

Assessment of Nutritional Status and Morbidity Pattern in Children Aged 6–60 Months in the Rural Area PatnaSaurav Suman¹, Rishabha Mehta², Anil Kumar Tiwari³¹Senior Resident, Upgraded Department of Pediatrics, Patna Medical College and Hospital, Patna, Bihar, India²Senior Resident, Upgraded Department of Pediatrics, Patna Medical College and Hospital, Patna, Bihar, India³Associate Professor, Upgraded Department of Pediatrics, Patna Medical College and Hospital, Patna, Bihar, India

Received: 08-10-2025 / Revised: 29-10-2025 / Accepted: 27-11-2025

Corresponding Author: Dr. Rishabha Mehta

Conflict of interest: Nil

Abstract:**Background:** Malnutrition remains a major public health problem among under-five children in rural India and is closely linked with increased morbidity and mortality.**Aim:** To assess the nutritional status and morbidity pattern among children aged 6–60 months in the rural field practice area of Upgraded Department of Pediatrics, PMCH, Patna, Bihar, India.**Methodology:** A community-based cross-sectional study was conducted among 300 children aged 6–60 months selected by systematic random sampling from rural field practice areas of our tertiary care hospital. Socio-demographic details and morbidity history were collected using a structured questionnaire. Anthropometric measurements were taken as per WHO guidelines, and nutritional status was assessed using WHO Child Growth Standards (2009). Data were analyzed using appropriate statistical tests.**Results:** Underweight, stunting, and wasting were observed in 43.3%, 63.3%, and 25% of children, respectively. Stunting showed a significant increase with age ($p < 0.05$), while gender had no significant association with nutritional status. Anemia was the most common morbidity (35%), followed by acute respiratory infections (20%), fever (18.3%), and diarrhea (8.3%). Multiple overlapping morbidities were present in 21.7% of children.**Conclusion:** The study reveals a high burden of chronic undernutrition and morbidity among rural under-five children, highlighting the need for sustainable & effective nutritional interventions, anemia control, and strengthened child health services.**Keywords:** Malnutrition, Under-five children, Stunting, Morbidity pattern, Rural area.This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Malnutrition is a well-recognized, persistent public health problem among children in India. Malnutrition is a pathological condition that results from a relative or absolute deficiency or excess of one or more essential nutrients, causing adverse effects on body composition, physical growth, and functional outcomes. [1] Despite several decades of national and international efforts aimed at improving child health and nutrition, malnutrition remains one of the major contributors to childhood illness and mortality, particularly in developing countries such as India. The burden is disproportionately higher among infants and young children because their nutritional requirements are higher for rapid growth and development. The global prevalence of under-nutrition accounts for almost half of all deaths among children under five years of age, averaging to three million young lives lost annually. [2] Under-nutrition not only leads to an increased risk of mortality but also

predisposes the child to frequent childhood infections, contributing to the associated morbidity & mortality. It increases the incidence and severity of these infections and significantly slows down the recovery, thus setting up a vicious cycle of infection and malnutrition. The poor nutritional status increasing the susceptibility to disease is a challenge that remains paramount in child health.

Malnutrition is strongly linked to high morbidity and mortality rates and underlies nearly a third to half of all deaths in children less than five years of age from conditions that are otherwise preventable. [3] Malnourished children are more vulnerable to experiencing multiple episodes of diseases like acute respiratory infections, diarrheal diseases, and other infectious diseases, leading to further deterioration of their nutritional status. As a result, there is a long-term impact of cumulative repeated illness and poor

nutrition on physical growth, cognitive development, and productivity in later years.

In India, children in rural areas are especially prone to poor nutrition. Morbidity is higher among under-five children in rural areas than among children in the same age group but from a better socioeconomic background. [4] This can be attributed to factors such as poverty, illiteracy, inadequate health services, unsanitary conditions, unsafe drinking water, and general unawareness about the ideal practice of childcare. Growth assessment in children is thus an important tool, not only for the diagnosis of nutritional problems at the individual level, but also to monitor the general health status of the communities and effectiveness of the public health programs at the population level.

Recognizing the magnitude of this problem, the Union Government of India initiated the Integrated Child Development Services Scheme, aiming to improve the nutritional and health status and learning opportunities of children under six years of age, with special attention to those from below poverty line and disadvantaged groups. This scheme provides supplementary nutrition, immunization support, health check-ups, and nutrition education through Anganwadi Centers. Supplementary nutrition services are made available at Anganwadi Centers for all children in the eligible age groups. However, despite such programs, morbid conditions continue to remain exceedingly common among rural children due to multiple risk factors such as poor hygienic surroundings, inappropriate dietary intake, and limited utilization of quality health care services. [5]

What is really worrisome about child malnutrition in India is the seeming slowness with which the problem has been improving in spite of high economic growth. From 1991 to the present, India's Gross Domestic Product has more than doubled, yet it has seen only a single-digit percentage decrease in rates of malnutrition. [6] This is a paradox that emphasizes the fact that economic growth per se cannot ensure nutritional sufficiency unless accompanied by greater equity in the distribution of such resources and/or effective implementation of nutrition programs, improvements in education, sanitation, and health delivery systems.

Malnutrition is still the most significant health concern facing the country even after the concerted efforts of the government and other stakeholders to eradicate it. [7] Though malnutrition affects people from all age groups, the infants and young children are the most vulnerable segment of the populace. This susceptibility is because of their very high nutritional needs for rapid growth, especially growth of the body, brain, and maturation of the immune system. Nutritional deprivations during this critical growth period may have irreversible consequences on growth and development.

Nutritional status can be regarded as a sensitive indicator of the general state of health and well-being in children. Under-five children are highly representative of the most vulnerable group in any community, and their nutritional status reflects not only household food security but also wider social, economic, and environmental conditions. [8] Poor nutrition in early childhood is linked with stunted growth, impaired cognitive function, reduced school performance, and decreased productivity in adulthood. Assessing nutritional status among this population is, thus, very important for improvement in long-term health outcomes.

Good nutrition in childhood has implications that go beyond mere survival and health in childhood. The prime determinant of overall health status often originates from nutritional status during childhood. [9] Optimal physical, mental, and emotional development in the formative years requires good nutrition. Nutrition plays a key role in the quality of a child's life, and continued nutritional deficiencies will place an individual's life potential at risk, in its entirety. [10] Thus, proper nutrition in early childhood is a key public health concern.

The growth rate in children is maximal during the first six years of life. Because of this, malnutrition has a direct and profound impact on infant mortality rates and under-five mortality rates during this period, considered part of the key indicators of overall health status of a country. [11] High rates of malnutrition are often reflected in poor child survival indicators and signal broader systemic challenges in health and social development.

With nutritional status being so closely related to morbidity, mainly in rural settings, the need for the generation of local data that may inform targeted interventions cannot be overstated. Such knowledge regarding prevalence and patterns of malnutrition, combined with associated morbidities, facilitates valuable insights for policy makers, providers of healthcare, and program planners. Such evidence is essential for strengthening existing child health programs and developing context-specific strategies aimed at improving child nutrition and reducing disease burden.

Therefore, the present study was undertaken to assess the nutritional status and morbidity pattern in children aged 6–60 months belonging to a rural area. The findings of this study would add to a better understanding of the magnitude of malnutrition and its related ailments among the rural under-five children and advocate for improving child health and nutrition outcomes.

Methodology

Study Design: This was a community-based cross-sectional observational study conducted to assess

the nutritional status and morbidity pattern among children aged 6–60 months residing in rural areas.

Study Area: The study was conducted under the Upgraded Department of Pediatrics, Patna Medical College and Hospital (PMCH), Patna, Bihar, India.

Study Duration: The study was carried out for a period of 8 months from February 2025 to September 2025.

Study Population: The study population consisted of children aged 6–60 months living in the selected rural areas of Patna district and attending or covered under the field practice area of the Department of Pediatrics, PMCH.

Sample Size: A total of 300 children aged 6–60 months were included in the study.

Sampling Technique: A systematic random sampling method was adopted. Every sixth household in the selected rural areas was visited and screened for the presence of eligible children. If more than one eligible child was present in a household, one child was selected randomly.

Inclusion Criteria

- Children aged 6 months to 60 months
- Children residing in the selected rural areas
- Children whose parents or guardians gave informed consent

Exclusion Criteria

- Children aged more than 60 months
- Children with intrauterine growth restriction (IUGR) or small-for-date babies
- Children suffering from chronic organic diseases, congenital anomalies, or any physical disability that could affect growth measurements

Data Collection: Data were collected through house-to-house visits in the selected rural areas attached to the Department of Pediatrics, Patna Medical College and Hospital, Patna. A systematic sampling approach was used, wherein every sixth household was visited to identify children aged 6–60 months. If an eligible child was present, the mother or primary caregiver was interviewed after obtaining informed consent. In households with more than one eligible child, one child was selected randomly for inclusion in the study.

Socio-demographic details including age, sex, parental education, occupation, and socioeconomic status were collected using a pre-designed, pre-tested, and structured questionnaire administered through face-to-face interviews. Socioeconomic status of the family was assessed using the Modified Kuppuswamy scale. Information regarding morbidity patterns, recent illnesses, and immunization

status of the child was obtained from the mother or caregiver and verified using Mother and Child Protection (MCP) cards or immunization cards wherever available. The age and date of birth of the child were recorded based on maternal recall and cross-checked with available records.

Anthropometric measurements were carried out following standard World Health Organization guidelines. Body weight was measured using a portable weighing scale with a sensitivity of 0.1 kg, with the child barefoot and wearing minimal clothing. Length was measured in the supine position using an infant meter for children below two years of age, while height was measured in the standing position using a measuring tape for children aged two years and above. All measurements were recorded to the nearest appropriate unit. A general physical examination was also performed to assess the overall health status of the child.

Nutritional status was assessed using the WHO Child Growth Standards (2009). Weight-for-age, height-for-age, and weight-for-height indices were calculated to determine underweight, stunting, and wasting, respectively, based on age- and sex-specific Z-scores. The data collection tools were initially pilot tested in the field, modified as required, and then used for the final data collection to ensure validity and reliability of the information collected.

Procedure: After obtaining consent, households were visited according to the sampling method. Eligible children were identified, interviews were conducted with caregivers, anthropometric measurements were recorded, and a general physical examination was performed. Data collection tools were pilot-tested, modified accordingly, and used uniformly throughout the study.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using appropriate statistical software. Results were expressed as frequencies and percentages. The Chi-square test was used to assess associations between categorical variables. Binary logistic regression analysis was performed to determine the association between nutritional status and selected independent variables. A p-value < 0.05 was considered statistically significant.”

Result

Table 1 describes the demographic profile of the 300 children studied, showing that most were aged between 24–41 months and 42–60 months (35% each), while 30% were in the 6–23 month age group. Females slightly outnumbered males (51.7% vs. 48.3%), the majority of children belonged to the Hindu religion (90%), and a high proportion were fully immunized (95%), indicating good immunization coverage in the study population.

Demographic Characteristics	Number (n = 300)	Percentage (%)
Age in months		
6–23	90	30
24–41	105	35
42–60	105	35
Gender		
Male	145	48.3
Female	155	51.7
Religion		
Hindu	270	90
Muslim	24	8
Christian	6	2
Immunization status		
Fully immunized	285	95
Partially immunized	15	5

Table 2 summarizes the nutritional status of children based on WHO growth standards (2006), showing that underweight was present in 43.3% of children, with 26.7% moderately and 16.6% severely underweight, while stunting was highly prevalent at 63.3%, including 35% moderate and 28.3% severe

cases. Wasting affected 25% of children, with 15% having moderate and 10% severe wasting, whereas assessment by mid-arm circumference indicated that the majority were nutritionally normal (89%), with 7% showing mild to moderate protein-energy malnutrition and 3.8% cases of severe PEM.

Nutritional Status	Number	Percentage (%)
Weight-for-age (Underweight)		
Normal	170	56.7
Moderate	80	26.7
Severe	50	16.6
Height-for-age (Stunting)		
Normal	110	36.7
Moderate	105	35
Severe	85	28.3
Weight-for-height (Wasting)		
Normal	225	75
Moderate	45	15
Severe	30	10
Mid-arm circumference (PEM)		
Normal	285	95
Mild–Moderate PEM	20	7
Severe PEM	11	3.8

Table 3 shows that there was no statistically significant association between gender and nutritional status among the study children. Underweight was observed in 65 males and 65 females ($\chi^2 = 0.002$, $p = 0.965$), stunting in 95 males and 95 females ($\chi^2 =$

0.01 , $p = 0.92$), and wasting in 35 males and 40 females ($\chi^2 = 0.186$, $p = 0.666$), indicating that the prevalence of underweight, stunting, and wasting was comparable between male and female children.

Nutritional Status	Male (n = 145)	Female (n = 155)	Total	Chi-square	P value
Underweight					
Yes	65	65	130	0.002	0.965
No	80	90	170		
Stunting					
Yes	95	95	190	0.01	0.92
No	50	60	110		
Wasting					

Yes	35	40	75	0.186	0.666
No	110	115	225		

Table 4 indicates that stunting showed a significant association with age group, with prevalence increasing from 6–23 months to 42–60 months ($\chi^2 = 12.86$, $p = 0.0016$), suggesting a cumulative effect of chronic undernutrition as age advances. In contrast,

underweight and wasting did not demonstrate a statistically significant association with age group ($p = 0.576$ and $p = 0.421$, respectively), indicating relatively uniform distribution of these conditions across the different age categories.

Table 4: Association of Age Group with Nutritional Status (N = 300)						
Nutritional Status	6–23 months	24–41 months	42–60 months	Total	Chi-square	P value
Underweight						
Yes	45	40	45	130	1.102	0.576
No	45	65	60	170		
Stunting						
Yes	40	70	80	190	12.86	0.0016*
No	50	35	25	110		
Wasting						
Yes	20	25	30	75	1.73	0.421
No	70	80	75	225		

Table 5 shows that anemia was the most common morbidity among the 300 study children, affecting 35%, followed by acute respiratory tract infections in 20% and fever in 18.3%. Diarrhea was observed in 8.3% of children, while dental caries and skin

infections were reported in 6.7% and 5%, respectively. Notably, more than one morbidity was present in 21.7% of children, indicating a substantial burden of coexisting health problems in this population.

Table 5: Morbidity Pattern Among Study Children (N = 300)		
Morbidity Condition	Number	Percentage (%)
Anemia	105	35
Acute respiratory tract infection (ARTI)	60	20
Fever	55	18.3
Diarrhea	25	8.3
Skin infections	15	5
Dental caries	20	6.7
More than one morbidity	65	21.7

Discussion

In the current study, out of 300 children aged 6–60 months in rural areas, more than half of them (56.7%) had normal weight-for-age, while 43.3% were underweight, out of which 26.7% were moderately underweight and 16.6% severely underweight. This prevalence of underweight children is more than the national average as reported by NFHS-5, documenting 29.6% underweight children in India (International Institute for Population Sciences [IIPS], 2021) [12]. However, it is comparatively lower than that reported by Murarkar et al. (2020) who observed underweight children in 35.4% of under-five children in rural Maharashtra [13]. The possible reason may be due to a difference in the socio-economic status, maternal education, and accessibility to health and nutritional services”.

Stunting emerged as a major nutritional problem in the present study, with 63.3% of the children being stunted, including 28.3% severely stunted. This prevalence is exceedingly higher compared to the

NFHS-5 national estimate of 31.2% stunting (IIPS, 2021) [12], indicating a high burden of chronic undernutrition in the studied population. Similarly high levels of stunting have been documented in other rural and resource-limited settings. Murarkar et al. (2020) reported stunting in 45.9% of children [13], while Gebreselassie et al. (2018) [14] observed a stunting prevalence of 49.4% among children aged 6–59 months in Ethiopia [15]. The higher prevalence in the present study indicates that the children in the current study suffered from inadequate nutrition and repeated infections throughout their early childhood, which cumulatively impaired linear growth.

However, wasting was observed in 25% of children in the present study, wherein 15% were moderately wasted and 10% severely wasted. This is slightly higher compared to the estimate of NFHS-5 as 22.1% wasting [12], though comparable with reports from Murarkar et al., 2020, who reported it to be 17.1% [13]. Wasting is an indicator of acute

undernutrition and can be affected by recent illness or food insecurity. Comparatively lower prevalence of wasting than stunting suggests that chronic nutritional deprivation is more important than acute malnutrition in the study area.

MUAC-based assessment indicated that only 7% of children had mild to moderate protein-energy malnutrition, while 3.8% of them suffered from severe malnutrition. This result is lower than the prevalence from some rural studies using MUAC measurement, which could be attributed to the very high immunization coverage (95%) and also better outreach of child health services in the present study area. According to the WHO Child Growth Standards, MUAC is a sensitive indicator of severe acute malnutrition, and the small prevalence might be indicative of early detection and intervention (WHO, 2006) [16].

The current study did not reveal any statistically significant difference in underweight, stunting, or wasting among male and female children. Indeed, Sang-eetha and Priyadarsini (2018) did not find a significant gender disparity in the nutritional status of under-five children in rural Tamil Nadu [17]; this indicates that, in some rural communities, there is a reduction in gender bias in child feeding and care practices. However, studies have shown higher malnutrition among female children from other areas, indicating regional variations influenced by cultural norms (Shreyaswi et al., 2013) [18].

Age-wise analysis showed that with advancing age, stunting significantly increased from 6–23 months to 42–60 months, indicating a cumulative effect of chronic undernutrition. This finding is in agreement with studies by Gebre et al., 2019, and Gebreselassie et al., 2018, which reported higher odds of stunting among older children than their younger counterparts [19,14]. The critical window of the first 1,000 days of life is crucial for determining linear growth, and inappropriate complementary feeding practices beyond infancy could be a contributing factor to growth faltering in later years.

As for the morbidity pattern, anemia was reported as the most prevalent condition, 35%, followed by acute respiratory tract infection, 20%, and fever, 18.3%. These are closely comparable with studies conducted in similar settings. Kubde and Kokiwar (2013) indicated anemia as the most prevalent morbidity (48.1%) among under-six children, followed by respiratory infections. Anemia is often related to poor dietary iron intake, parasitic infection, and repeated illnesses, a feature common in rural settings. In the current study, the presence of multiple morbidities amongst 21.7% of children further compounds the vicious cycle between undernutrition and infection, as evidence from WHO reports showed that almost 45% of under-five mortality globally is linked to undernutrition (WHO, 2021)

Overall, the findings of the present study highlight a high burden of chronic undernutrition and morbidity among under-five children in rural areas, despite relatively good immunization & other health interventions implementation & coverage. Comparisons with national and international studies show that although some indicators have improved, stunting and anemia remain long-standing challenges requiring integrated nutrition-specific and nutrition-sensitive interventions.

Conclusion

The prevalence of undernutrition among children aged 6-60 months in this rural area is high, and the prevalence of underweight, stunting, and wasting is still a significant public health concern. Stunting represented chronic undernutrition and was rather prominent, showing a strong association with increasing age, which reflects its cumulative burden resulting from a long period of nutritional deprivation. Gender showed no meaningful association with any form of malnutrition, which may suggest that the conditions of boys and girls were similar. Most of the children had a normal mid-arm circumference, indicating relatively lower levels of acute severe malnutrition. The prevalence of morbidity was high, and anemia, respiratory infections, fever, and diarrheal diseases were the most commonly reported conditions; a considerable proportion of children reported multiple illnesses. Thus, the findings highlight the need for continued nutrition-specific interventions, age-appropriate feeding practices, effective anemia control, and enhanced preventive and curative health services as a matter of urgency to ensure better nutritional and health status among young children in rural areas.

References

1. Jelliffe DB, World Health Organization. The assessment of the nutritional status of the community (with special reference to field surveys in developing regions of the world. World Health Organization; 1966.
2. Operational Guidelines on FacilityBased Management of Children with Severe Acute Malnutrition. Ministry of Health and Family Welfare Government of India, 2011 available at www.mohawk.nic.in.
3. Pelletier DL, Frongillo Jr EA, Schroeder DG, Habicht JP. The effects of malnutrition on child mortality in developing countries. Bulletin of the World Health Organization. 1995;73(4):443.
4. Wong's Nutritional assessment - Nursing care of Infants and children, 7th edition, Mosby company, Missouri: 2002, 1692. . Bull World Health Organ. 1995;73(4):443-8.
5. Jyothi LA, Begum K, Saraswathi G, Prakash J. Influence of nutrition and environment on morbidity profile of Indian preschool children.

- Malaysian Journal of Nutrition. 2005;11(2):121- 32.
6. Pada G. Putting the Smallest First. *The Economist*; 23 September 2010.
 7. Navya N, Udayakiran N. A comparative study of anthropometric measurements of children attending urban and rural Anganwadi centres of a coastal district in Karnataka, India. *Int J Community Med Public Health* 2017; 4:91 5.
 8. Manjunath R, Kulkarni P, Begum K, Gangadhar MR. Malnutrition among under-five children of kadukuruba tribe: need to reach the unreached. *Journal of clinical and diagnostic research: JCDR*. 2014 Jul;8(7):JC01.
 9. Shivaprakash NC, Joseph RB. Nutritional status of rural school going children (6 12 Years) of Mandya District, Karnataka. *International journal of scientific study*. 2014;2 (2): 39-43.
 10. Roopadevi V, Karinagannavar A. Nutritional status assessment of under five children in urban field practice area of Mysore. *J Prev Med Holist Health*. 2016; 2:1-3.
 11. Srinivasa SB, Dnyaneshwar B, Ajay U. Anthropometric measurement of weight for assessment of nutritional status of Anganwadi Children in Urban Mangalore–A cross-sectional study. *Anat Physiol*. 2017;7(3):259-63.
 12. National Family Health Survey (NFHS-5), 2019-20.
 13. Murarkar S, Gothankar J, Doke P, Pore P, Lalwani S, Dhumale G, Quraishi S, Patil R, Waghachavare V, Dhobale R, Rasote K. Prevalence and determinants of undernutrition among under-five children residing in urban slums and rural area, Maharashtra, India: a community-based cross-sectional study. *BMC public health*. 2020 Dec; 20(1):1-9.
 14. Geberselassie SB, Abebe SM, Melsew YA, Mutuku SM, Wassie MM. Prevalence of stunting and its associated factors among children 6-59 months of age in Libo-Kemekem district, Northwest Ethiopia; A community based cross sectional study. *PloS one*. 2018 May 3;13(5): e0195361.
 15. Geberselassie SB, Abebe SM, Melsew YA, Mutuku SM, Wassie MM. Prevalence of stunting and its associated factors among children 6-59 months of age in Libo-Kemekem district, Northwest Ethiopia; A community based cross sectional study. *PloS one*. 2018 May 3;13(5): e0195361.
 16. The WHO Child Growth Standards. 2006.
 17. Sangeetha S, Priyadarsini SP: A study on prevalence and determinants of malnutrition among under five children in a rural area, Salem district, Tamil Nadu. *Nat J Basic Med Sci*. 2018; 9: 89-95.
 18. Shreyaswi SM, Rashmi, Udaya Kiran N: Prevalence and risk factors of under nutrition among under five children in a rural community. *J Health Allied Sci NU*. 2013; 3:082-6.
 19. Gebre A, Reddy PS, Mulugeta A, Sedik Y, Kahssay M. Prevalence of malnutrition and associated factors among under-five children in pastoral communities of Afar Regional State, Northeast Ethiopia: a communitybased cross-sectional study. *Journal of nutrition and metabolism*. 2019 Jun 2; 2019.
 20. Kubde SR, Kokiwar PR. A comparative study of morbidity pattern among children of 0-6 years in ICDS and non ICDS area. *MRIMS Journal of Health Sciences*. 2013 Jan 1;1(1):31.
 21. Vassilakou T. Childhood malnutrition: time for action. *Children*. 2021 Feb 3;8(2):103.