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Community Nutrition Approaches for Addressing the Double Burden of Malnutrition among Children in India: Evidence from a Cross-Sectional Study

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Abstract

Background: India continues to face the double burden of malnutrition (DBM), characterized by the coexistence of undernutrition and overweight/obesity among children. Community nutrition interventions have emerged as effective strategies to address both forms of malnutrition through integrated health promotion, dietary diversification, and nutrition education.
Objective: To assess the effectiveness of community-based nutrition approaches in addressing the double burden of malnutrition among children residing in selected rural and urban communities of North and South 24 Parganas, West Bengal, India.
Materials and Methods: A cross-sectional study was conducted among 300 children aged 5–12 years from selected rural and urban communities. Data on anthropometric measurements, dietary intake, socioeconomic characteristics, and participation in community nutrition programs were collected using structured questionnaires and standard WHO anthropometric procedures. Descriptive statistics, chi-square tests, and logistic regression analyses were performed. Means were presented with standard errors (SE). Statistical significance was considered at $p < 0.05$.
Results: The prevalence of underweight, stunting, wasting, overweight, and obesity was 24.3%, 27.7%, 13.7%, 11.0%, and 3.3%, respectively. Children participating in community nutrition interventions showed significantly better dietary diversity scores (6.2 ± 0.18) compared with non-participants (4.9 ± 0.20). Participation was associated with lower odds of undernutrition (AOR = 0.61; 95% CI: 0.42–0.89) and overweight (AOR = 0.69; 95% CI: 0.45–0.96).
Conclusion: Community nutrition approaches significantly improve dietary diversity and nutritional status among children. Strengthening integrated community-based nutrition programs can reduce both undernutrition and overnutrition, contributing to improved child health in India.

1. Introduction

Malnutrition remains one of the most significant public health challenges globally (Müller and Krawinkel, 2005). India experiences a unique nutritional transition where undernutrition coexists with overweight and obesity among children, commonly referred to as the double burden of malnutrition (DBM) (Wells et al., 2020). This phenomenon results from rapid urbanization, dietary transition, reduced physical activity, and socioeconomic inequalities.

Undernutrition contributes to impaired physical growth, poor cognitive development, weakened immunity, and increased susceptibility to infections (Carvalho et al., 2025). Conversely, childhood overweight and obesity increase the risk of diabetes, hypertension, cardiovascular diseases, and metabolic syndrome later in life (Putri et al., 2026).

Community nutrition programs play an important role in improving child nutrition through nutrition education, growth monitoring, food supplementation, promotion of dietary diversity, school nutrition initiatives, kitchen gardens, and behaviour change communication (Marine et al., 2026). Government initiatives such as the Integrated Child Development Services (ICDS), POSHAN Abhiyaan, and Mid-Day Meal Scheme have strengthened community-based nutrition interventions (Nahata et al., 2025).

However, evidence regarding the effectiveness of integrated community nutrition approaches in addressing both undernutrition and overnutrition simultaneously remains limited. Therefore, this study aimed to assess the effectiveness of community nutrition approaches in combating the double burden of malnutrition among children in India.

2. Materials and Methods

2.1 Study Design

A community-based cross-sectional study was conducted to assess the selected health, nutritional, and/or lifestyle-related characteristics of the target population at a specific point in time. This study design was chosen because it enables the simultaneous collection of information on exposures and outcomes within a defined population and facilitates the estimation of the prevalence and distribution of the variables under investigation. Data were collected from eligible participants residing in the selected community using a structured and pre-tested questionnaire following predefined inclusion and exclusion criteria. The cross-sectional approach provided an efficient framework for examining associations between sociodemographic, dietary, lifestyle, and health-related factors within the study population.

2.2 Study Area

The study was conducted in selected rural and urban communities of the **North and South 24 Parganas districts of West Bengal, India**. These areas were selected to ensure representation of populations from both rural and urban settings with diverse socioeconomic, demographic, dietary, and lifestyle characteristics. Participants were recruited from selected communities within

these districts according to the predefined eligibility criteria. Inclusion of both rural and urban populations provided an opportunity to obtain a broader and more representative understanding of the study variables across different community settings in West Bengal.

2.3 Study Population

The study population comprised **children aged 5–12 years** residing in the selected rural and urban communities of the North and South 24 Parganas districts of West Bengal, India. Children within the specified age group who had been residing in the selected communities during the study period and fulfilled the predefined eligibility criteria were considered for participation. Information related to the children's sociodemographic characteristics, dietary practices, nutritional status, lifestyle patterns, and other relevant study variables was collected with the assistance and consent of their parents or legal guardians, wherever applicable.

2.4 Sample Size and Sampling Technique:

A total of **300 children aged 5–12 years** were included in the study. Participants were selected from the identified rural and urban communities of the North and South 24 Parganas districts of West Bengal, India, using a **multistage random sampling technique**. At successive stages, study areas and eligible participants were selected through random sampling procedures to obtain adequate representation from both rural and urban settings. Children who fulfilled the predefined inclusion criteria were enrolled until the required sample size of 300 participants was achieved.

2.5 Inclusion Criteria

Children were eligible to participate in the study if they were **between 5 and 12 years of age** and had been residing in the selected rural or urban community for **at least one year** prior to data collection. This residency criterion was applied to ensure that the participants had sufficient exposure to the local socioeconomic, dietary, environmental, and lifestyle conditions. Only children whose **parents or legal guardians provided written informed consent** for participation were included in the study. Where appropriate, age-appropriate assent from the children was also obtained before data collection.

2.6 Exclusion Criteria

Children were excluded from the study if they had any **severe chronic illness** that could substantially influence their growth, nutritional status, dietary intake, or general health. Children with **congenital abnormalities or developmental conditions known to affect normal**

growth and physical development were also excluded to minimize potential confounding of anthropometric and nutritional assessments. In addition, participants with **incomplete or missing data** for key study variables, including sociodemographic, dietary, clinical, or anthropometric information, were excluded from the final statistical analysis to maintain the completeness and reliability of the study findings.

2.7 Data Collection

Data were collected through face-to-face interviews using a **structured and pre-tested questionnaire** administered to the parents or primary caregivers of the participating children. The questionnaire included information on **socio-demographic characteristics**, dietary diversity, food consumption frequency, participation in community-based nutrition programs, physical activity patterns, and household food security. Dietary practices were assessed using dietary diversity and food-frequency-related questions to obtain information regarding the variety and frequency of foods consumed by the children. Participation in community nutrition programs was documented to assess access to and utilization of available nutrition-related services. Anthropometric assessment included measurement of **height and body weight**, from which **body mass index (BMI)** was calculated as weight in kilograms divided by height in metres squared (kg/m^2). Anthropometric measurements were performed using standardized equipment and procedures in accordance with **World Health Organization (WHO) recommendations**. Appropriate precautions were taken during measurement and recording to minimize observational and measurement errors and to ensure consistency and reliability of the collected data.

2.8 Outcome Variables

The primary outcome variables of the study where the nutritional status indicators **underweight, stunting, wasting/thinness, overweight, and obesity** among children aged 5–12 years. Nutritional status was determined using age- and sex-specific anthropometric indices based on **World Health Organization (WHO) growth reference standards**. Stunting was assessed using height-for-age, while underweight was evaluated using weight-for-age where applicable. BMI-for-age was used to identify thinness/wasting, overweight, and obesity. Children with anthropometric Z-scores below the recommended WHO cut-off points were classified as having growth faltering or undernutrition, whereas BMI-for-age values above the specified cut-offs were used to classify overweight and obesity.

These indicators were used to estimate the prevalence and pattern of malnutrition among the children included in the study.

2.9 Statistical Analysis

Data were analyzed using SPSS version 26. Continuous variables are presented as Mean ± Standard Error (SE). Categorical variables are presented as frequencies and percentages. Chi-square tests and logistic regression analyses were performed. Statistical significance was considered at $p < 0.05$.

3. Results and Discussion:

Table 1. Nutritional Status of Children (n = 300)

Nutritional Indicator	Frequency	Percentage (%)
Normal	149	49.7
Underweight	73	24.3
Stunting	83	27.7
Wasting	41	13.7
Overweight	33	11.0
Obesity	10	3.3

The nutritional status of the 300 children revealed a considerable burden of both undernutrition and overnutrition, demonstrating the coexistence of the **double burden of malnutrition** within the study population. Approximately half (49.7%) of the children had normal nutritional status, whereas stunting was observed in 27.7%, underweight in 24.3%, and wasting/thinness in 13.7%. These findings are consistent with previous evidence demonstrating the persistence of undernutrition alongside emerging overnutrition among Indian children. Daga et al. (2020), in a cross-sectional study involving 1,444 Indian schoolchildren, similarly documented the simultaneous presence of undernutrition and overnutrition, with 10.1% of children classified as having moderate acute malnutrition and additional children falling into overweight and obese categories. Furthermore, analysis of the Comprehensive National Nutrition Survey reported that among Indian adolescents, the prevalence of stunting and thinness was 27.4% and 24.4%, respectively, while overweight and obesity affected 4.8% and 1.1%, demonstrating that both ends of the malnutrition spectrum coexist in the Indian population (Pandurangi et al., 2022). More recent analysis of Comprehensive National Nutrition Survey data among children and adolescents aged 5–19 years has also

confirmed the presence of multiple and overlapping forms of malnutrition in India, reinforcing the importance of addressing undernutrition and overnutrition simultaneously. The relatively high prevalence of stunting in the present study may reflect prolonged nutritional inadequacy and socioeconomic disadvantage, whereas the simultaneous occurrence of overweight and obesity suggests an ongoing nutrition transition. Collectively, the present findings and previous Indian evidence emphasize the need for integrated nutrition strategies capable of addressing persistent growth faltering while also preventing the emerging burden of childhood overweight and obesity.

At the same time, overnutrition was also evident, with **11.0% (n = 33) of children classified as overweight and 3.3% (n = 10) as obese**. The presence of overweight and obesity alongside underweight, stunting, and wasting/thinness demonstrates an important nutritional transition within the studied communities. Changes in dietary patterns, increased consumption of energy-dense and nutrient-poor foods, reduced physical activity, sedentary behaviour, and changing socioeconomic conditions may contribute to the development of childhood overweight and obesity. Overall, the findings highlight the need for a **dual-action approach to childhood nutrition**, in which interventions address persistent undernutrition while simultaneously preventing excessive weight gain. Community-based nutrition education, improvement in dietary diversity and household food security, regular growth monitoring, promotion of healthy food choices and physical activity, and effective utilization of child nutrition programmes may contribute to improving nutritional outcomes among school-aged children.

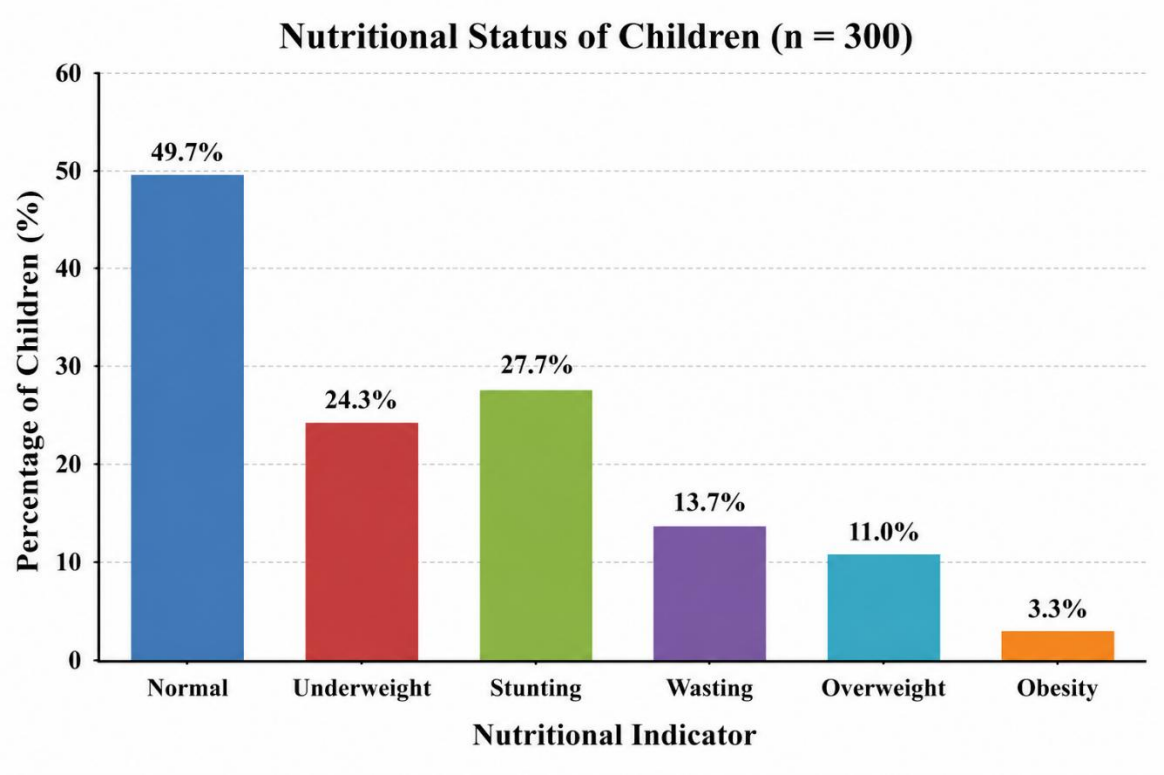

Figure 1. Distribution of Nutritional Status among Children (n = 300)

Table 2. Mean Nutritional Characteristics of Participants

Variable	Participants (Mean ± SE)	Non-participants (Mean ± SE)	p-value
Dietary Diversity Score	6.20 ± 0.18	4.90 ± 0.20	<0.001
Daily Fruit Intake (servings)	2.10 ± 0.09	1.40 ± 0.08	<0.001
Vegetable Intake (servings)	3.00 ± 0.12	2.20 ± 0.11	<0.001
BMI (kg/m²)	17.10 ± 0.25	18.00 ± 0.28	0.021
Physical Activity (hours/day)	1.90 ± 0.10	1.30 ± 0.09	<0.001

The present findings are broadly consistent with previous intervention studies demonstrating that structured nutrition and health-promotion programmes can improve dietary and lifestyle behaviours among children. In the present study, children participating in community nutrition programmes had a significantly higher Dietary Diversity Score (6.20 ± 0.18) than non-participants (4.90 ± 0.20; $p < 0.001$), along with greater fruit and vegetable consumption. Similar findings were reported by Singhal et al. (2010) in the

MARG intervention study among urban Indian schoolchildren, where a large-scale school-based nutrition and health education programme produced improvements in nutrition-related knowledge and healthy lifestyle behaviours. Furthermore, Rosário et al. (2012), in a randomized intervention involving children aged 6–12 years, found that a nutrition programme delivered through trained teachers significantly increased fruit and vegetable consumption among participating children. These observations support the present finding that exposure to organized nutrition interventions may encourage healthier and more diverse food choices. The significantly greater physical activity observed among participants in the present study (1.90 ± 0.10 hours/day) compared with non-participants (1.30 ± 0.09 hours/day; $p < 0.001$) is also supported by intervention research from India. Ponnambalam et al. (2022) demonstrated that a structured after-school physical activity intervention among Indian adolescents produced significant between-group differences in BMI during follow-up, while Srivastav et al. (2024) evaluated a multifactorial lifestyle intervention combining lifestyle education with physical activity among overweight and obese Indian adolescents. Collectively, these studies support the potential value of community- and school-based nutrition and lifestyle programmes for promoting healthier dietary practices and active lifestyles among children. However, unlike intervention trials, the present study employed a cross-sectional design; therefore, the observed differences between participants and non-participants should be interpreted as associations and cannot establish that programme participation directly caused the improved dietary or lifestyle characteristics.

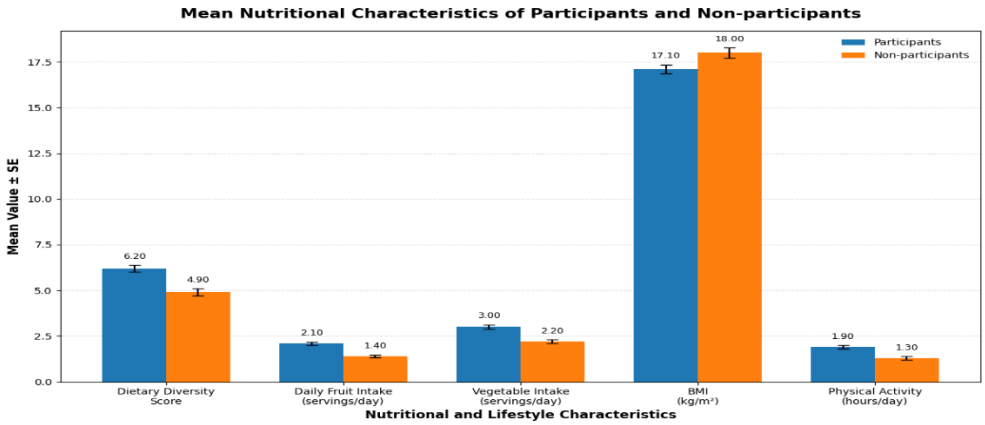

Figure 2. Comparison of Mean Nutritional and Lifestyle Characteristics between Participants and Non-participants (Mean ± SE)

Table 3. Logistic Regression Analysis

Variable	Adjusted Odds Ratio	95% CI	p-value
Community nutrition participation	0.61	0.42–0.89	0.010
Dietary diversity	0.74	0.58–0.93	0.015
Household income	0.82	0.69–0.96	0.022
Maternal education	0.71	0.53–0.95	0.018

The multivariable logistic regression analysis identified community nutrition programme participation, dietary diversity, household income, and maternal education as significant factors associated with childhood malnutrition. Children participating in community nutrition programmes had significantly lower odds of malnutrition (AOR = 0.61; 95% CI: 0.42–0.89; p = 0.010), corresponding to approximately 39% lower odds compared with non-participants. This finding is broadly supported by earlier Indian evidence on the potential nutritional benefits of community-based services. Tandon et al. (1995) reported that the Integrated Child Development Services (ICDS) programme contributed to improvements in the nutritional status of Indian children, while later evidence indicated a greater reduction in severe grades of malnutrition among ICDS beneficiaries than in comparison populations. More specifically, Jain (2015), using nationally representative Indian data, reported beneficial associations between intensive supplementary feeding through ICDS and physical growth among young rural children. However, the evidence is not entirely consistent. Pradhan and Shete (2022), analysing NFHS-4 data from 127,813 under-five children receiving ICDS services, found that ICDS utilization itself was not consistently associated with better nutritional status, although maternal education, maternal nutritional status, household wealth, residence, and other socioeconomic characteristics were significant determinants of undernutrition.

Greater dietary diversity was significantly associated with lower odds of malnutrition in the present study (AOR = 0.74; 95% CI: 0.58–0.93; p = 0.015), suggesting that consumption of a wider range of food groups may improve nutrient adequacy and support healthy growth. Household income was also significantly associated with reduced odds of malnutrition (AOR = 0.82; 95% CI: 0.69–0.96; p = 0.022). This finding is consistent with the analysis by Pradhan and Shete (2022), which identified household wealth as a significant socioeconomic determinant of undernutrition among Indian children

receiving ICDS services. Similarly, higher maternal education was associated with approximately 29% lower odds of malnutrition in the present study (AOR = 0.71; 95% CI: 0.53–0.95; p = 0.018). The importance of maternal education is also supported by Pradhan and Shete (2022), who identified maternal education as a significant determinant of stunting, wasting, and underweight among Indian children. Collectively, the present findings and previous Indian evidence indicate that childhood malnutrition is influenced by interconnected nutritional, socioeconomic, educational, and programme-related factors. Therefore, strengthening community nutrition services should be accompanied by strategies to improve dietary diversity, maternal education, household economic conditions, and access to appropriate health and nutrition services. Nevertheless, because the present study was cross-sectional, the observed associations should not be interpreted as evidence of causality.

Conclusion:

The present study demonstrates the coexistence of undernutrition and overnutrition among children aged 5–12 years, highlighting the double burden of malnutrition in the selected rural and urban communities of West Bengal. Stunting (27.7%), underweight (24.3%), and wasting/thinness (13.7%) remained important nutritional concerns, while overweight (11.0%) and obesity (3.3%) indicated an emerging burden of excessive weight. Children participating in community nutrition programs showed significantly greater dietary diversity, fruit and vegetable consumption, and physical activity than non-participants. Furthermore, community nutrition participation, greater dietary diversity, higher household income, and maternal education were significantly associated with lower odds of malnutrition. These findings emphasize the importance of strengthening integrated community-based nutrition strategies that combine dietary diversification, nutrition education, regular growth monitoring, promotion of physical activity, household food security, and parental awareness. Such comprehensive interventions may contribute to simultaneously reducing childhood undernutrition and preventing overweight and obesity; however, given the cross-sectional study design, the observed relationships should be interpreted as associations rather than causal effects.

Ethical Statement

The study was conducted in accordance with established ethical principles for research involving human participants. Data were collected through an online Google Form, and participation was

entirely voluntary. As the study involved children aged 5–12 years, informed consent was obtained electronically from parents or legal guardians before participation. Parents/guardians were informed about the purpose of the study, the nature of the information being collected, and their right to decline or withdraw participation without any consequences. The study involved no invasive procedures, blood collection, biological sample collection, or clinical intervention and therefore posed minimal risk to the participants. All information obtained through the Google Form was kept confidential, and participants' identities were not disclosed during data analysis or reporting. The collected data were used exclusively for academic and research purposes, with appropriate measures taken to maintain privacy, anonymity, and confidentiality throughout the study.

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