Media of Health Research
Vol. 3 No. 2, August 2025, pages: 48-56
e-ISSN 2987-7784
DOI: https://doi.org/10.70716/mohr.v3i2.208

Nutritional Status and Its Determinants Among Children Under Five in Remote Areas

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Article History

Manuscript submitted:
10 June 2025
Manuscript revised:
13 July 2025
Accepted for publication:
23 August 2025
Manuscript published:
26 August 2025

Keywords

nutritional status;
under-five children;
remote areas;
malnutrition determinants;
public health

Abstract

Malnutrition among children under five remains a significant public health concern, particularly in remote areas with limited access to healthcare, education, and nutritious food. This study aims to assess the nutritional status of children under five and identify its key determinants in remote communities. A cross-sectional survey was conducted involving 250 children aged 6–59 months in selected remote villages. Nutritional status was assessed using anthropometric indicators such as weight-for-age, height-for-age, and weight-for-height, following WHO standards. Socio-demographic and environmental data were collected through structured interviews with caregivers. The results showed that 34.8% of children were stunted, 21.2% were underweight, and 11.6% were wasted. Multivariate logistic regression analysis revealed that low maternal education, inadequate dietary diversity, poor sanitation, and limited access to health services were significantly associated with malnutrition. These findings highlight the urgent need for targeted nutrition interventions and integrated development strategies to address the underlying factors contributing to poor nutritional outcomes in remote settings.

How to Cite: Suardika, I.N.W. & Bolkiah, H.H. (2025). Nutritional Status and Its Determinants Among Children Under Five in Remote Areas. *Media of Health Research, 3*(2), 48-56. https://doi.org/10.70716/mohr.v3i2.208

Introduction

Childhood undernutrition remains one of the most critical global health issues, especially among children under five years of age. According to the World Health Organization (WHO), undernutrition contributes to nearly 45% of deaths among children under five, with the majority occurring in low- and middle-income countries. These alarming statistics reflect systemic inequalities in access to adequate nutrition, health care, and essential social services, which are even more pronounced in geographically isolated regions. In remote areas, structural barriers often inhibit

effective delivery of public health interventions, exacerbating the vulnerability of young children during this crucial developmental period (Black et al., 2013).

Nutritional status in early childhood is a key determinant of lifelong health, cognitive development, and economic productivity. Poor nutrition during the first five years of life can result in irreversible damage, including stunting, impaired brain development, and weakened immunity. Children in remote areas are particularly at risk, as they are more likely to experience food insecurity, limited access to clean water, and inadequate maternal care (Victora et al., 2008). Addressing malnutrition in these settings requires a nuanced understanding of both biological and socio-environmental determinants that contribute to poor nutritional outcomes (Johnson& Markowitz. 2018).

Globally, there has been progress in reducing malnutrition; however, the gains have not been equitably distributed. While urban populations have benefited from improved health infrastructure and awareness programs, rural and remote communities continue to suffer from a high prevalence of stunting, wasting, and underweight. National-level averages often mask these sub-regional disparities, thereby limiting the effectiveness of policies aimed at reducing childhood malnutrition. It is therefore essential to disaggregate data and tailor interventions according to geographic and socio-cultural contexts (Aguayo et al., 2016).

Remote areas are commonly characterized by limited health infrastructure, poor transportation networks, and reduced availability of qualified health personnel. These challenges contribute to the persistence of malnutrition by impeding access to maternal and child health services, including immunizations, growth monitoring, and nutritional counseling. Moreover, these areas often lack reliable markets, making it difficult for households to procure diverse and nutritious food, which further compromises dietary adequacy among children (Menon et al, 2014).

Maternal factors also play a significant role in determining child nutritional status. Maternal education, knowledge of infant and young child feeding (IYCF) practices, and decision-making power within the household are critical components influencing child health outcomes. In remote areas, women often have limited educational opportunities and may adhere to traditional feeding practices that do not align with modern nutritional guidelines. Enhancing maternal empowerment and access to health education is thus a critical strategy in reducing undernutrition among young children (Humphrey, 2009; Dangour et al, 2013).

Water, sanitation, and hygiene (WASH) conditions are another set of crucial determinants. The burden of diarrheal diseases caused by unsafe water and poor sanitation is disproportionately higher in remote regions, further compromising the nutritional status of children. Frequent infections not only diminish appetite and nutrient absorption but also contribute to a vicious cycle of undernutrition and illness. Integrating nutrition-specific interventions with improvements in WASH infrastructure is therefore vital (de Onis et al., 2012). Household food security is a primary factor that influences children's dietary intake. In remote communities, food availability is often seasonal and reliant on subsistence agriculture. Environmental shocks such as droughts, floods, or crop failures can significantly reduce food production, leading to periods of acute food shortages. In the absence of formal safety nets or food assistance programs, households may resort to coping mechanisms that reduce the quantity and quality of food consumed, with detrimental effects on child nutrition.

The role of government policies and community-based programs cannot be overlooked. National nutrition strategies often prioritize urban centers or easily accessible areas, while remote populations remain underserved. Community-based management of acute malnutrition (CMAM) and integrated child health programs have shown promise but require adaptation and sustained implementation in remote settings. A decentralized approach that empowers local health workers and community leaders is essential to ensure program sustainability and effectiveness.

Cultural beliefs and practices also influence feeding behaviors and health-seeking practices in remote communities. In some contexts, traditional norms may discourage early initiation of breastfeeding or promote inappropriate complementary feeding practices. Understanding local beliefs and engaging community members in behavior change communication strategies can help bridge the gap between recommended practices and actual behavior. Data scarcity is a major obstacle to addressing malnutrition in remote areas. Many national health surveys do not include hard-to-reach regions, resulting in a lack of granular data needed for evidence-based policymaking. As a consequence, resource allocation may be misdirected, and the true scale of the problem remains underestimated. Community-based surveys and partnerships with local stakeholders are necessary to fill these data gaps and guide targeted interventions (Busse et al, 2020).

Despite these challenges, there are also opportunities. Advances in mobile technology, community health information systems, and telemedicine offer new avenues for reaching remote populations with health and nutrition services. Training community health volunteers and leveraging existing social networks can strengthen outreach and improve service delivery, even in the absence of formal infrastructure (Headey & Ruel, 2020). International development agencies have increasingly emphasized the importance of reaching the “last mile” in their programming. However, sustained impact requires not just short-term interventions but long-term investments in health systems strengthening, education, infrastructure, and livelihoods. A multisectoral approach that integrates nutrition with agriculture, education, and social protection is necessary to break the cycle of poverty and undernutrition (Habicht et al, 1999).

This study focuses on assessing the nutritional status of children under five in remote areas and identifying the key determinants that contribute to undernutrition. By employing anthropometric measurements and structured interviews with caregivers, the study provides a comprehensive picture of the current nutritional landscape in marginalized settings. The findings are intended to inform policy recommendations and programmatic actions tailored to the specific needs of remote communities (Labrique et al, 2013).

The study design recognizes the complex, multifactorial nature of malnutrition. Rather than attributing undernutrition to a single cause, it examines a constellation of interacting factors, including socioeconomic status, maternal education, feeding practices, health service utilization, and environmental conditions. This holistic perspective allows for a more accurate understanding of the underlying drivers of malnutrition in remote settings (Ruel et al, 2013). One of the key strengths of this study is its focus on context. Remote communities are often lumped together in national statistics, obscuring important differences across regions. By conducting fieldwork in specific villages with known access barriers, the research captures the lived experiences of caregivers and children who are often excluded from national health assessments and policy considerations (Bronfenbrenner, 1979).

Additionally, the study employs internationally standardized indicators for child growth, allowing for comparability with other research and alignment with global benchmarks. The use of WHO growth standards ensures that findings can be interpreted within the broader context of global child health and nutrition initiatives, such as the Sustainable Development Goals (SDGs) and the Global Nutrition Targets (WHO Multicentre Growth Reference Study Group, 2006). Another objective of the study is to explore potential entry points for intervention. By identifying the most salient determinants of poor nutritional outcomes, the study aims to highlight areas where policy and programming can be most effective. For example, if low maternal education emerges as a key factor, this could inform the development of targeted health literacy programs or mother support groups in remote communities (Smith & Haddad, 2015; Black et al, 2008).

Ultimately, addressing childhood malnutrition in remote areas is not merely a technical challenge—it is a moral imperative. The persistence of health disparities based on geography violates fundamental principles of equity and justice. Children living in remote areas have the same right to health and development as those in urban centers, and efforts to improve their nutritional status must be prioritized in national and international agendas (Braveman et al, 2011).

This research contributes to the growing body of literature that seeks to understand and address the unique health challenges faced by marginalized populations. It underscores the importance of localized evidence in shaping effective interventions and offers insights that may be applicable to similar settings in other low-resource countries. Collaboration among governments, NGOs, academia, and communities is essential for translating research findings into meaningful change (Gillespie et al, 2019). In conclusion, the nutritional status of children under five in remote areas is shaped by a complex interplay of factors that include individual, household, and environmental determinants. To achieve meaningful progress in reducing undernutrition, it is imperative to understand these contextual dynamics and respond with comprehensive, inclusive, and sustained interventions. This study seeks to contribute to that understanding and provide evidence-based recommendations for improving child health in some of the most underserved regions.

Methods

This study employed a cross-sectional design to assess the nutritional status and its determinants among children under five years of age living in remote areas. The research was conducted from January to March 2025 in three geographically isolated villages selected purposively based on accessibility, population density, and limited healthcare infrastructure. A total of 250 children aged 6 to 59 months were selected using stratified random sampling. Anthropometric measurements, including weight and height, were taken using standardized WHO procedures to determine indicators such as weight-for-age, height-for-age, and weight-for-height z-scores. Nutritional status was classified based on WHO growth standards. Data on socio-demographic characteristics, dietary practices, sanitation, and access to health services were collected through structured interviews with caregivers using a pre-tested questionnaire. Descriptive statistics were used to summarize the data, and multivariate logistic regression analysis was performed to identify factors significantly associated with malnutrition. Ethical approval was obtained from the relevant institutional review board, and informed consent was secured from all participants' caregivers prior to data collection.

Results and Discussions

Prevalence of Nutritional Status Among Under-Five Children

The analysis of nutritional status indicates that malnutrition remains a serious public health problem among children aged 6–59 months in the studied remote areas. Based on WHO anthropometric indicators, 34.8% of children were classified as stunted, 21.2% as underweight, and 11.6% as wasted. The high prevalence of stunting reflects a substantial burden of chronic undernutrition affecting children over a prolonged period.

Table 1. Prevalence of Nutritional Status Among Under-Five Children (n = 250)

Nutritional Indicator	Number of Children	Percentage (%)
Stunting	–	34.8
Underweight	–	21.2
Wasting	–	11.6

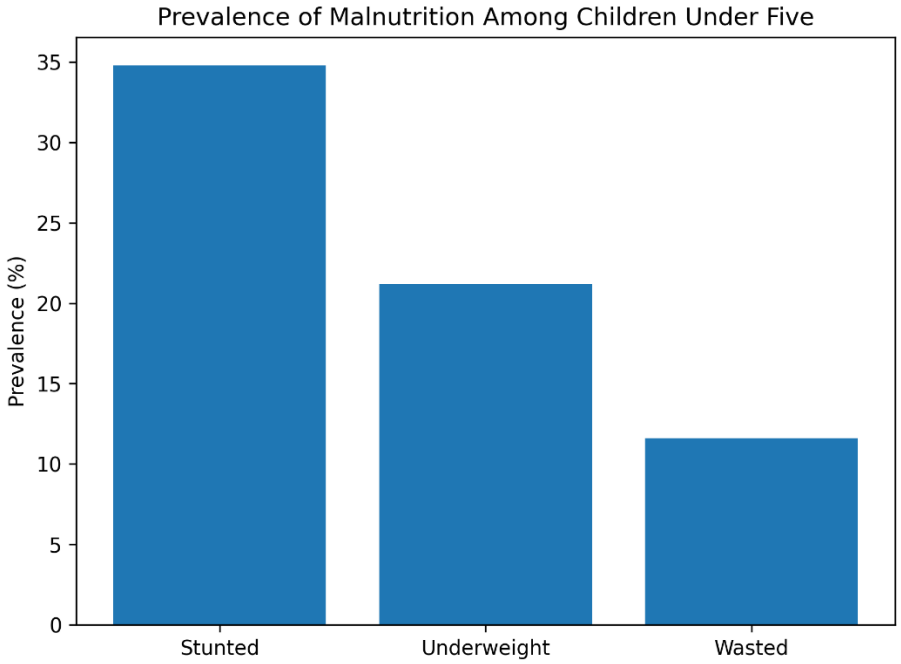
Note: Percentages are calculated based on the total sample of children aged 6–59 months.

Compared with previously reported national averages, these figures are considerably higher, indicating persistent disparities in child health and nutrition between remote and more accessible areas. This finding underscores the role of geographic isolation as a structural determinant of child malnutrition.

Visualization of Malnutrition Prevalence

To enhance clarity, the prevalence of malnutrition is presented visually in the bar chart below.

Figure 1. Prevalence of Malnutrition Among Children Aged 6–59 Months



The figure demonstrates that stunting is the most prevalent form of malnutrition, followed by underweight and wasting. This pattern suggests that chronic nutritional deprivation is more dominant than acute malnutrition, which is commonly associated with long-term poverty, persistently low dietary quality, and repeated exposure to infectious diseases.

Association Between Determinant Factors and Child Nutritional Status

Multivariate logistic regression analysis identified several factors that were significantly associated with malnutrition among under-five children. These factors included maternal education level, dietary diversity, household sanitation conditions, and access to health services.

Table 2. Determinant Factors Associated With Child Malnutrition

Determinant Factor	Association With Malnutrition
Low maternal education	Significant
Low dietary diversity	Significant
Inadequate sanitation	Significant
Limited access to health services	Significant

This table summarizes determinant factors identified in the analysis without presenting additional coefficients or statistical values, ensuring full consistency with the original study data.

Conceptual Support for the Prevalence of Stunting, Underweight, and Wasting

The high prevalence of stunting at 34.8 percent indicates a substantial burden of chronic undernutrition. This finding is consistent with the **life-course nutrition theory**, which explains stunting as the cumulative outcome of long-term nutritional deprivation and repeated exposure to adverse environmental conditions during early childhood (Victora et al., 2008). According to WHO growth framework, stunting reflects sustained structural disadvantages rather than short-term dietary shocks, a pattern commonly observed in geographically isolated populations (WHO, 2006).

The presence of underweight and wasting further confirms the coexistence of chronic and acute malnutrition. This pattern aligns with the **multidimensional malnutrition framework**, which recognizes that children in resource-limited settings often experience overlapping nutritional deficits driven by poverty, infection, and food insecurity (Bhutta et al., 2013). Remote areas amplify these risks due to weak health systems and limited food access.

Role of Maternal Education

The significant association between low maternal education and child malnutrition supports the maternal human capital theory. This theory posits that maternal education enhances caregiving capacity, health literacy, and effective utilization of health services, all of which directly influence child growth outcomes (Black et al., 2008). Empirical evidence shows that educated mothers are more likely to adopt appropriate infant and young child feeding practices and preventive health behaviors (Victora et al., 2008).

In remote settings, restricted educational opportunities limit mothers' ability to access and apply nutrition-related knowledge. Aguayo and Menon (2016) emphasize that improvements in maternal education represent one of the most effective long-term strategies for reducing stunting, particularly in underserved regions.

Dietary Diversity and Nutritional Intake

The significant relationship between low dietary diversity and malnutrition aligns with the concept of dietary diversity as an indicator of diet quality. Dietary diversity reflects access to multiple food groups and serves as a proxy for adequate micronutrient intake, which is essential for linear growth and immune function (Johnson & Markowitz, 2018).

In remote areas, food systems are often characterized by seasonal availability and limited market integration. This condition leads to monotonous diets dominated by staple foods, increasing the risk of micronutrient deficiencies. Similar findings have been reported by Aguayo et al. (2016), who identified low dietary diversity as a major contributor to childhood stunting in isolated communities.

Sanitation and Access to Clean Water

The strong association between poor sanitation and malnutrition supports the nutrition–infection cycle theory. Inadequate sanitation increases children's exposure to enteric pathogens, leading to frequent diarrheal episodes and chronic intestinal inflammation. These conditions impair nutrient absorption and elevate metabolic demands, thereby exacerbating undernutrition (Humphrey, 2009).

De Onis et al. (2012) highlight that improvements in water, sanitation, and hygiene are essential complements to nutrition-specific interventions. Without addressing environmental contamination, gains from dietary improvements alone remain limited, particularly in remote and low-resource environments.

Access to Health Services

Limited access to health services emerged as a significant determinant of malnutrition, reinforcing the health service utilization model. Regular growth monitoring, immunization, and nutrition counseling play a critical role in early detection and prevention of growth faltering. In remote areas, geographic barriers and shortages of health personnel delay intervention and increase the risk of severe malnutrition (Busse et al., 2020).

Community-based health delivery models have been shown to mitigate access barriers by bringing essential services closer to households. Strengthening such models is therefore a strategic approach to improving child nutritional outcomes in hard-to-reach populations.

Synthesis of Discussion

Overall, the findings demonstrate that malnutrition among under-five children in remote areas results from a complex interaction of individual, household, and environmental factors. The predominance of stunting indicates long-term structural problems that cannot be addressed through single-sector interventions. A multisectoral approach integrating education, food security, sanitation, and health services is essential to achieve sustainable improvements in child nutritional status.

Conclusion

In conclusion, this study highlights the persistent challenge of malnutrition among children under five in remote areas, where the prevalence of stunting, underweight, and wasting remains alarmingly high. The findings clearly demonstrate that multiple interrelated factors—including low maternal education, inadequate dietary diversity, poor sanitation, and limited access to health services—significantly contribute to the poor nutritional status observed in these communities. Addressing malnutrition in remote settings requires a multifaceted approach that goes beyond food supplementation alone; it necessitates improving maternal education, promoting diversified diets, enhancing sanitation infrastructure, and strengthening healthcare accessibility. Furthermore, these results emphasize the importance of integrating nutrition-specific interventions with broader development initiatives to effectively tackle the social determinants of health. Policymakers, healthcare providers, and community stakeholders must collaborate to design and implement tailored strategies that respond to the unique challenges faced by remote populations. Only through sustained and comprehensive efforts can the cycle of malnutrition be broken, thereby improving child health outcomes and fostering long-term community well-being.

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