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Prevalence of under-nutrition and its associated factors among children under six years of age in an urban field practice area of Raichur, Karnataka

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ABSTRACT

Background: Undernutrition in early childhood remains a major public health challenge in India, contributing significantly to childhood morbidity, mortality, and impaired physical and cognitive development. Despite the implementation of large-scale nutrition programs, undernutrition continues to be highly prevalent, particularly in socioeconomically disadvantaged urban communities. Local epidemiological evidence is essential to identify vulnerable groups and guide targeted interventions.
Objectives: To estimate the prevalence of undernutrition among children under six years of age and to assess its association with selected socio-demographic and epidemiological factors.
Methods: A community-based cross-sectional study was conducted in the urban field practice area of the Department of Community Medicine, Raichur Institute of Medical Sciences, Raichur, from December 2011 to November 2012. A total of 592 children aged 0–71 months were selected using systematic random sampling from Anganwadi centres. Data were collected through caregiver interviews using a pretested semi-structured proforma, along with anthropometric measurements. Undernutrition was assessed using WHO weight-for-age criteria (< −2 SD). Data were analyzed using Epi Info version 7. Chi-square test was applied to assess associations, and a p-value <0.05 was considered statistically significant.
Results: The overall prevalence of undernutrition was 48.31%, with 26.69% children underweight and 21.62% severely underweight. Undernutrition increased significantly with age ($p < 0.001$). Significant associations were observed with low birth weight ($p = 0.005$), prelacteal feeding ($p < 0.001$), and lack of exclusive breastfeeding ($p < 0.001$). No significant association was found with sex or socioeconomic status.
Conclusion: Nearly half of the under-six children in the study area were undernourished, indicating a substantial public health burden. Strengthening maternal nutrition, promoting optimal infant feeding practices, and improving the effectiveness of ICDS services are crucial for reducing childhood undernutrition.

Keywords: *Undernutrition, underweight, children under six years, prevalence, urban community, India.*

INTRODUCTION

Undernutrition in early childhood remains one of the most persistent public health challenges in low- and middle-income countries, and it continues to undermine child survival, growth, and human capital formation. Childhood undernutrition is commonly assessed using anthropometric indicators based on the World Health Organization (WHO) Child Growth

Standards, which provide an internationally harmonized reference for evaluating growth in children under five years of age.[1,2] Underweight (low weight-for-age) is widely used as a summary indicator reflecting a combination of chronic and acute nutritional deficits and is often applied in community surveillance and program monitoring where rapid risk identification is required. [2]

The health consequences of undernutrition extend far beyond low body weight. Evidence from large global analyses has demonstrated that maternal and child undernutrition contributes substantially to childhood morbidity and mortality, and it predisposes children to recurrent infections, delayed recovery, and higher risk of death. [3] In addition, early nutritional deprivation during the critical "first 1000 days" (conception to two years) can lead to lasting deficits in physical growth and neurodevelopment, ultimately affecting school performance, future productivity, and intergenerational health outcomes.[3,4] Global estimates continue to show a large burden: the UNICEF–WHO–World Bank Joint Child Malnutrition Estimates indicate that in 2024, approximately 150.2 million children under five were stunted and 42.8 million were wasted worldwide, highlighting the magnitude of growth faltering and acute malnutrition. [5]

India bears a disproportionate share of the global burden of child undernutrition despite economic progress and expansion of nutrition-related programs. The National Family Health Survey (NFHS-5, 2019–21) reports that at the national level, 35.5% of children under five are stunted, 19.3% are wasted, and 32.1% are underweight. [6,7] These figures underscore that undernutrition remains deeply entrenched and heterogeneous across states and population groups. The persistence of undernutrition is closely related to multi-level determinants including household food insecurity, poverty, parental education, inadequate water and sanitation, suboptimal infant and young child feeding practices, and repeated infections.3,4 In India, these determinants often cluster in vulnerable communities, particularly in urban slums and socioeconomically disadvantaged urban localities, where overcrowding, poor environmental conditions, unstable livelihoods, and limited access to quality health services increase children's vulnerability to growth faltering.[8,9]

From a programmatic perspective, India has long attempted to address child undernutrition through the Integrated Child Development Services (ICDS) scheme one of the world's largest early childhood care and nutrition platforms delivered primarily through Anganwadi centres. ICDS provides a package of services including supplementary nutrition, preschool non-formal education, and convergence with health services such as immunization and health check-ups.[10,11] However, the effectiveness of ICDS is influenced by multiple factors such as service quality, regularity of supplementary nutrition, caregiver engagement, local governance, and the broader social determinants of health. [10,11] Recognizing the need for intensified, technology-enabled, and convergent action, the Government of India launched POSHAN Abhiyaan (National Nutrition Mission) in 2018 to accelerate reductions in stunting, wasting, and undernutrition among children (0–6 years), and to improve monitoring and program delivery.[12,13,14] While these initiatives strengthen the policy and implementation environment, local epidemiological evidence remains essential to identify high-risk groups and context-specific determinants that can be targeted through ICDS and allied health systems.

Importantly, undernutrition is not uniformly distributed even within states and districts; therefore, community-level studies are vital for understanding local patterns, priority age groups, and modifiable risk factors. In many urban field practice areas linked to medical colleges, Anganwadi-based registers and routine growth monitoring provide a starting point for surveillance, but they may not fully capture the socio-demographic and epidemiological correlates that shape nutritional outcomes. Your thesis setting highlights the need for local assessment in Raichur an under-served district where undernutrition has been reported as a continuing concern and where programmatic improvement depends on reliable community evidence. Against this background, a community-based study estimating the prevalence of undernutrition among children under six years and examining associated factors (such as age, parental education, socioeconomic status, birth weight, and infant feeding practices) becomes highly relevant to strengthen evidence-informed planning, improve ICDS effectiveness, and guide preventive interventions.

Therefore, the present research paper aims to estimate the prevalence of undernutrition among children under six years of age in the study area and to examine its association with selected socio-demographic and epidemiological determinants, thereby generating actionable evidence for local child nutrition programming.

MATERIALS AND METHODS

Study Design

A community-based cross-sectional study was conducted to estimate the prevalence of under-nutrition and to assess its associated factors among children under six years of age.

Study Area and Setting

The study was carried out in the urban field practice area of the Department of Community Medicine, Raichur Institute of Medical Sciences (RIMS), Raichur, Karnataka. The study area is served by the Urban Health Training Centre (UHTC) and is covered by multiple Anganwadi centres implementing the Integrated Child Development Services (ICDS) scheme.

Study Period
The study was conducted over a period of one year, from December 2011 to November 2012.

Study Population
The study population comprised children under six years of age who were:
- Residing in the study area for more than one year, and
- Registered at the Anganwadi centres under the UHTC field practice area.

Inclusion and Exclusion Criteria
Inclusion criteria
- Children aged 0–71 months
- Resident of the study area for ≥1 year
- Available at the time of survey with a parent or primary caregiver

Exclusion criteria
- Children whose parents/caregivers did not consent or were not cooperative despite repeated visits

Sample Size:
The minimum calculated sample size was 434 children. To account for possible non-response, an additional 30% was added, resulting in a final sample size of 564. Ultimately, 592 children were included in the study.

Sampling Technique
A list of all Anganwadi centres in the study area was obtained from the Child Development Project Office. There were 37 Anganwadi centres, catering to approximately 3840 children.
Using systematic random sampling, 16 children from each Anganwadi centre were selected, ensuring proportional representation of all centres. This resulted in the inclusion of 592 children in the final sample.

Data Collection
Data were collected through:
- Interview of parents or primary caregivers using a pre-designed, pre-tested, semi-structured proforma
- House-to-house visits and Anganwadi centre visits

Information collected included:
- Socio-demographic details
- Parental education and occupation
- Socio-economic status
- Birth history (birth weight, place of delivery, birth order, birth spacing)
- Infant and young child feeding practices (prelacteal feeds, exclusive breastfeeding, weaning practices)
- Immunization status
- History of common childhood illnesses in the past one year

A general physical and systemic examination was conducted for each child.

Anthropometric Measurements
- Weight: Measured to the nearest 0.1 kg using a Salter's weighing scale for infants and a calibrated standard weighing machine for older children. Measurements were taken with minimal clothing and without footwear.
- Height: Standing height was measured to the nearest 0.5 cm using a calibrated vertical measuring scale, with the child standing erect without footwear.
- Mid-Upper Arm Circumference (MUAC): Measured at the midpoint between the acromion and olecranon process of the left arm, recorded to the nearest 0.1 cm.

Operational Definition of Undernutrition
Nutritional status was assessed using WHO growth standards (weight-for-age):
- Normal: ≥ −2 SD
- Underweight: ≥ −3 SD to < −2 SD
- Severely underweight: < −3 SD

Children with weight-for-age below −2 SD were classified as undernourished.

Ethical Considerations

Ethical clearance was obtained from the Institutional Ethics Committee of Raichur Institute of Medical Sciences. Permission was also taken from the Child Development Project Officer (CDPO). Written informed consent was obtained from parents or caregivers prior to data collection.

Statistical Analysis

Data were coded and entered into Microsoft Excel and analyzed using Epi Info version 7.

- Descriptive statistics were used to calculate frequencies and percentages.
- The prevalence of under-nutrition was estimated.
- Association between under-nutrition and socio-demographic as well as epidemiological variables was assessed using the Chi-square test.
- A p-value < 0.05 was considered statistically significant.

RESULTS

Table 1. Prevalence of under-nutrition among children under six years of age (n = 592)

Nutritional status	Number	Percentage (%)
Normal	306	51.69
Underweight	158	26.69
Severely underweight	128	21.62
Total under-nutrition	**286**	**48.31**
Total	**592**	**100.00**

Nearly half (48.31%) of the children under six years were undernourished, indicating a substantial burden of undernutrition in the study population, with more than one-fifth being severely underweight.

Table 2. Age-wise distribution of children according to nutritional status

Age group (months)	Undernourished n (%)	Normal n (%)	Total	χ^2	p-value
0–12	44 (28.95)	108 (71.05)	152		
13–24	72 (47.37)	80 (52.63)	152		
25–36	61 (51.26)	58 (48.74)	119		
37–48	54 (60.67)	35 (39.33)	89	**42.13**	**<0.001**
49–60	37 (68.52)	17 (31.48)	54		
61–72	18 (69.23)	8 (30.77)	26		
Total	**286 (48.31)**	**306 (51.69)**	**592**		

The prevalence of undernutrition increased progressively with age, reaching the highest levels among children aged 49–72 months. This association was statistically highly significant, indicating cumulative nutritional deprivation with advancing age.

Table 3. Association between sex and under-nutrition

Sex	Undernourished n (%)	Normal n (%)	Total	χ^2	p-value
Male	135 (49.63)	137 (50.37)	272		
Female	151 (47.19)	169 (52.81)	320	**0.35**	**0.55**
Total	**286 (48.31)**	**306 (51.69)**	**592**		

Undernutrition was marginally higher among boys than girls; however, the difference was not statistically significant, suggesting no meaningful gender-based disparity in nutritional status.

Table 4. Association between religion and under-nutrition

Religion	Undernourished n (%)	Normal n (%)	Total	χ^2	p-value
Hindu	201 (52.62)	181 (47.38)	382		
Muslim & others	85 (40.48)	125 (59.52)	210		
Total	**286 (48.31)**	**306 (51.69)**	**592**	**7.52**	**0.006**

A significantly higher proportion of undernutrition was observed among Hindu children compared to Muslim and other religious groups, indicating a statistically significant association between religion and nutritional status.

Table 5. Association between birth weight and under-nutrition

Birth weight (kg)	Undernourished n (%)	Normal n (%)	Total	χ^2	p-value
< 2.5	68 (60.18)	45 (39.82)	113		
≥ 2.5	218 (45.51)	261 (54.49)	479		
Total	**286 (48.31)**	**306 (51.69)**	**592**	**7.87**	**0.005**

Children with low birth weight (<2.5 kg) had a significantly higher prevalence of undernutrition compared to those with normal birth weight, highlighting the importance of intrauterine and maternal factors.

Table 6. Association between prelacteal feeding and under-nutrition

Prelacteal feeding	Undernourished n (%)	Normal n (%)	Total	χ^2	p-value
Yes	200 (55.40)	161 (44.60)	361		
No	86 (37.23)	145 (62.77)	231		
Total	**286 (48.31)**	**306 (51.69)**	**592**	**18.63**	**<0.001**

Undernutrition was significantly more common among children who received prelacteal feeds, demonstrating a strong association between inappropriate early feeding practices and poor nutritional outcomes.

Table 7. Association between exclusive breastfeeding and under-nutrition

Exclusive breastfeeding	Undernourished n (%)	Normal n (%)	Total	χ^2	p-value
Yes	79 (36.57)	137 (63.43)	216	**18.76**	**<0.001**
No	207 (55.05)	169 (44.95)	376		
Total	**286 (48.31)**	**306 (51.69)**	**592**		

Children who were not exclusively breastfed had a significantly higher prevalence of undernutrition, emphasizing the protective role of exclusive breastfeeding during early infancy.

DISCUSSION

The present community-based cross-sectional study assessed the prevalence of under-nutrition among children under six years of age and examined its association with selected socio-demographic and epidemiological factors in an urban field practice area. The findings reveal that under-nutrition continues to be a major public health concern, with nearly half of the study population affected, highlighting persistent nutritional vulnerability despite the presence of national nutrition programs.

Prevalence of under-nutrition

In the present study, the overall prevalence of under-nutrition (weight-for-age < −2 SD) was 48.31%, with 26.69% underweight and 21.62% severely underweight children. This prevalence is comparable to national estimates reported in NFHS-3 (2005–06), which documented 43% underweight children under five years, and slightly higher than NFHS-5 (2019–21), which reported 32.1% underweight children nationally, reflecting slow and uneven progress in nutritional outcomes across regions [15,16]. The higher prevalence observed in the present study may be attributed to urban socio-economic disparities, suboptimal infant feeding practices, and clustering of risk factors within vulnerable communities, as documented in other urban slum-based studies [17,18].

Comparable prevalence rates have been reported in studies from urban slums of Pune (65.2%) and Bareilly (66.3%), where under-nutrition remains high due to poverty, poor maternal education, and inadequate child care practices [19,20]. The persistently high burden observed in the present study underscores the need for intensified, context-specific interventions at the community level.

Age-wise distribution and under-nutrition

A statistically significant association was observed between age and under-nutrition, with prevalence increasing progressively with advancing age ($p < 0.001$). The highest proportion of under-nourished children was seen in the 49–72 months age group. Similar age-related trends have been reported by Srivastava et al. and Sengupta et al., who observed worsening nutritional status as children grow older, likely due to inadequate complementary feeding, recurrent infections, and reduced caregiver attention [20,21].

This pattern suggests that while breastfeeding may provide partial nutritional protection during infancy, inadequate dietary diversity and caloric intake during the preschool years contribute significantly to growth faltering. Studies by Black et al. and Victora et al. emphasize that cumulative nutritional deficits beyond infancy play a critical role in determining long-term growth outcomes [22,23].

Sex and under-nutrition

No statistically significant association was found between sex and under-nutrition in the present study, although a slightly higher proportion of under-nourished children was observed among boys. Similar findings have been reported by Goel et al. and Mittal et al., who observed no consistent gender differences in under-nutrition [24,25]. However, other studies have reported either male or female predominance depending on sociocultural practices and regional contexts [21,26]. The lack of significant gender disparity in the present study may reflect relatively uniform child-feeding practices across sexes in the study population.

Religion and socio-cultural factors

Religion showed a statistically significant association with under-nutrition, with a higher prevalence among Hindu children compared to Muslim and other religious groups. While religion itself may not be a direct determinant, it often reflects underlying socio-economic, dietary, and cultural practices that influence child nutrition. Similar observations have been reported by Dey et al., who found higher under-nutrition prevalence among certain religious groups, although the differences were not always statistically significant [27]. These findings indicate the importance of culturally sensitive nutrition education and behavior change communication.

Birth weight and early life determinants

Low birth weight (<2.5 kg) was significantly associated with under-nutrition in the present study ($p = 0.005$). Children born with low birth weight had a substantially higher risk of being under-nourished, consistent with findings from studies conducted in India, Bangladesh, and Africa [21,28,29]. Low birth weight reflects poor maternal nutrition and intrauterine growth restriction, which predispose children to postnatal growth failure and recurrent illness.

Evidence from longitudinal studies suggests that children born with low birth weight are more likely to experience stunting and underweight during early childhood, emphasizing the intergenerational nature of under-nutrition [22,23]. Strengthening maternal nutrition and antenatal care is therefore crucial for breaking this cycle.

Infant feeding practices

Infant feeding practices emerged as strong and modifiable determinants of under-nutrition. The present study demonstrated a highly significant association between prelacteal feeding and under-nutrition ($p < 0.001$), with children who received prelacteal feeds showing a markedly higher prevalence of under-nutrition. Similar findings have been reported by Luthra et al. and Roy et al., who observed that prelacteal feeding interferes with early initiation of breastfeeding and increases the risk of infections [30,31].

Exclusive breastfeeding was found to be protective, with significantly lower under-nutrition among exclusively breastfed children ($p < 0.001$). This finding is consistent with studies by Sengupta et al., Chakraborty et al., and WHO recommendations, which emphasize exclusive breastfeeding for the first six months as a key intervention for preventing childhood under-nutrition [21,32,33]. The protective effect of exclusive breastfeeding highlights the need for reinforcing breastfeeding counseling through ICDS and primary health care services.

Programmatic implications

Despite the long-standing implementation of ICDS and recent strengthening through POSHAN Abhiyaan, the high prevalence of under-nutrition observed in this study suggests gaps in service delivery, utilization, and community engagement. Studies evaluating ICDS performance have identified issues such as irregular supplementary nutrition, inadequate growth monitoring, and limited caregiver awareness as barriers to program effectiveness [34,35]. Community-based evidence such as the present study is essential for identifying high-risk groups and tailoring interventions accordingly.

CONCLUSION

Nearly half of the children under six years in the study area were undernourished, indicating a significant public health problem. Undernutrition increased with age and was significantly associated with low birth weight, prelacteal feeding, and lack of exclusive breastfeeding. Strengthening maternal nutrition, promoting optimal infant feeding practices, and improving the effectiveness of ICDS services are essential to reduce undernutrition in this population.

LIMITATIONS

This study was cross-sectional, which limits causal inference between undernutrition and associated factors. Nutritional status was assessed using weight-for-age alone, which does not distinguish between acute and chronic malnutrition. Information on feeding practices and past illnesses was based on caregiver recall, introducing the possibility of recall bias. Additionally, as the study was conducted in a single urban field practice area, the findings may not be generalizable to rural settings or other regions.

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