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Anthropometric Profile and Nutritional Status of Under-Five Children in an Urban Resettlement Colony: Mid-Upper Arm Circumference as a Community-Based Screening Tool

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ABSTRACT

Introduction: In low-and-middle-income countries, childhood undernutrition continues to remain as one of the most important public health challenges. According to World Health Organization, about 150 million children under five years of age are stunted and about 45 million children are wasted and 37 million children are overweight globally. About 40% of the children in India are known to be living in severe food poverty areas and about 45% of preventable deaths among under-five children has been linked to undernutrition. **Methodology:** A community based cross sectional study was conducted in an urban resettlement colony of Delhi, where a total of 559 under-five children and their mothers or care-givers were recruited for the study. **Result:** Majority of households belonged to the upper lower (42.6%) and lower middle (42.2%) socioeconomic classes. Among the 534 children (children less than 6 months excluded), 89.7% had a normal MUAC (≥12.5 cm), whereas 10.3% had MUAC values between 11.5 and 12.4 cm, indicating moderate acute malnutrition (MAM) according to WHO screening criteria. **Conclusion:** Routine MUAC screening offers a feasible approach for early detection of acute malnutrition in under-five children. Its widespread use in community-based programmes can improve case identification, referral, and nutritional outcomes, particularly in resource-limited settings.

Keywords*: Under-five children, Nurtritional status, Mid-upper arm circumference (MUAC), Acute malnutrition, Community-based screening.*

INTRODUCTION

In low-and-middle-income countries, childhood undernutrition continues to remain as one of the most important public health challenges. According to World Health Organization, about 150 million children under five years of age are stunted and about 45 million children are wasted and 37 million children are overweight globally [1]. According to UNICEF, 181 million under-five children live in severe food poverty areas [2]. In India, according to the Global Nutrition Report and NFHS-5, about 37 million under-five children (35.5%) are stunted and with highest child wasting rate in the world of 18.7% [3]. About 40% of the children in India are known to be living in severe food poverty areas [2]. Approximately 45% of preventable deaths among under-five children has been linked to undernutrition [4].

Undernutrition affects the physical growth, cognitive development, educational achievement and future economic productivity [5]. Children belonging to lower socioeconomic status and living in urban resettlement colonies are particularly vulnerable overcrowding, poor sanitation, unsafe drinking water, recurrent infections, food insecurity, and limited access to quality healthcare [5]. Although several national nutrition initiatives, including POSHAN Abhiyaan, the Integrated Child Development Services (ICDS) scheme, Saksham Anganwadi, and the Pradhan Mantri Poshan Shakti

Nirman (PM POSHAN) programme, have strengthened nutrition services, undernutrition remains disproportionately prevalent among children residing in urban slums and resettlement colonies [6].

The nutritional status of young children is influenced by a complex interplay of biological, environmental, and socioeconomic determinants. Recurrent diarrhoeal disease remains one of the leading causes of childhood undernutrition because repeated intestinal infections impair nutrient absorption, reduce dietary intake, increase metabolic demands, and contribute to growth faltering. Inadequate sanitation, unsafe drinking water, poor hygiene practices, low parental education, poverty, and household overcrowding further exacerbate this vicious cycle of infection and malnutrition [6].

Anthropometric assessment is the cornerstone of nutritional evaluation in children. Conventional indicators such as weight-for-age, height-for-age, and weight-for-height provide valuable information regarding underweight, stunting, and wasting but require accurate measurements, standardized equipment, and age-specific growth references [7]. Mid-upper arm circumference (MUAC) is a simple, rapid, inexpensive, and reliable anthropometric measure that reflects muscle mass and subcutaneous fat stores and is widely recommended by the World Health Organization (WHO) for community-based screening of acute malnutrition among children aged 6–59 months [7]. Therefore, this study was undertaken to describe the anthropometric profile of under-five children and assess the utility of MUAC for community-based screening of acute malnutrition in an urban resettlement colony.

OBJECTIVE

To assess the anthropometric profile of under-five children in an urban resettlement colony and evaluate mid-upper arm circumference (MUAC) as a screening tool for acute malnutrition using World Health Organization (WHO) criteria.

METHODOLOGY

Study type: A community based cross sectional study.

Study population: Children under five years of age.

Study area: Kalyanpuri, an urban resettlement colony in Delhi.

Sample size: Sample size has been calculated assuming the Prevalence (p) of diarrhoeal diseases in Urban slums as 14.8% (4), at 95 % confidence interval and relative error of 20%. The sample size came out to be 553 under five age children. Therefore, $N= Z(1-\alpha)2*p*q/E^2$, where p =14.8, q= 100-14.8, E=10%, $Z(1-\alpha)=1.96$

Inclusion criteria: Children under five years of age residing in Kalyanpuri for more than a year and those whose mothers/care givers gave consent.

Exclusion criteria: Children with compromised immune system or with debilitating diseases or both.

Data collection strategy: Fifty percent of blocks of the resettlement colony of Kalyanpuri were randomly selected for conducting the study. Approximately, equal number of children were taken from all the five blocks. The 1st household was selected according to serial number of houses and data was collected until sample size was complete. In households where there were no under-five children, the next consecutive household was selected. In a household where there was more than one eligible subject then all the eligible subjects were included in the study. Pre-tested semi-structured proforma was designed to collect socio-demographic data and Mid Upper Arm Circumference (MUAC) measurements were taken based on WHO standard criteria.

RESULTS

Table 1. Sociodemographic characteristics of the study participants (N = 559)

Characteristic	Frequency (n)	Percentage (%)
Age group (months)		
Up to 12 months	107	19.1
13–24 months	87	15.6
25–36 months	151	27.0
37–48 months	85	15.2
49–60 months	129	23.1
Sex		
Male	273	48.8
Female	286	51.2
Religion		
Hindu	531	95

Muslim	27	4.8
Others	1	0.2
Type of family		
Nuclear	273	48.8
Joint	286	51.2
Mother's educational status		
Illiterate	54	9.7
Primary school	76	13.6
Middle school	219	39.2
High school	117	20.9
Intermediate/Diploma	8	1.4
Graduate	84	15
Father's educational status		
Illiterate	5	0.9
Primary school	6	1.1
Middle school	80	14.3
High school	252	45.1
Intermediate/Diploma	153	27.4
Graduate	63	11.3
Socioeconomic status (Modified Kuppuswamy Scale)		
Upper	14	2.5
Upper middle	67	12
Lower middle	236	42.2
Upper lower	238	42.6
Lower	4	0.7

The study included 559 under-five children residing in an urban resettlement colony. The largest proportion of children belonged to the 25–36 months age group (27.0%), followed by 49–60 months (23.1%) and up to 12 months (19.1%). Females constituted a slight majority (51.2%) compared with males (48.8%). Most participants belonged to the Hindu religion (95.0%), and just over half lived in joint families (51.2%).

About 39.2% of mothers had completed middle school, while 20.9% had completed high school and 15.0% were graduates. Among fathers, 45.1% had completed high school, followed by 27.4% with intermediate or diploma education. Based on the Modified Kuppuswamy socioeconomic classification, the majority of households belonged to the upper lower (42.6%) and lower middle (42.2%) socioeconomic classes, indicating that most participants were from lower socioeconomic backgrounds typical of urban resettlement colonies.

Table 2. Nutritional status of under-five children according to WHO MUAC screening criteria (n = 534)

WHO MUAC classification	WHO cut-off (cm)	Number (n)	Percentage (%)
Severe Acute Malnutrition (SAM)	<11.5	0	0.0
Moderate Acute Malnutrition (MAM)	11.5–12.4	55	10.3
Normal nutritional status	≥12.5	479	89.7
Total		**534**	**100.0**

Among the 534 children (children less than 6 months excluded), 89.7% had a normal MUAC (≥12.5 cm), whereas 10.3% had MUAC values between 11.5 and 12.4 cm, indicating moderate acute malnutrition (MAM) according to WHO screening criteria. No child had a MUAC below 11.5 cm, suggesting that severe acute malnutrition (SAM) was not identified in the study population.

Table 3. Mid-Upper Arm Circumference (MUAC) according to age category

Age category	Observations (n)	Mean ± SD (cm)	Median (IQR) (cm)	Range (cm)
≤12 months	5	12.56 ± 0.52	12.8 (12.0–13.0)	12.0–13.0
13–24 months	73	13.14 ± 0.73	13.0 (13.0–14.0)	12.0–15.0
25–36 months	151	13.73 ± 0.69	14.0 (13.0–14.0)	11.5–15.0
37–48 months	85	13.83 ± 0.55	14.0 (14.0–14.0)	12.5–16.0
49–60 months	129	14.04 ± 1.08	14.0 (14.0–15.0)	12.0–16.0
Total	**443**			

The mean MUAC showed a progressive increase with age, rising from 12.56 ± 0.52 cm among children aged ≤12 months to 14.04 ± 1.08 cm among those aged 49–60 months. Median MUAC also increased from 12.8 cm to 14.0 cm across successive age groups. The difference in MUAC between age categories was highly statistically significant (Kruskal–Wallis H = 71.54, $p < 0.001$), indicating a significant increase in arm circumference with advancing age.

DISCUSSION

The study population comprised of children under-five years of age with an almost equal distribution of males and females, providing a representative sample of children residing in an urban resettlement colony. Most participants belonged to Hindu families, reflecting the demographic composition of the study area [table 1]. The educational profile of parents reflects the social disadvantage of the study population. Maternal education is consistently recognized as a key determinant of child health, influencing appropriate infant and young child feeding practices, healthcare utilization, hygiene and timely recognition of childhood illness. Similarly, paternal education contributes to household income, health awareness and healthcare-seeking behaviour, all of which have indirect effects on child growth and development [8,9]. Limited financial resources may compromise dietary diversity, food security, housing conditions, sanitation and access to quality healthcare, thereby increasing the risk of poor growth and undernutrition among children. These findings emphasize the continued need for targeted nutrition and social support interventions in economically disadvantaged urban communities [8,10].

According to the WHO MUAC classification applied in this study, 10.3% of children had moderate acute malnutrition, while none had severe acute malnutrition and the mean MUAC showed a progressive increase with advancing age, from 12.56 cm in children aged ≤12 months to 14.04 cm among those aged 49–60 months, reflecting the expected increase in muscle mass and arm circumference with growth. This age-related trend supports the utility of MUAC as a practical anthropometric indicator of nutritional status (table 3). Unlike weight-for-height assessment, MUAC requires only a simple colour-coded measuring tape and does not depend on weighing scales, height boards, accurate age determination, or complex interpretation of growth charts. Its simplicity, low cost, portability and rapid application make it particularly suitable for community-based nutritional screening in resource-constrained settings [7]. Furthermore, MUAC measurement can be standardized with minimal training and can be reliably performed by frontline health workers, including Accredited Social Health Activists (ASHAs), Auxiliary Nurse Midwives (ANMs), and Anganwadi workers, thereby facilitating large-scale screening and early identification of children requiring nutritional intervention [7,11].

Although severe wasting was not observed, the presence of moderate acute malnutrition indicates the need for early identification and nutritional intervention to prevent disease progression (Table 2). Moderate acute malnutrition is associated with impaired immunity, increased susceptibility to common childhood infections, delayed physical growth, and poorer developmental outcomes if left untreated. Therefore, identifying these children before progression to severe acute malnutrition has important clinical and public health implications [1,2,7,11]. The observed prevalence of moderate acute malnutrition highlights the continuing burden of undernutrition among children living in urban resettlement colonies. These findings underscore the importance of routine community-based nutritional screening and timely nutritional interventions to prevent progression from moderate to severe acute malnutrition.

The present findings further support the incorporation of routine MUAC assessment into existing child health and nutrition services, including Integrated Child Development Services (ICDS), Poshan Abhiyaan, Village Health Sanitation and Nutrition Days (VHSNDs), and community outreach activities, where rapid identification of nutritionally vulnerable children is essential. Periodic MUAC measurement is valuable for monitoring children at nutritional risk, particularly those with recurrent diarrhoea, low birth weight, inadequate complementary feeding, or belonging to socioeconomically disadvantaged households. This enables targeted follow-up and evaluation of nutrition interventions over time [1,2,7,11]. In addition, previous studies have demonstrated that MUAC correlates well with muscle mass and body protein reserves and is an effective predictor of mortality among children with acute malnutrition, further supporting its value as a screening tool in community settings [12,13]. Overall, the present study highlights MUAC as a simple, inexpensive and practical tool for community-based screening of acute malnutrition among under-five children. Its routine use can help identify at-risk children early and enable timely nutritional care.

CONCLUSION

Mid-upper arm circumference (MUAC) is a simple, rapid, inexpensive, and practical tool for community-based screening of acute malnutrition among under-five children. Its minimal equipment requirements, ease of measurement, and feasibility for use by trained frontline health workers make it particularly suitable for routine nutritional screening in resource-limited settings. While comprehensive anthropometric assessment remains essential for a complete evaluation of nutritional status, MUAC serves as an effective first-line screening tool for the early identification of nutritionally vulnerable children who require further assessment and timely intervention. Strengthening the routine use of MUAC within existing child health and nutrition programmes can enhance community-based nutritional surveillance, facilitate timely referral and management, and support efforts to reduce childhood undernutrition.

REFERENCE

1. World Health Organization, United Nations Children's Fund (UNICEF), World Bank. *Joint child malnutrition estimates, 2025 edition (2024 data)*. Geneva: World Health Organization; 2025. Available from: WHO Joint Child Malnutrition Estimates
2. UNICEF. *Child food poverty: Nutrition deprivation in early childhood*. New York: United Nations Children's Fund; 2024. Available from: https://www.unicef.org/reports/child-food-poverty
3. International Institute for Population Sciences (IIPS), ICF. *National Family Health Survey (NFHS-5), 2019–21: India Report*. Mumbai: IIPS; 2021.
4. World Health Organization. Malnutrition. Geneva: World Health Organization; 2024 [cited 2026 Jul 9]. Available from: https://www.who.int/news-room/fact-sheets/detail/malnutrition
5. Victora CG, Adair L, Fall C, Hallal PC, Martorell R, Richter L, et al. Maternal and child undernutrition: consequences for adult health and human capital. **Lancet.** 2008;371(9609):340-57.
6. Ghosh S, Shah D. Nutritional problems in urban slum children. Indian Pediatr. 2004 Jul;41(7):682-96. PMID: 15297683.
7. World Health Organization. *WHO Child Growth Standards: Length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age: Methods and development*. Geneva: World Health Organization; 2006.
8. Balaj M, York HW, Sripada K, et al. Parental education and inequalities in child mortality: a global systematic review and meta-analysis. *Lancet.* 2021;398(10300):608–620.
9. Sangma RVN, Rasania SK. Prevalence of Diarrhea Among under-5 Children and Health-Seeking Behavior of Mothers in a Resettlement Colony of Delhi, India: A Community-Based Cross-Sectional Study. Indian J Community Med. 2025 Jul-Aug;50(4):669-673. doi: 10.4103/ijcm.ijcm_90_24. Epub 2025 Feb 27. PMID: 40837155; PMCID: PMC12364293.
10. Black RE, Victora CG, Walker SP, Bhutta ZA, Christian P, de Onis M, et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. *Lancet.* 2013;382(9890):427–451.
11. World Health Organization. *Infant and young child feeding* [Internet]. Geneva: World Health Organization; 2023 [cited 2026 Jul 9]. Available from: WHO Infant and Young Child Feeding Fact Sheet
12. Briend A, Garenne M, Maire B, et al. *Nutritional status, age and survival: the muscle mass hypothesis.* European Journal of Clinical Nutrition. 1989;43(10):715–726. PMID: 2612460. This classic paper explains that arm circumference reflects muscle mass and that muscle mass is closely related to survival.
13. Taneja S, Rongsen-Chandola T, Mohan SB, et al. *Mid upper arm circumference as a predictor of risk of mortality in children in a low resource setting in India.* PLoS ONE. 2018;13(6):e0197832. The study concluded that MUAC is a significant predictor of subsequent mortality in under-five children and supports its use as a community screening tool.