്.
6. വയനാട് പ്രോഗ്രാം ഓഫീസർക്കും ബന്ധപ്പെട്ട സിഡിപിഒമാർക്കും പഠനം നടത്തുന്നത് സംബന്ധിച്ച് രേഖാമൂലം അറിയിപ്പ് നൽകേണ്ടതാണ്.
7. പഠനം സംബന്ധിച്ചുള്ള റിപ്പോർട്ടിന്റെ പകർപ്പ് ഈ കാര്യാലയത്തിൽ സമർപ്പിക്കേണ്ടതാണ്.

വിശ്വസ്തതയോടെ,



വനിതാ ശിശുവികസന ഡയറക്ടർക്കുവേണ്ടി

**പകർപ്പ്:**

1. പ്രോഗ്രാം ഓഫീസർ, വയനാട്
2. സിഡിപിഒ, ബത്തേരി
3. സിഡിപിഒ, കൽപ്പറ്റ
4. സിഡിപിഒ, മാനന്തവാടി
5. സിഡിപിഒ, മാനന്തവാടി അഡീഷണൽ
6. സിഡിപിഒ, പനമരം

**Permission for Field Work in Forest Areas for  
Scientific Research.**

WL10-19717/2018

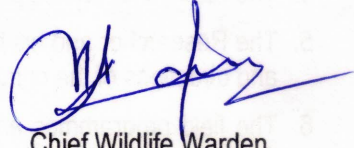
Dated.28.04.2018

|                         |   |
|-------------------------|---|
| Title of the Project    | <b><i>“Inequalities in Nutritional Status of Children Three to Five year Old Belonging to Paniya and Kurichiya Tribal Communities in Wayanad district Kerala-reg”</i></b> |
| Researcher              | Sri,Sabu.K.U, Ph.D. Scholar   |
| Institution             | Achutha Menon Centre for Health Science Studies,Sree ChitraTirunal Institute for Medical Science and Technology   |
| Duration of the project | 01/05/2018 to 31/07/2018  |
| Funding Agency          | Nil   |

Subject to the provisions of the Wildlife (Protection) Act, 1972, and the Kerala Forest Act, 1961, and the Rules made there under is **Sri.Sabu.K.U, Ph.D. Scholar, Achutha Menon Centre for Health Science Studies, Sree Chitra Tirunal Institute for Medical Science and Technology** is granted permission to enter the forest areas of Noolpuzha, Kottathara, and Thirunelli of Wayanad district from **01/05/2018 to 31/07/2018** for the purpose of scientific research on the above project, on following conditions.

1. The researcher shall not collect any samples/specimens from the Forest Area.
2. The Researcher shall abide by the conditions laid down in the order no D3-1851/2018 dt.20.03.2018 of the Director, Scheduled Tribes Development Department (copy enclosed )
3. None of the faunal elements belonging to endangered/threatened/rare categories and included in the Scheduled lists of Indian Wildlife (Protection) Act, 1972 will be collected or disturbed, and the survey shall not entail any clearing of forests or flora in the area.
4. The researcher should produce Identity Proof before the competent authority on demand.
5. The Researcher and his team, if any, shall be bound to act in accordance with the existing Acts, Rules and directions of the concerned officers.
6. The field programmes and visits of the research team shall be intimated to the concerned Assistant Conservator of Forests/ Wildlife Warden / Divisional Forest Officer / Asst. Wildlife Warden / Range Officer in advance as per the schedule attached on such dates / time mutually agreed by the researcher and the Divisional Forest Officer/Wildlife Warden having jurisdiction over the area and the collection shall be made in the presence of local Forest Department Staff only.
7. If photography is involved during the course of collection of biological resources, copies of the photographs with identity of plants / animals shall be sent to the concerned DFO/WLW, who shall maintain a register for such cases.
8. A minimum of three hard copies and one soft copy of the published and one hard and one soft copy of the Final Research Report shall be given free of cost to the Chief Wildlife Warden, on expiry of the period of research. Progress report of the study should be submitted every six months of the period of research, failure of which will lead to withdrawal of permission.
9. The Institution shall be held liable for any damage or loss caused due to the action of negligence or otherwise of the members of the research team. The research team shall make good to Government in Forest Department for any loss caused and for the destruction or damage to any forest produce, wildlife, forests or environment. The loss will be assessed by the Chief Wildlife Warden and his decision shall be final.

10. The Chief Wildlife Warden has the full discretionary powers to grant, suspend or reject permission to regulate the field works related to the research project with respect to time and space in view of the protection and management problems in the Protected Areas / Forest areas.
11. Any vehicle, vessel, weapon, trap or tool that has been used for violation of the conditions specified herein shall be forfeited to the State Government and the offender will be proceeded against as per provisions of the laws in operation in forest area / Wildlife Sanctuary / National Park / Closed area of the State.
12. The study team shall be permitted to enter into the forest area only with proper accompaniment of Forest Guides / Staff as the case may be. Suitable amount as fixed by the Chief Wildlife Warden from time to time will have to be remitted by the study team for such services rendered by the Forest Department.
13. The Chief Wildlife Warden shall take appropriate action on the researcher/organization for non-submission of final report on time as per Terms and Conditions stipulated in the letter granting permission for the project.
14. A researcher will not be required to pay entry fee in the park. If researcher needs to use a vehicle for his research activities inside the park no entry fee for the vehicle will be charged. Other facilities when availed will be charged at the rate applicable to Government officials on duty.
15. Movements of the researcher and or his assistants in the Protected Area shall be recorded in a log book to be maintained by him which will be submitted to the park management every month.
16. Movement at night shall not be permitted.
17. The Chief Wildlife Warden or any competent authority shall have the powers to suspend, withdraw or cancel the permission granted, for violation of any of the conditions of permission, or if it is subsequently found that any particulars furnished by the applicant in the application are not true or for any other just and valid reasons to be recorded in writing and, the Government or Department or any Forest Officer shall not be liable to pay any compensation for loss or damages or inconveniences caused due to the suspension, withdrawal or cancellation of the permit.

  
Chief Wildlife Warden,  
Kerala.

To,

**Sri, Sabu.K.U, Ph.D. Scholar, Achutha Menon Centre for Health Science Studies, Sree Chitra Tirunal Institute for Medical Science and Technology, Thiruvananthapuram**

**Copy to: The Wildlife Warden Waynad for information and necessary action.**

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# Factors Associated with Inequality in Composite Index of Anthropometric Failure between the *Paniya* and *Kurichiya* Tribal Communities in Wayanad District of Kerala

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## Abstract

**Background:** Tribal children in India bear a higher burden of undernutrition when compared to other communities. However, inequality within tribal communities is under-researched. **Objectives:** To examine the factors associated with inequality in undernutrition between *Paniya* and *Kurichiya* tribal communities in Wayanad district of Kerala. **Methods:** A cross-sectional analytical study was conducted during August to October 2018 among 314 children aged 2–5 years belonging to *Paniya* (151) and *Kurichiya* (163) communities. Participants were selected using multistage cluster sampling. Data were collected using structured interview schedule based on household food insecurity access scale; relevant individual, parental, and household factors were ascertained; child nutritional status was assessed based on anthropometric measurements. The composite index of anthropometric failure (CIAF) was used as an aggregate indicator of undernutrition. Statistical analysis was done using Chi-square test and univariate and multivariable logistic regression. **Results:** There were significant differences in the prevalence of stunting, underweight, and wasting between *Paniya* (52.3%, 58.9%, and 25.2%, respectively) and *Kurichiya* (28.2%, 31.1%, and 12.3%, respectively) tribal children. Based on the CIAF, 66.9% and 41.1% of *Paniya* and *Kurichiya* children, respectively, were undernourished. Intratribal difference was observed to exist in all three forms of anthropometric failures simultaneously. Significant factors associated with CIAF were community identity, household food insecurity, and maternal early marriage. Significant factor associated with all three forms of undernutrition was maternal experience of domestic violence. **Conclusion:** This study demonstrates the child nutritional inequality within the tribal communities and indicates the need for more focused policies and programs among vulnerable tribal groups to ensure food security and empowerment of women.

**Key words:** Food insecurity, inequality, Kerala, tribal, undernutrition

## INTRODUCTION

Kerala has reported the lowest prevalence of undernutrition among under-five children in India. In 2015–2016, the state had 16.1%, 19.7%, and 15.7% of children (below 5 years) underweight, stunted, and wasted, respectively. Among the Scheduled Tribe (ST) communities in Kerala, 28.2%, 22.9%, and 20% of children were stunted, underweight, and wasted, respectively. These figures are lower than the national average for both general and ST population.<sup>[1]</sup> All the same, cross-sectional studies conducted among different tribal communities in Kerala reported that the prevalence of stunting among children under-five from the ST communities ranged from 20.2% to 85.1%; underweight from 31% to 87.7%, and

wasting from 31% to 79.56%. This indicates wide nutritional inequalities among the tribal children in Kerala.<sup>[2,3]</sup> While the tribal communities in Kerala are a nutritionally vulnerable group, identifying the most vulnerable subgroups among the

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tribal communities is critical for formulating better-targeted nutritional interventions.

The age-specific trend in child growth faltering in the NFHS 3 (2005–2006) data reports that the high rate of growth faltering occurs between the age of 0 and 24 months; after the age of 24 months, more consistent trend in growth faltering is reported.<sup>[4]</sup> Hence, the study focused on children in the age group of 24–60 months which showed a more consistent pattern. The measurement of stunting indicating chronic undernutrition, wasting indicating acute undernutrition, and underweight which is the composite measure of both stunting and wasting<sup>[5-7]</sup> allows the categorization of children into these specific categories. However, it does not provide a single measure of prevalence of undernutrition by single or multiple failures of anthropometric measurements.<sup>[6]</sup> The composite index of anthropometric failure (CIAF) developed by Svedberg as a new aggregated indicator of stunting, wasting, and underweight<sup>[8]</sup> addresses this limitation and provides valuable insights for the identification and prioritization of subgroups, with multiple forms of anthropometric failures. The formulation of policies and intervention with efficient targeting and prioritization is critical for the equitable achievement of nutritional outcomes.<sup>[9]</sup> Hence, the current study was undertaken to assess the child nutritional inequality using CIAF between *Paniya* and *Kurichiya* tribal communities in a district of Kerala and also to identify the associated individual, parental, and household factors for child undernutrition.

## MATERIALS AND METHODS

### Study design, area, and subjects

A cross-sectional analytical study was conducted among *Kurichiya* and *Paniya* tribal communities in Wayanad district of Kerala from August to October 2018. The study subjects included 2–5-year-old children residing in the study area and their mothers being primary respondents.

### Sample size and Sampling

The prevalence of underweight among the children from *Paniya* and *Kurichiya* was assumed to be 63% and 43% with a 20% difference between the groups, based on a previous study.<sup>[10,11]</sup> The sample size was calculated with significance level 0.05, with statistical power  $1 - \beta = 0.8$ , and with allocation ratio 1:1. The calculated sample size was 97 for each group. Considering the possibilities of difference in the proportion of undernutrition between the clusters, a design effect of 1.5 was assumed, and assuming 10% as the nonresponse rate, the sample size calculated was 165 for each community (after rounding off). Thus, the total desired sample size covering both groups was estimated at 330.

The study used a multistage cluster sampling strategy. In the first stage, six Panchayats with higher proportion of *Paniya* and *Kurichiya* communities were selected out of 26 village Panchayats in the Wayanad district. As the *Paniya* and *Kurichiya* communities live in settlements, each settlement was considered as a cluster. In the second stage, a list of all

*Paniya* (198) and *Kurichiya* (106) settlements with a minimum of 20 households from the six selected Panchayats were collected from the Panchayat Tribal Development Extension Office. From these, 33 (16.7%) *Paniya* settlements and 33 (31.1%) *Kurichiya* settlements were selected randomly. The number of settlements selected was proportionate to the total number of settlements in each of the selected Panchayats. All the children in the age group of 2–5 years from each of the selected settlements were included in the study. We estimated approximately five children from each settlement to achieve the calculated sample size. However, in smaller settlement, we were able to find only three children, and this was made up by selecting seven or six children from larger settlements with more than 50 households. Overall, we included 167 children from the *Paniya* community and 166 children from the *Kurichiya* community, with a total of 333.

### Data collection: Tools and techniques

We interviewed mothers using an interview schedule that explored factors at the individual, parental, household, and community levels. We assessed household-level food insecurity using household food-insecurity assessment scale (HFIAS), a nine-item scale on four frequency response using a 4-week recall period. HFIAS is reported a reliable and valid instrument to measure household food insecurity in the Indian context.<sup>[12]</sup> We assessed the nutritional status using the 1995 WHO Expert Committee recommendations.<sup>[7]</sup> Weight was measured to the precision of 100 g using a lightweight SECA 803 flat-scale having a digital monitor designed and monitored by the UNICEF (SECA Medical Scales and Measuring Systems, Birmingham, UK). The weighing scale was calibrated at the beginning of each working day. Height was also measured to the precision of 1 mm using SECA stadiometer designed and monitored by the UNICEF (SECA Medical Scales and Measuring Systems, Birmingham, UK). Weight-for-age Z-scores (WAZ), height-for-age Z-scores (HAZ), and weight-for-height Z-scores (WHZ) were computed using WHO Anthro Software as per the new 2006 WHO Child Growth Standards. Open Data Kit (ODK) Collective v1.18.2 was used in a mobile tablet for data collection, and data entry and the data were exported to Statistical Package for the Social Sciences 23.0, Armonk, NY, US: IBM Corp (SPSS, License No.: 567588dab50014edac00) for cleaning and further analysis.

### Statistical analysis

Descriptive analysis of HAZ, WAZ, and WHZ was performed. CIAF was constructed using seven subgroup of anthropometric failures, namely A – no failure, B – only wasted, C – underweight and wasted, D – stunted, wasted, and underweight, E – stunted and underweight, F – only stunted, and Y – only underweight. Chi-square test was performed to test the statistical significance of the difference in the proportion of CIAF between children from *Paniya* and *Kurichiya* community. Finally, binary logistic regression was performed to examine the association between the CIAF and other sociodemographic variables. Multicollinearity among the predictor variables was verified using variance inflation factors (VIFs), and VIF higher than

3 was considered collinear factor and was excluded from the model.

### Ethical considerations

The study was undertaken after getting the approval and clearance from the institutional ethics committee (IEC) of the host institution (IEC Reg No. ECR/189/Inst/KL/2013). Oral witnessed consent or informed consent with thumb impression was obtained from the participants, after explaining the objectives and purpose of the study and potential benefits and risk of participating in the study before data collection. The objectives and purpose of the study and the potential benefits and risks of participating in the study were explained to the participant in the presence of the witness. The witness then signed or registered his/her thumb impression on the informed consent form.

## RESULTS

### Inequalities in socio-demographic characteristics

A total of 333 mothers and children were approached, of which 322 (96.7%) consented to participate in the survey. After excluding 8 (2.5%) incomplete responses from the surveyed samples, a total of 314 respondents were included in the final analysis. Of these, 163 mothers belonged to *Kurichiya* and 151 belonged to *Paniya* communities. Significant differences in all the sociodemographic factors that were known to be associated with household food-security status were observed between *Paniya* and *Kurichiya* households [Table 1]. A majority of the mothers and fathers from the *Kurichiya* community were at least secondary schooleducated, whereas a majority of the mothers from the *Paniya* community had primary school education or below and one-third of *Paniya* mothers were illiterate. While two-thirds of *Kurichiya* mothers were engaged in some remunerated work, only one-fourths of *Paniya* mothers were engaged in any remunerated work. Roughly one-fourth of the mothers from *Paniya* community consumed alcohol (23.2%), whereas it was only 1.2% among *Kurichiya* mothers. Paternal alcohol consumption was observed to be high among both *Paniya* (75.5%) and *Kurichiya* (58.9%) communities. A higher proportion of households with more than nine members were observed among *Paniya* community (30%) as compared with *Kurichiya* community (5.6%). While 81.5% of *Paniya* households owned <10 cents of land, only 32.6% of *Kurichiya* households owned <10 cents of land and one-third of *Kurichiya* households owned more than 50 cents of land. More *Paniya* households (44.4%) were located near the forest area as compared to *Kurichiya* households (29.4%). A higher proportion of *Kurichiya* households (80.4%) had a ration card as compared to *Paniya* households (69.5%). Among *Kurichiya* community, 94.5% of households had toilet facilities, while it was 61.5% among *Paniya*. While 59.5% of the households from *Kurichiya* community were food insecure, as high as 85.4% of the households from *Paniya* community were food insecure. A higher proportion of children from *Paniya* community had low birth weight (41.6%), when compared with that of *Kurichiya* community (29.1%).

### Inequalities in nutritional status

Table 1 also provides data on the CIAF among children from *Paniya* and *Kurichiya* communities. A higher proportion of children from *Paniya* community were reported to suffer at least one anthropometric failure (66.9%) as compared with that of *Kurichiya* community (41.1%). However, no significant difference was observed in single anthropometric failure (only stunting, only wasting, and only underweight) and double failure of underweight and wasting. All the same, there was a significant difference in the proportion of children who suffered from all three forms of anthropometric failures: *Paniya* (16.6%) and *Kurichiya* (4.3%) communities ( $P = 0.0001$ ). Similarly, differences in double failure of underweight and stunting were also statistically significant between *Paniya* (29.1%) and *Kurichiya* (14.1%) communities ( $\chi^2 = 10.54$ ,  $P = 0.001$ ). Similarly, Z-score distribution of height for age, weight for age, and weight for height was plotted to show the differences in its overall distribution and severe cases between *Paniya* and *Kurichiya* communities [Figure 1].

Table 2 shows the result of binomial logistic regression model that examined significant factors at individual, parental, household, and community that are associated with CIAF. Although many factors were found to be significantly associated with CIAF in unadjusted logistic regression, with multivariable logistic regression, only community identity, household food insecurity, and maternal early marriage remained significantly associated with CIAF after adjusting for other variables. The children belonging to the *Paniya* community were 2.68 times (adjusted odds ratio [AOR] = 2.68, 95% confidence interval [CI] = 1.04–6.93) more likely to suffer at least one anthropometric deficit as compared to the children from the *Kurichiya* community, after adjusting all the individual, maternal, and household characteristics. Children from food insecure households had 2.10 times (AOR = 2.10, 95% CI = 1.13–3.93) greater likelihood of CIAF compared with the children from food-secure households. Similarly, children of mothers who married before the age of 18 years had a 2.56 times (AOR = 2.56, 95% CI = 1.11–5.93) higher risk of CIAF compared with children to mother who were married at the age of 18 or later.

Table 3 shows the factors associated with all three forms of anthropometric failures (stunting, wasting, and underweight). Although community identity, household land ownership, food insecurity, maternal alcoholic consumption, and maternal experience of domestic violence were significantly associated with all three forms of anthropometric failure, maternal experience of domestic violence remained as the only significant factor associated with all three types of anthropometric failures after adjusting for other variables. The children of mothers who experienced domestic violence had 2.35 times (AOR = 2.35, 95% CI = 1.02–5.39,  $P < 0.05$ ) greater likelihood of all three forms of anthropometric failures, compared with that of mothers who did not experience domestic violence. Similarly, maternal consumption of alcohol also remained nearly significant.

**Table 1: Distribution of socio-demographic variables and nutritional status between Kurichiya and Paniya tribal communities**

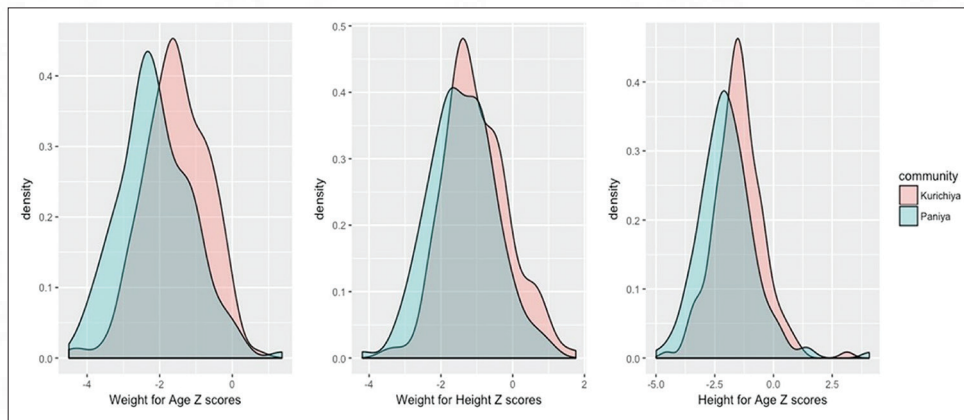
| Variables                                     | Kurichiya (n=163) | Paniya (n=151) | Total (n=314) | $\chi^2$ | df | P      |
|---|-------------------|----------------|---------------|----------|----|--------|
| Education of the mother                       |                   |                |               |          |    |        |
| Higher-secondary or above                     | 51 (31.3)         | 5 (3.3)        | 56 (17.8)     | 159.2    | 3  | 0.0001 |
| Secondary                                     | 103 (63.2)        | 36 (23.8)      | 139 (44.3)    |          |    |        |
| Primary                                       | 7 (4.3)           | 25 (16.6)      | 32 (10.2)     |          |    |        |
| Without formal education                      | 2 (1.2)           | 85 (56.3)      | 87 (27.7)     |          |    |        |
| Work status                                   |                   |                |               |          |    |        |
| Domestic, remunerated, and unremunerated work | 39 (23.9)         | 9 (6)          | 48 (15.3)     | 69.9     | 3  | 0.0001 |
| Remunerated work and domestic work            | 72 (44.2)         | 24 (15.9)      | 96 (30.6)     |          |    |        |
| Unremunerated work and domestic work          | 17 (10.4)         | 53 (35.1)      | 70 (22.3)     |          |    |        |
| Only domestic work                            | 35 (21.5)         | 65 (43)        | 100 (31.8)    |          |    |        |
| Maternal alcoholic consumption                |                   |                |               |          |    |        |
| No  | 161 (98.8)        | 116 (76.8)     | 277 (88.2)    | 36       | 1  | 0.0001 |
| Yes   | 2 (1.2)           | 35 (23.2)      | 37 (11.8)     |          |    |        |
| Maternal experience of domestic violence      |                   |                |               |          |    |        |
| No  | 154 (94.5)        | 99 (65.6)      | 253 (80.6)    | 41.87    | 1  | 0.0001 |
| Yes   | 9 (5.5)           | 52 (34.4)      | 61 (19.4)     |          |    |        |
| Maternal age of marriage                      |                   |                |               |          |    |        |
| 18+   | 155 (96.3)        | 91 (61.5)      | 246 (79.6)    | 57.49    | 1  | 0.0001 |
| ≤17   | 6 (3.7)           | 57 (38.5)      | 63 (20.4)     |          |    |        |
| Education of the father                       |                   |                |               |          |    |        |
| Higher-secondary or above                     | 24 (14.7)         | 3 (2)          | 27 (8.6)      | 91.7     | 3  | 0.0001 |
| Secondary                                     | 100 (61.3)        | 39 (25.8)      | 139 (44.3)    |          |    |        |
| Primary                                       | 23 (14.1)         | 22 (14.6)      | 45 (14.3)     |          |    |        |
| Without formal education                      | 16 (9.8)          | 87 (57.6)      | 103 (32.8)    |          |    |        |
| Paternal alcoholic consumption                |                   |                |               |          |    |        |
| No  | 67 (41.1)         | 37 (24.5)      | 104 (33.1)    | 9.75     | 1  | 0.002  |
| Yes   | 96 (58.9)         | 114 (75.5)     | 210 (66.9)    |          |    |        |
| Total number of household members             |                   |                |               |          |    |        |
| 9+  | 9 (5.6)           | 45 (30)        | 54 (17.3)     | 36.4     | 2  | 0.0001 |
| 05-08   | 112 (69.1)        | 88 (58.7)      | 200 (64.1)    |          |    |        |
| ≤4  | 41 (25.3)         | 17 (11.3)      | 58 (18.6)     |          |    |        |
| Land ownership                                |                   |                |               |          |    |        |
| 100+  | 25 (15.3)         | 1 (.7)         | 26 (8.3)      | 78.5     | 3  | 0.0001 |
| 51-100 cents                                  | 30 (18.4)         | 1 (.7)         | 31 (9.9)      |          |    |        |
| 11-50 cents                                   | 49 (30.1)         | 26 (17.2)      | 75 (23.9)     |          |    |        |
| ≤10 cents                                     | 59 (36.2)         | 123 (81.5)     | 182 (58)      |          |    |        |
| Domicile                                      |                   |                |               |          |    |        |
| Nonforest                                     | 115 (70.6)        | 84 (55.6)      | 199 (63.4)    | 7.5      | 1  | 0.006  |
| Forest  | 48 (29.4)         | 67 (44.4)      | 115 (36.6)    |          |    |        |
| Ownership of ration card                      |                   |                |               |          |    |        |
| Yes   | 131 (80.4)        | 105 (69.5)     | 236 (75.2)    | 4.9      | 1  | 0.03   |
| No  | 32 (19.6)         | 46 (30.5)      | 78 (24.8)     |          |    |        |
| Availability of toilet facility               |                   |                |               |          |    |        |
| Yes   | 154 (94.5)        | 123 (81.5)     | 277 (88.2)    | 12.78    | 1  | 0.0001 |
| No  | 9 (5.5)           | 28 (18.5)      | 37 (11.8)     |          |    |        |
| Household food-insecurity status              |                   |                |               |          |    |        |
| Food secure                                   | 66 (40.5)         | 22 (14.6)      | 88 (28)       | 26.1     |    | 0.0001 |
| Food insecure                                 | 97 (59.5)         | 129 (85.4)     | 226 (72)      |          |    |        |
| Sex of the child                              |                   |                |               |          |    |        |
| Female  | 72 (44.2)         | 79 (52.3)      | 151 (48.1)    | 2.08     | 1  | 0.15   |
| Male  | 91 (55.8)         | 72 (47.7)      | 163 (51.9)    |          |    |        |
| Birth weight                                  |                   |                |               |          |    |        |
| 2.5 kg+                                       | 112 (70.9)        | 80 (58.4)      | 192 (65.1)    | 5.04     | 1  | 0.03   |
| <2.5 kg                                       | 46 (29.1)         | 57 (41.6)      | 103 (34.9)    |          |    |        |

Contd...

**Table 1: Contd...**

| Variables  | Kurichiya (n=163) | Paniya (n=151) | Total (n=314) | $\chi^2$ | df | P      |
|--|-------------------|----------------|---------------|----------|----|--------|
| <b>Differences in composite index of anthropometric failures</b> |                   |                |               |          |    |        |
| Only wasting   |                   |                |               |          |    |        |
| No   | 161 (98.8)        | 149 (98.7)     | 310 (98.7)    | 0.006    | 1  | 1      |
| Yes  | 2 (1.2)           | 2 (1.3)        | 4 (1.3)       |          |    |        |
| Underweight and wasting  |                   |                |               |          |    |        |
| No   | 152 (93.3)        | 140 (92.7)     | 292 (93)      | 0.035    | 1  | 1      |
| Yes  | 11 (6.7)          | 11 (7.3)       | 22 (7)        |          |    |        |
| Underweight, wasting, and stunting                               |                   |                |               |          |    |        |
| No   | 156 (95.7)        | 126 (83.4)     | 282 (89.8)    | 12.9     | 1  | 0.0001 |
| Yes  | 7 (4.3)           | 25 (16.6)      | 32 (10.2)     |          |    |        |
| Underweight and stunted  |                   |                |               |          |    |        |
| No   | 140 (85.9)        | 107 (70.9)     | 247 (78.7)    | 10.54    | 1  | 0.001  |
| Yes  | 23 (14.1)         | 44 (29.1)      | 67 (21.3)     |          |    |        |
| Only stunted   |                   |                |               |          |    |        |
| No   | 147 (90.2)        | 141 (93.4)     | 288 (91.7)    | 1.05     | 1  | 0.2    |
| Yes  | 16 (9.8)          | 10 (6.6)       | 26 (8.3)      |          |    |        |
| Only underweight   |                   |                |               |          |    |        |
| No   | 155 (95.1)        | 142 (94)       | 297 (94.6)    | 0.17     | 1  | 0.8    |
| Yes  | 8 (4.9)           | 9 (6)          | 17 (5.4)      |          |    |        |
| CIAF   |                   |                |               |          |    |        |
| No   | 96 (58.9)         | 50 (33.1)      | 146 (46.5)    | 20.95    | 1  | 0.0001 |
| Yes  | 67 (41.1)         | 101 (66.9)     | 168 (53.5)    |          |    |        |

Figures in parenthesis indicate percentages (column-wise). CIAF: Composite index of anthropometric failure



**Figure 1:** Differences in Z-score distribution between *Paniya* and *Kurichiya* communities.

## DISCUSSION

According to the NFHS 4 (2015–2016), the overall prevalence of stunting, underweight, and wasting in India among children (below 5 years) was 38.4%, 35.7%, and 21%, respectively. Among the tribal communities, 44%, 45%, and 27% of children were stunted, underweight, and wasted. The current study reported that 39.8%, 43.9%, and 18.5% of children from the *Paniya* and *Kurichiya* tribal communities combined to be stunted, underweight, and wasted. This shows a lower prevalence of stunting and wasting among tribal children in Kerala, when compared to the national average for tribal children. However, community-wise nutritional status shows that children from the *Paniya* community had a much higher prevalence of stunting and underweight and

comparable levels of wasting (52.3%, 58.9%, and 25.2%, respectively) to the national average for tribal children. This indicates to the need for going beyond averages for the tribal community as a whole and characterizing nutritional status of specific tribal communities. Other cross-sectional studies conducted among the *Paniya* communities have reported a large difference in stunting, underweight, and wasting among *Paniya* children (82.9%, 83.6%, and 82%, respectively) as compared to *Kurichiya* children (20.2%, 31%, and 31%, respectively).<sup>[13]</sup>

Comparing the overall magnitude of undernutrition using the CIAF also found significant differences between *Paniya* and *Kurichiya* children. The working paper by Rajpal *et al.*<sup>[9]</sup> based on the NFHS 4 (2015–2016) reported that 55% of the children

**Table 2: Multivariable logistic regression model for factors associated with composite index of anthropometric failure at the individual, parental, and household level**

| Variables                                     | CIAF deficit |            | OR (95% CI)         |                   |
|---|--------------|------------|---------------------|-------------------|
|   | No           | Yes        | Unadjusted OR       | Adjusted OR       |
| Community                                     |              |            |                     |                   |
| <i>Kurichiya</i>                              | 96 (58.9)    | 67 (41.1)  | Reference           | Reference         |
| <i>Paniya</i>                                 | 50 (33.1)    | 101 (66.9) | 2.89 (1.83-4.59)*** | 2.68 (1.04-6.93)* |
| <b>Household factors</b>                      |              |            |                     |                   |
| Total number of household members             |              |            |                     |                   |
| ≤4  | 33 (56.9)    | 25 (43.1)  | Reference           | Reference         |
| 5-8   | 95 (47.5)    | 105 (52.5) | 1.46 (0.81-2.63)    | 1.85 (0.91-3.75)  |
| 9+  | 17 (31.5)    | 37 (68.5)  | 2.87 (1.32-6.23)**  | 1.77(.83-3.75)    |
| Consumption of any fruits or vegetables       |              |            |                     |                   |
| Yes   | 127 (51.4)   | 120 (48.6) | Reference           | Reference         |
| No  | 19 (28.4)    | 48 (71.6)  | 2.67 (1.49-4.81)*** | 1.95 (0.82-4.63)  |
| Household land ownership                      |              |            |                     |                   |
| 51+   | 33 (57.9)    | 24 (42.1)  | Reference           | Reference         |
| 11-50   | 40 (53.3)    | 35 (46.7)  | 1.20 (0.60-2.41)    | 1.05 (0.46-2.41)  |
| ≤10   | 73 (40.1)    | 109 (59.9) | 2.05 (1.12-3.75)*   | 0.89 (0.38-2.06)  |
| Toilet facility at home                       |              |            |                     |                   |
| Yes   | 135 (48.7)   | 142 (51.3) | Reference           | Reference         |
| No  | 11 (29.7)    | 26 (70.3)  | 2.25 (1.07-4.73)*   | 1.10 (0.43-2.81)  |
| Food security                                 |              |            |                     |                   |
| Food secure                                   | 53 (60.2)    | 35 (39.8)  | Reference           | Reference         |
| Food insecure                                 | 93 (41.2)    | 133 (58.8) | 2.17 (1.31-3.58)*** | 2.10 (1.13-3.93)* |
| <b>Maternal level factors</b>                 |              |            |                     |                   |
| Education of the mother                       |              |            |                     |                   |
| Higher-secondary or above                     | 36 (64.3)    | 20 (35.7)  | Reference           | Reference         |
| Secondary                                     | 62 (44.6)    | 77 (55.4)  | 2.23 (1.18-4.24)**  | 1.38 (.66-2.90)   |
| Primary                                       | 17 (53.1)    | 15 (46.9)  | 1.59 (0.66-3.84)    | 0.36 (0.11-1.20)  |
| Without formal education                      | 31 (35.6)    | 56 (64.4)  | 3.25 (1.61-6.55)*** | 0.54 (0.16-1.79)  |
| Maternal age at marriage                      |              |            |                     |                   |
| 18+   | 124 (50.4)   | 122 (49.6) | Reference           | Reference         |
| ≤17   | 18 (28.6)    | 45 (71.4)  | 2.54 (1.39-4.63)*** | 2.56* (1.11-5.93) |
| Work status                                   |              |            |                     |                   |
| Domestic, remunerated, and unremunerated work | 29 (60.4)    | 19 (39.6)  | Reference           | Reference         |
| Remunerated work and domestic work            | 42 (43.8)    | 54 (56.3)  | 1.96 (0.97-3.97)    | 1.93 (0.86-4.33)  |
| Unremunerated work and domestic work          | 32 (45.7)    | 38 (54.3)  | 1.81 (0.86-3.12)    | 0.73 (0.27-1.99)  |
| Only domestic work                            | 43 (43)      | 57 (57)    | 2.02 (1-4.08) *     | 1.09 (.45-2.67)   |
| Maternal alcoholic consumption                |              |            |                     |                   |
| No  | 134 (48.4)   | 143 (51.6) | Reference           | Reference         |
| Yes   | 12 (32.4)    | 25 (67.6)  | 1.95 (0.94-4.04)    | 1.26 (0.50-3.20)  |
| Experience of domestic violence               |              |            |                     |                   |
| No  | 127 (50.4)   | 125 (49.6) | Reference           | Reference         |
| Yes   | 19 (30.6)    | 43 (69.4)  | 2.30 (1.27-4.16)**  | 1.71 (0.78-3.73)  |
| <b>Individual-level factors</b>               |              |            |                     |                   |
| Birth weight                                  |              |            |                     |                   |
| 2.5+g   | 100 (52.1)   | 92 (47.9)  | Reference           | Reference         |
| <2.500 g                                      | 38 (36.9)    | 65 (63.1)  | 1.86 (1.14-3.04)**  | 1.63 (0.90-2.94)  |
| Frequency food consumption                    |              |            |                     |                   |
| 4≥ times                                      |              |            | Reference           | Reference         |
| 3 times                                       | 62 (56.9)    | 47 (43.1)  | 1.60 (0.96-2.66)    | 1.33 (0.72-2.45)  |
| ≤2 times                                      | 23 (32.9)    | 47 (67.1)  | 2.69 (1.44-5.04)*** | 2.13 (0.83-5.46)  |

\* $P < 0.05$ , \*\* $P < 0.01$ , \*\*\* $P < 0.001$ . Figures in parenthesis indicate percentages (row wise). CI: Confidence interval, OR: Odds ratio, CIAF: Composite index of anthropometric failure

**Table 3: Factors associated with three anthropometric failures (stunting, wasting, and underweight)**

| Variables                       | No         | Yes       | OR (95% CI)          |                   |
|---------------------------------|------------|-----------|----------------------|-------------------|
|                                 |            |           | Unadjusted           | Adjusted          |
| Community                       |            |           |                      |                   |
| <i>Kurichiya</i>                | 156 (95.7) | 7 (4.3%)  |                      |                   |
| <i>Paniya</i>                   | 126 (83.4) | 25 (16.6) | 4.42 (1.85-10.56)*** | 1.84 (0.63-5.33)  |
| <b>Household level factors</b>  |            |           |                      |                   |
| Household land ownership        |            |           |                      |                   |
| 51+ cents                       | 56 (98.2)  | 1 (1.8)   |                      |                   |
| 11-50 cents                     | 68 (90.7)  | 7 (9.3)   | 5.76 (0.69-48.26)    | 3.13 (0.35-28.31) |
| ≤10 cents                       | 158 (86.8) | 24 (13.2) | 8.51 (1.13-64.35)*   | 3.32 (0.38-29.15) |
| Food insecurity                 |            |           |                      |                   |
| Food secure                     | 84 (95.5)  | 4 (4.5)   |                      |                   |
| Food insecure                   | 198 (87.6) | 28 (12.4) | 2.97 (1.01-8.73)*    | 1.42 (0.45-4.50)  |
| <b>Maternal level factors</b>   |            |           |                      |                   |
| Maternal alcoholic consumption  |            |           |                      |                   |
| No                              | 255 (92.1) | 22 (7.9)  |                      |                   |
| Yes                             | 27 (73)    | 10 (27)   | 4.29 (1.84-10.00)*** | 2.46 (0.976-6.21) |
| Experience of domestic violence |            |           |                      |                   |
| No                              | 234 (92.7) | 18 (7.1)  |                      |                   |
| Yes                             | 48 (77.4)  | 14 (22.6) | 3.79 (1.77-8.14)***  | 2.35 (1.02-5.39)* |

\* $P < 0.05$ , \*\* $P < 0.01$ , \*\*\* $P < 0.001$ . Figures in parenthesis indicate percentages (row-wise). CI: Confidence interval, OR: Odds ratio

in India suffer from CIAF, meaning that CIAF reported among *Kurichiya* children is 14% points lower than the national average and among the *Paniya* children is about 12% points above the national average. CIAF reported among *Paniya* community is higher than that reported in cross-sectional studies conducted in other tribal communities in Assam,<sup>[14]</sup> West Bengal,<sup>[15]</sup> and Tamil Nadu.<sup>[16]</sup>

The differences in the nutritional status between *Paniya* and *Kurichiya* community were wider in the case of severe stunting and severe underweight. A pooled analysis of 10 prospective studies conducted in Asia, Africa, and North America reported that children with severely underweight had 9.40 times higher (95% CI 8.02–11.03) risk of mortality, severely wasted children had 11.63 times (95% CI 9.84–13.76) higher risk of mortality, and severe stunting had 5.48 times (95% CI 4.62–6.50) higher risk of mortality compared with its normal counterpart.<sup>[17]</sup> Similarly, 16.6% of the children from *Paniya* community suffered from all three forms of anthropometric failures simultaneously. Global evidence shows that the children who suffer from all three forms of anthropometric failures have the highest risk of mortality (odds ratio = 12.3, 95% CI = 95% CI: 7.7–19.6) among the undernourished children.<sup>[18]</sup> In addition to this, the significant differences in anthropometric deficit in two dimensions between *Paniya* and *Kurichiya* community indicate that the higher burden of severe forms of child undernutrition among the tribal communities is not uniformly distributed and there is an unfair clustering of undernutrition among some groups in tribal communities. Hence, universal access to nutritional programs needs to be ensured to the tribal communities on the one hand; at the same time, more nutritionally vulnerable groups within tribal

communities need to be identified and more targeted nutritional program should be implemented for them.

The use of CIAF in this paper has the advantages of unequivocally demonstrating the inequality in the overall magnitude of undernutrition and severity of undernutrition between the two communities, which would not have been possible with the use of conventional anthropometric measurements of individual aspects of undernutrition. This is critical from the point of view of equity, for prioritizing nutritional interventions where large proportion of children experience multiple and simultaneous failures and deserve prioritized intervention. The significantly higher risk of CIAF among children from the *Paniya* community after controlling for household, maternal, and individual child characteristics points toward the need for more focused nutritional intervention among the *Paniya* community. The other significant factors associated with CIAF were household food insecurity and maternal early marriage, and the significant factor associated with all three forms of anthropometric failures was maternal experience of domestic violence. While a substantial proportion of food insecure households were reported from both the communities, a high proportion of maternal early marriage and maternal experience of domestic violence were reported from *Paniya* community alone. This indicates the need for more focused food provisioning interventions among the tribal communities in general and more specific intervention to empower the tribal women from the most marginalized tribal groups to address the high level of undernutrition.

The analysis in this study did not include community-level conditions related to water and sanitation, which are important variables affecting child nutritional status. Although there were significant differences in paternal characteristics between

the communities, these did not show any associations with nutritional outcomes. This needs to be further explored. The study was based on a relatively small sample size, and this limited the scope for analysis of very severe forms of undernutrition and multiple failures of undernutrition. Recall bias is possible in responding to the household food-insecurity scale for 1 month. Besides, there may have been under-reporting of household food security due to social and cultural stigma toward identifying oneself as belonging to a household with food insecurity. In some cases, there may have been an exaggeration of household food insecurity because of the expectation that some welfare measures would be made available to them. Finally, the cross-sectional design of the study does not allow for drawing any causal conclusion.

## CONCLUSION

The findings from this study indicate that while overall tribal communities in Kerala have a higher burden of undernutrition, there is severe nutritional inequality within the tribal communities. Hence, nutritional programs and interventions need to be more focused to reach the most marginalized communities within the tribal groups. By implementing a common design and delivery strategy across all tribal subgroups, current food security programs may be failing the population groups that are most vulnerable to the effects of childhood malnutrition. Empowerment of tribal women to address early marriage, alcohol consumption, the experience of domestic violence could be a critical intervention to address severe forms of undernutrition.

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## Conflicts of interest

There are no conflicts of interest.

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

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## Abstract

**Objectives** To understand the complex interaction of structural inequalities, co-occurring health conditions, and child undernutrition 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.

**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

## Introduction

India has one of the highest proportions of child undernutrition in the world, with a prevalence of stunting and underweight 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

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[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 undernutrition [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 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

**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%) | <b>2.85* (1.04–7.81)</b> |
| 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%) | <b>2.3 (0.94–5.61)</b>   |
| History of cough and fever (last two weeks)              |            |            |                          |
| No   | 28 (45.9%) | 33 (54.1%) | Ref:                     |
| Yes  | 22 (24.4%) | 68 (75.6%) | <b>2.93* (1.24–6.93)</b> |
| 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

\* $p < 0.05$

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

**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            |
|--|--------|------------------------|------------------------|---------------------------|----------------------------|
| <b>Low Prevalence Paniya Settlement</b>  |        |                        |                        |                           |                            |
| 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                     |                            |
| <b>High Prevalence Paniya Settlement</b> |        |                        |                        |                           |                            |
| 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                    |                            |

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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## Declarations

**Conflict of Interest** None.

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# Alarming level of severe acute malnutrition in Indian districts

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## ABSTRACT

Over the last two decades, severe acute malnutrition (SAM) has been increasing in India despite favourable national-level economic growth. The latest round of the National Family Health Survey 5 (NFHS-5) results was released, allowing us to assess changes in the malnutrition trends. Analysis of the previous rounds of the NFHS (NFHS-4) has already shown disturbing levels of wasting, often co-occurring with other forms of anthropometric failures. These have been shown to occur in clusters of districts across India that already needed urgent policy and programmatic action. A rapid assessment of data from NFHS-5 for some of these districts for which data are now available shows an alarming increase in SAM in several malnutrition hotspot districts. Surprisingly, some districts outside hotspots and in states and regions that have previously not been known for high malnutrition too have shown increasing SAM prevalence in the latest round. The data from NFHS-5 was collected just before the COVID-19 pandemic and hence does not yet reflect the likely impact of the pandemic on food security, livelihoods and other social stressors among the most marginalised Indian households. Based on this emerging pattern of increasing SAM, we call for an urgent policy and programmatic action to strengthen the Anganwadi system, which caters to preschool children in India and community-based management of acute malnutrition based on recent evidence on their effectiveness.

## INTRODUCTION

The prevalence of severe acute malnutrition (SAM) among preschool children has been on a steady rise in India over the last two decades. It has increased from 6.6% in 2005–2006 as per the National Family Health Survey-3 (NFHS-3)<sup>1</sup> to 7.5% in NFHS-4 in 2015–2016.<sup>2</sup> As per the most recent NFHS-5 survey (2019–2021)<sup>3</sup> covering 36 states and union territories (UTs), the prevalence continues to be an alarming 7.7%. SAM is defined as weight-for-height below  $-3$  z-scores of the median WHO growth standards known as severe wasting.<sup>4</sup> Children with SAM are at 9–11 times higher risk of mortality and morbidity than well-nourished children.<sup>5 6</sup> Case fatality rate among SAM children receiving inpatient treatment based on WHO protocol<sup>7</sup> ranged

## Summary box

- ⇒ Children with severe acute malnutrition (SAM) have an elevated risk of mortality and morbidity.
- ⇒ In this analysis paper, we compared the district level trend in the prevalence of SAM between the National Family Health Survey 4 (NFHS 4) (2015–2016) and NFHS 5 (2019–2021).
- ⇒ Manifold increase in SAM prevalence in several Indian districts is a public health emergency that requires urgent policy response.
- ⇒ Worsening of SAM in districts which were already identified as undernutrition hotspots in India requires prioritised policy action.
- ⇒ We call for an urgent policy and programmatic action to strengthen the Anganwadi system, which caters to preschool children in India and community-based management of acute malnutrition based on recent evidence on their effectiveness.

from 3.4% to 35%.<sup>6</sup> An estimate based on the NFHS-4 survey suggests that approximately 10 billion children in India suffer from SAM.<sup>8</sup> Meaning that the case fatality rate of 3.4%–35% would translate into 340 000 to 3.5 million deaths among under-five children in India. This is an unprecedented public health emergency requiring urgent policy attention. Although the prevalence trend in SAM between NFHS-4 and NFHS-5 shows an almost stagnant position at the national level, the national average hides the worsening of SAM at several individual districts due to the improvement in other districts. Hence, identifying districts or region with a higher burden of SAM and providing focused priority to such districts/region is a critical aspect of equitable public policy intervention. Moreover, district is an important subunit for action in India's flagship nutritional initiative of *POSHAN Abhiyaan*, and district level planning and monitoring is a critical aspect in its execution. Indian districts are relatively large with population ranging from 1 million to few million people. Hence, in this article, we analyse the district level trend in

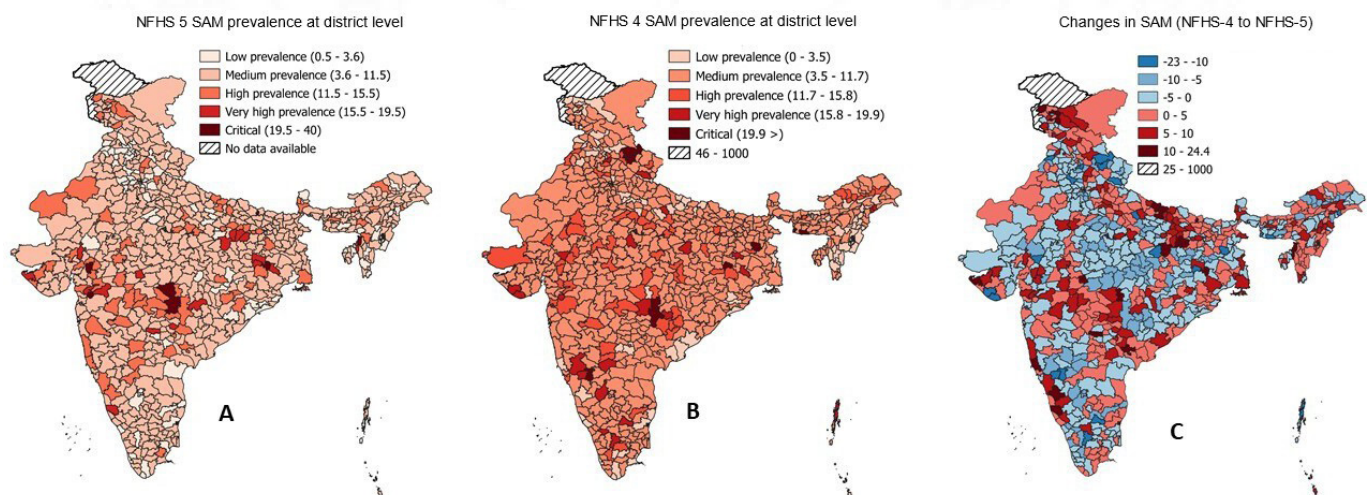
SAM prevalence between NFHS-4 and NFHS-5 surveys to prioritise the districts/region for immediate public policy intervention.

District level prevalence data of severe wasting was extracted from NFHS-4 (2015–2016) and NFHS-5 (2019–2021). The data collection for NFHS-5 was conducted in two phases. The first phase was conducted between June 2019 and February 2020, and the second phase was between January 2020 and April 2021. Though data collection in the second phase was started in January 2020, it was suspended on 21 March 2020 due to the nationwide lockdown on account of the COVID-19 pandemic. The survey was resumed in November 2020 and completed in April 2021. In the NFHS-4 survey, data were collected from 640 districts. However, by the time the NFHS-5 was conducted the number of districts increased by 67 districts ( $n=707$ ) for which data were not available in NFHS-4. The 67 newly added districts in NFHS-5 were formed bifurcating the geographical regions from one or more districts included in the NFHS-4 survey. Of the 67 new districts, 15 districts have been formed, adding geographical units from two or more parent districts. Of the remaining 52 new districts, each district was formed from one parent district each. In order to make the comparison of the district level SAM prevalence between two surveys for newly formed districts, we followed the method adopted by Subramaniam *et al* in the NFHS policy tracker for Indian districts.<sup>9</sup> In the case of the 52 new districts formed from singly parent districts, the prevalence value of the parent district was assigned to its corresponding new district. In cases where a new district was formed adding geographical areas from two or more parent districts, the mean prevalence value of the respective parent districts was calculated, and the calculated mean prevalence was assigned to the newly formed district. Further to this, the differences in SAM prevalence between the two data sets was calculated. SAM prevalence in NFHS-4 and NFHS-5 surveys was categorised as low, medium, high, very high and critical prevalence

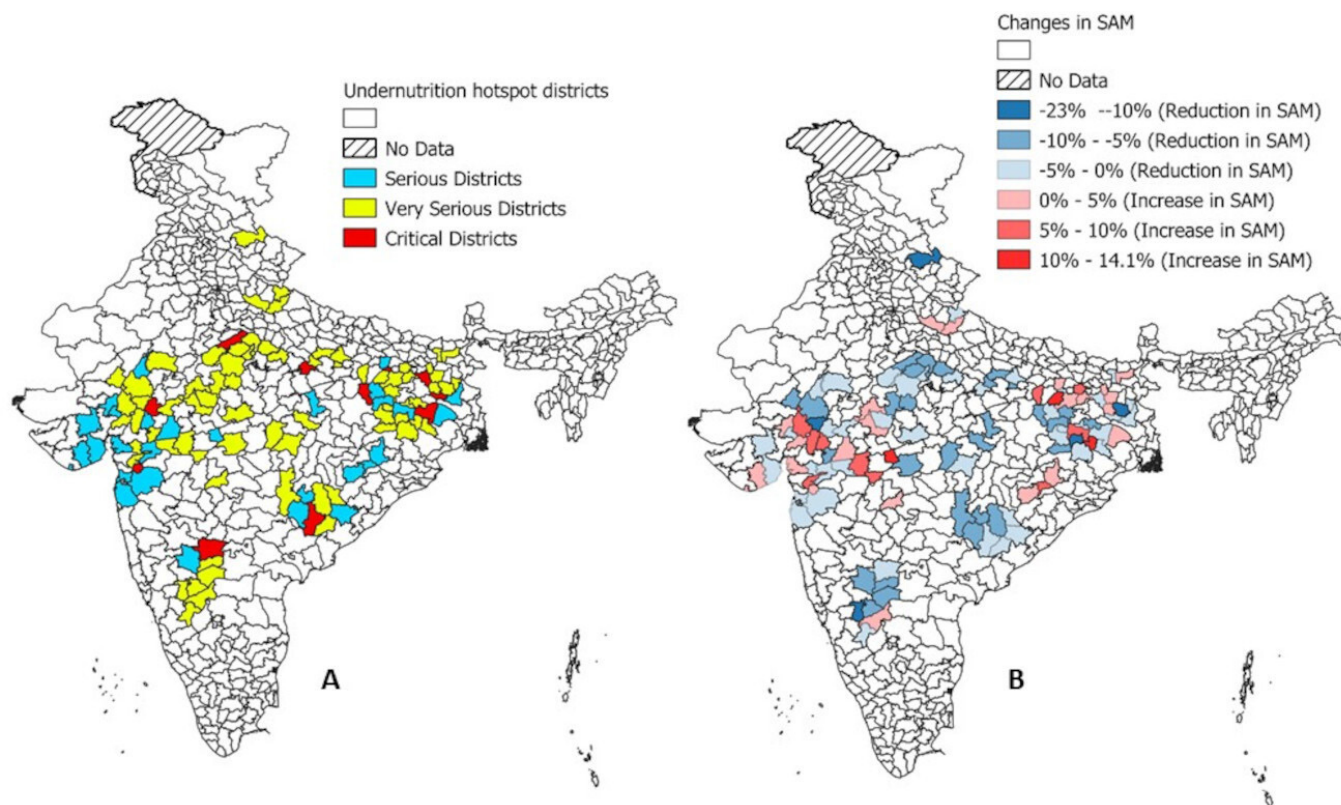
based on district-level mean prevalence and SD. Additionally, we examined the prevalence trend in SAM in the 111 undernutrition hotspot districts identified using the Composite Index of Anthropometric Failures (CIAF) based on the NFHS-4 data.<sup>10</sup> Finally, the district level data set for SAM prevalence from NFHS-4 and NFHS-5 survey was linked with India spatial database with district boundaries in Quantum Geographic Information System (QGIS) open source software. Using this data set, we constructed choropleth maps to visualise the district level variations in SAM in NFHS-4 (figure 1A), in NFHS-5 (figure 1B) and the changes in SAM between NFHS-4 and NFHS-5 (figure 1C), and to highlight the districts in the undernutrition hotspots that have reported further worsening of SAM (see figure 2A,B).

### INCREASING SAM TREND IN SOME HIGH-PREVALENCE DISTRICTS

Among the 707 districts from 36 states and UTs, 341 districts reported at least some increase, and 9 districts reported no changes in SAM prevalence between the two surveys. The mean district-level prevalence of SAM reported in NFHS-5 was 7.56% (SD=3.97). Districts with one SD higher from mean prevalence was categorised as high prevalence districts (11.5%–15.5%), two SD higher from mean prevalence was categorised as very high prevalence districts (15.5%–19.5%) and three SD higher from mean prevalence was categorised as critical districts (>19%) that need urgent policy attention on an urgent priority (table 1). We identified a total of 112 districts as critical ( $n=7$ ), very serious ( $n=19$ ) and serious ( $n=86$ ) districts which require priority policy attention. The critical districts include Dang (22.2%) and Panchmahal (19.7%) from Gujarat, and Chandrapur (21.8%), Nagpur (20%) from Maharashtra, Karimganj (30.5%) in Assam, Sheohar (21.4%) in Bihar and Saraikeela (23%) Kharsawan in Jharkhand (see online supplemental



**Figure 1** (A) Prevalence of SAM based on NFHS-4, (B) prevalence of SAM based on NFHS-5, (C) changes in SAM between NFHS-4 and NFHS-5. NFHS, National Family Health Survey; SAM, severe acute malnutrition.



**Figure 2** (A) District level undernutrition hotspot based on the high prevalence of simultaneous two and three anthropometric failures (NFHS-4) (source:<sup>10</sup>). (B) Changes in SAM prevalence in undernutrition hotspots (NFHS-5). NFHS, National Family Health Survey; SAM, severe acute malnutrition.

table A). Nineteen districts were in a very high prevalence category. These districts include Kaimur (15.9%), Aurangabad (18.5%), Rohtas (11.3%) in Bihar; Tapi (9.6%–17.1%), Sabarkantha (7%–16.6%) and Devbhumi Dwarka (17.2%) in Gujarat; Ranchi (16.8%), Purbi Singhbhum (16.8%) and Khunti (16.8%) from Jharkhand; Kamareddy (17.9%) and Peddapalli (15.6%) from Telangana. The remaining eight districts in this category are Uttar Bastar Kanker (15.7%) in Chhattisgarh, Shopian (17.4%) in Jammu and Kashmir, Dakshin Kannada (15.7%) in

Karnataka, Harda (18.8%) in Madhya Pradesh, Dhule (18.1%) in Maharashtra, North Tripura (18.1%), Sonbhadra (17.4%) in Uttar Pradesh and Kolkata (16.9%) in West Bengal (see online supplemental table B). Among the 86 districts in the serious category, there were 13 districts each from the state of Maharashtra and Uttar Pradesh; 9 districts from Gujarat; 6 districts each from Telangana, Jammu and Kashmir and Karnataka; 5 districts each from Bihar, Assam and Rajasthan; 4 districts from Odisha; 3 districts from Madhya Pradesh; 2 districts each from Jharkhand, West Bengal and Arunachal Pradesh; and 1 district each from Chhattisgarh, Nagaland, Sikkim, Delhi and Tamil Nadu (see online supplemental table C). Overall, the highest number of districts that need urgent policy attention are from the state of Maharashtra (16 districts), Gujarat and Uttar Pradesh (14 districts each) and Bihar (9 districts).

Among the 341 districts that recorded an increasing trend in SAM between NFHS-4 and NFHS-5, 115 districts recorded a manifold increase of SAM. However, despite a rapid increase in SAM in 65 districts, given a low prevalence recorded in NFHS-4, the alarming nature of the increase was masked by the fact that they still appear in medium prevalence category. Whereas 50 districts moved from the medium or low prevalence category in NFHS-4 to serious or very serious or critical category in NHFS-5. Among

**Table 1** Descriptive statistics of severe acute malnutrition for 707 Indian districts

|                                | NFHS-5 (2019–2021) | NFHS-4 (2015–2016) |
|--------------------------------|--------------------|--------------------|
| District level mean prevalence | 7.56               | 7.6                |
| SD                             | 3.97               | 4.1                |
| Minimum                        | 1                  | 0                  |
| Maximum                        | 30.5               | 27                 |
| Low prevalence                 | <3.6               | <3.5               |
| Medium prevalence              | 3.6–11.5           | 3.5–11.7           |
| High prevalence                | 11.5–15.5          | 11.7–15.8          |
| Very high prevalence           | 15.5–19.5          | 15.8–19.9          |
| Critical                       | 19.5>              | 19.9>              |

NFHS, National Family Health Survey; SD, Standard Deviation.

these districts highest increase between NFHS-4 and NFHS-5 survey was recorded in the district of Karimganj in Assam (6.1%–30.5%); Sheohar in Bihar (4.3%–21.4%); Saraikela Kharsawan in Jharkhand (8.9%–23%); North Tripura district in Tripura (4.3%–18.1%); Kupwara (1%–14.7%) and Shopian (3.8%–17.4%) in Jammu and Kashmir. Additionally, 17 districts recorded more than 10% of the increase in SAM between NFHS-4 and NFHS-5. These districts are from Uttar Pradesh (n=4), two districts each from Bihar, Jammu and Kashmir, Karnataka, Maharashtra and Telangana, and one district each from Gujarat, Madhya Pradesh and West Bengal. In contrast, 21 districts reported more than a 10% reduction in SAM during the same period. Among these districts largest reduction was reported in Gadag (27.5%–4.5) in Karnataka; Tehri Garhwal (28.1%–5.2%) and Uttarkashi (23.6%–5.4%) in Uttarakhand; Southwest Garo Hills (23.7%–7.1%) in Meghalaya and Lucknow (17.9%–1.4%) in Uttar Pradesh. The remaining 16 districts, there were 2 districts each from the state of Gujarat, Hariyana, Jharkhand and Tamil Nadu; and 1 district each from the state of Arunachal Pradesh, Madhya Pradesh, Meghalaya, Punjab, Rajasthan, Uttar Pradesh and Uttarakhand and from the UT of Andaman and Nicobar Islands (see figure 1C).

In this section we outlined the changes in SAM prevalence in districts identified as hotspots for malnutrition based on a comprehensive analysis using the CIAF by Kochupurackal *et al.*<sup>10</sup> Kochupurackal *et al* identified 111 districts clustered in four malnutrition hotspots in India that requires urgent policy intervention. Out of 111 districts across these hotspots, 11 were critical, 72 were very serious and 28 were serious (see figure 1A). These hotspots have been shown to have co-occurring anthropometric failures using the CIAF. Children with simultaneous three or two nutritional failures have an elevated risk of mortality and morbidity compared with single nutritional failures.<sup>11</sup> In terms of prioritising districts, those with a high proportion of children with simultaneous two/three anthropometric failures ought to be prioritised.

The district level data for NFHS-5 shows that, 35 districts out of 111 undernutrition hotspot districts reported further worsening of SAM. Among these districts, nine each from Gujarat (Dangs, Panchmahal, Tapi, Sabarkantha, Dohad, Kheda, Amreli, Baruch and Mahesana), and Bihar (Aurangabad, Kaimur, Bhojpur, Nalanda, Banka, Gaya, Munger, Nawada and Purnia), five from Madhya Pradesh (Harda, Burhanpur, West Nimar, Shajapur and Dhar); three each from Jharkhand (Sarakela Kharsawan, Ranchi and Deoghar) and Odisha (Subarnapur, Balangir and Sambalpur); two districts from Uttar Pradesh (Shahjahanpur and Budaun). The remaining four districts are from Karnataka (Bellary), Maharashtra (Washim), Rajasthan (Jhalawar) and West Bengal (Bankura). Bellary district in Karnataka is the only district from south India to appear in this category.

Both SAM and multidimensional nutritional failures are known to have the highest risk of child mortality and morbidity unless adequately treated. The possible coexistence of these two conditions in these districts indicates an alarming situation.

### SYSTEMIC AND PROGRAMMATIC GAPS IN SAM DETECTION AND TREATMENT

Aggregate and actionable programmatic data from the current nutritional programme to identify children suffering from SAM and providing treatment is a major lacuna in the current nutritional programme in India. Integrated Child Development Services—Common Application Software (ICDS-CAS) was created to digitise the records and create a real-time monitoring system for the beneficiaries under the National Nutrition Mission (*POSHAN Abhiyaan*). However, until 2019, out of the 1 027 058 *Anganwadi* centres (AWCs) (preschool childcare and nutritional centres across India), only 611 369 *Anganwadi* workers (AWW) were equipped with ICDS-CAS.<sup>12</sup> Based on the data collected through ICDS-CAS by AWWs, only 7.07% of children in India recorded wasting, which is a much lower prevalence of wasting compared with NFHS-5 fact sheets, indicating under-reporting in programmatic data. Studies conducted in several parts of the country reported such under-reporting of SAM due to inadequate capacity-building of AWWs and the supply of growth monitoring devices. Adding to this, administrative pressure from higher authorities forces AWWs to under-report the prevalence of SAM, fearing retribution due to reputational harm to the district rather than support for dealing with SAM children.<sup>13–15</sup> Based on the NFHS-4 (2015–2016), children from Scheduled Tribal communities or the poorest wealth quintiles with a higher risk of SAM are less likely to access *Anganwadi* services.<sup>16–19</sup> Hence, these groups may go unnoticed if they are in SAM. Therefore, in addition to the geographical clustering of SAM, an unfair clustering of SAM prevalence occurs among the socially marginalised communities. An estimated 800 000 children with SAM needed treatment in Nutrition Rehabilitation Centres (NRCs). However, the recent data suggests that only 20% of children could be covered, possibly due to poor functioning of facility-based NRCs and high drop-out rate.<sup>12 20–23</sup>

### URGENT POLICY AND PROGRAMME ACTION

With the current increase in the prevalence of SAM, urgent policy action for effective identification and treatment of children suffering from SAM is crucial to prevent child mortality and foster nutritional equity. The systemic gap in identifying SAM children calls for more comprehensive policy action to strengthen community-level screening. AWCs are the prominent institutions at the village level to identify the SAM; improving the efficiency of AWCs can be a critical step in identifying the current gap. Capacity building of AWWs, a crucial component of *POSHAN Abhiyaan*, needs to include a specific focus

on the appropriate use of growth monitoring devices. Continued training and supervision on the proper use of growth monitoring devices among the AWWs have been shown to identify SAM.<sup>14 15 24</sup> However, beyond the individual capacity of AWWs, studies have shown multiple levels of factors beyond their individual capacity that hampered the Anganwadi programme's effectiveness, especially in poor-performing states. These include inadequate financing and infrastructure, prejudicial caste-based social relationships, seasonal labour migration, governance failures, inadequate/delayed salaries, punitive supervision and high workload.<sup>18 19 25</sup> Hence, it is imperative to strengthen the AWC through capacity-building programmes for AWWs to accurate anthropometric measurement, provide supportive supervision with sufficient logistic support and increase financial incentives corresponding to their work burden.

Given the current burden of children with SAM and the available NRCs in India, operationally, it is not feasible to treat all the SAM children in NRCs. Considering the relatively lower mortality and morbidity rate among the SAM children in India compared with African countries, mainstreaming of community-based management of acute malnutrition (CMAM) for the management of uncomplicated SAM has been suggested.<sup>26 27</sup> CMAM requires additional provisioning in the existing subcentres and primary healthcare centres to provide facility-based treatment to children with medically complicated SAM at the community, and children with uncomplicated SAM to be monitored every week and treated using ready to use therapeutic food and other nutrient-dense food at home.<sup>28</sup> Several models of CMAM interventions in Bihar, Madhya Pradesh, Odisha, Chhattisgarh and Rajasthan reported having increased the timely treatment coverage in a more cost-effective way.<sup>29</sup> A systematic review conducted on the effectiveness of CMAM concluded that CMAM for uncomplicated SAM is as effective as WHO recommended standard treatment using F-100.<sup>26</sup> Finally, a more lasting solution to SAM requires addressing socio-economic and gender inequality that limits the parental and household capacity to provide a nurturing environment and caring for children belonging to poor and marginalised children in India.<sup>8</sup>

### COVID-19 CRISIS AND WORSENING MALNUTRITION

The data represented in NFHS-5 is primarily collected before the COVID-19 pandemic. Hence, the nutritional trend in the majority of the districts revealed in NFHS-5 is the status before the COVID-19 pandemic lockdown was declared on 11 March 2020.<sup>30</sup> It is likely that the COVID-19 pandemic and the measures to control it have further amplified the existing nutritional crisis. The unemployment rate in India was the highest in 2019 over the past 45 years,<sup>31</sup> which could have worsened during the COVID-19 lockdown.<sup>32</sup> The migrant labourers in the unorganised sectors, street vendors, daily wage labourers and farmers already in a precarious situation were hard

hit by the COVID-19 lockdown.<sup>33 34</sup> This worsening economic crisis among the poor can cause reduced food expenditure and household food insecurity, further compromising India's already worsening nutritional crisis. Adding to this was the disruption in the food and nutritional services in the country. Systemic gaps in addressing malnutrition that were already present even before the COVID-19 pandemic was further amplified during this period. The school mid-day meal programme in India is a protection against household food insecurity among poor households.<sup>35</sup> The current disruption in Integrated Child Development Scheme (ICDS) and the school mid-day meal programme adds to household food insecurity.<sup>36</sup> They can further worsen the child nutritional crisis in India. Amid all the indications showing worsening child undernutrition, there was a report on a steep decline in the number of children referred to NRC following the COVID-19 lockdown on 25 March 2020, which too is probably not due to nutritional improvements but due to lockdown adversities.<sup>37</sup>

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**Contributors** SKU was involved in conceptualisation, data curation, methodology, formal analysis, visualisation, preparation of original draft and finalised the manuscript of the study. AW was involved in data curation, methodology, formal analysis, visualisation, preparation of original draft, reviewing, and editing. DC was involved in conceptualisation, preparation of the original draft, formal analysis, reviewing, editing and validating data. BS was involved in conceptualisation, methodology, visualisation, reviewing, editing and supervision. NSP was involved in conceptualisation, methodology, visualisation of data, reviewing, editing and overall supervision in review and writing.

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