

Prevalence and Associated Factors of Anemia among Hospitalized Children Under 5 Years of Age in a Rural Tertiary Care Hospital, Telangana

Khaja Nazeemoddin¹, Mohd. Sirazuddin², Najma Farheen³, B. Koteswar⁴

¹Assistant professor, Department of Pediatrics, Government Medical College, Nagarkurnool, Telangana, India. ²Associate Professor, Department of Pediatrics, Government Medical College, Nagarkurnool, Telangana, India. ³Professor & HOD, Department of General Medicine, Government Medical College, Narayanpet, Telangana, India. ⁴Professor & HOD, Department of Pediatrics, Government Medical College, Nagarkurnool, Telangana, India.

Abstract

Background: Iron deficiency anemia is a common nutritional deficiency found among children, and it is one of the causes of public health concern in India. The most common etiological factors in developing countries include micronutrient deficiencies. The objective of the current study was to determine the prevalence and associated factors of anemia among children of 5 years of age admitted to our tertiary care teaching hospital. **Material and Methods:** This study was conducted over 6 months from July 2025 to Dec 2025 in the Department of Pediatrics, GMC Nagarkurnool. N=659 children aged 1–60 months admitted with various ailments were included. Laboratory investigations were done for Hematological parameters, including hemoglobin, total WBC count, and red cell indices. Data on feeding Practices, junk food, and hematological parameters were collected. Appropriate statistical analysis was applied. **Results:** Moderate anemia was the most common 57.96%. Mixed feeding 80.1% in <2yrs and animal milk 56.3% in >2 yrs were common. Junk food intake was present in 67.7%; microcytic hypochromic anemia predominated. MCH and MCHC showed statistically significant differences, except for MCV. System-wise analysis has shown that nearly 39.9% of respiratory and 36.46% of infectious disease cases were anemic. **Conclusion:** The present study found a high burden of anemia among hospitalized children under 5 years of age, with moderate anemia being the predominant severity category. Microcytic hypochromic morphology was common, particularly among children aged 7–24 months, and RBC morphology varied significantly across age groups.

Keywords: Anemia, Under-five children, Feeding practices, Iron deficiency, Nagarkurnool.

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INTRODUCTION

Anaemia in children is a commonly prevalent nutritional and hematological disorder, and it is one of the important causes of public health problems in India. This disorder is present with higher frequency in children within the age group of 5 years because the rapid growth of the body increases the requirement of iron and other micronutrients. It has been reported by National Family Health Survey-5 reported that 67.1% of Indian children aged 6–59 months were anaemic.^[1] Although several nutritional interventions have been initiated, the burden remains high because of socioeconomic conditions, dietary practices, infections, and access to healthcare, and considerable variation between regions and population groups. The period of infancy and early childhood is characterized by rapid expansion of blood volume and tissue growth, making adequate dietary iron essential. Low iron intake, poor food diversity and inappropriate complementary feeding can result in depletion of iron stores and subsequently anemia. Iron deficiency during early childhood is of particular concern because iron plays an important role beyond erythropoiesis. These include brain development and neurotransmitter function. Deficiency during the first years of life has been associated with impaired cognitive, behavioral and developmental

outcomes.^[2,3] Early identification and correction of nutritional deficiencies are therefore important for both immediate health and long-term development.

Feeding practices have an important influence on the nutritional status of young children. Exclusive breastfeeding during early infancy followed by timely introduction of appropriate complementary foods is recommended to meet the changing nutritional requirements of growing children. Inadequate complementary feeding, limited dietary diversity and excessive consumption of foods with low micronutrient density may increase the risk of nutritional deficiencies. Consumption of large quantities of milk or other foods with relatively low iron content may also reduce the intake of iron-rich foods. These dietary factors are particularly relevant after six months of age,

Address for correspondence: Dr. Mohd Sirazuddin
Associate Professor, Department of Pediatrics, Government Medical College,
Nagarkurnool, Telangana, India.
E-mail: drmdsiraj98@gmail.com

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when breast milk alone is no longer sufficient to meet the infant's increasing nutritional requirements. Anemia in children may also occur in association with acute and chronic illnesses. Infections and inflammation can alter iron metabolism and erythropoiesis, while chronic disease, nutritional deficiencies, blood loss and inherited hemoglobin disorders may contribute to anemia through different mechanisms. Consequently, the presence of anemia in a hospitalized child cannot automatically be attributed to iron deficiency. Hemoglobin concentration and red cell indices such as mean corpuscular volume, mean corpuscular hemoglobin and mean corpuscular hemoglobin concentration can help characterize the morphological pattern, but biochemical assessment is required when definitive identification of iron deficiency is necessary.^[4]

Recent WHO guidance has also emphasized the importance of using appropriate age-specific hemoglobin thresholds when defining anemia in children.^[5] Reliable assessment is particularly relevant in younger children, as hemoglobin concentrations change with age and physiological development. Most available Indian data on childhood anemia are derived from community-based surveys such as NFHS, while relatively fewer studies have specifically examined anemia among children admitted to hospitals. Hospitalized children represent a clinically different population because acute infections, chronic illnesses, nutritional deficiencies and other underlying conditions may coexist and influence hemoglobin levels. Understanding the burden and factors associated with anemia in this setting may help clinicians identify children requiring nutritional assessment and follow-up. The present study was therefore undertaken to determine the prevalence and severity of anemia among hospitalized children under five years of age in a rural tertiary care hospital in Telangana and to evaluate its association with demographic characteristics, feeding practices, dietary factors, red cell indices, and the underlying system of illness.

MATERIALS AND METHODS

This was a cross-sectional study conducted in the Department of Pediatrics, Government Medical College and General Hospital, Nagarkurnool, Telangana, A Tertiary Care Teaching Hospital, from July 2025 to Dec 2025. Institutional Ethical approval was obtained for the study. Written consent was obtained from all the parents/guardians of the children included in the study after explaining the nature of the study in vernacular language.

Study Population: Children aged between 1 month and 60 months admitted with various illnesses who underwent baseline investigations, including complete hemogram and peripheral smear, were included.

Inclusion Criteria:

1. Hospitalized children aged from 1 month to 60 months
2. Parents/guardians signed informed consent
3. Voluntarily willing to participate in the study

Exclusion Criteria:

1. Children with readmission or those with incomplete records or data.
2. Children without complete hemogram evaluation
3. Children with non-nutritional anemia such as thalassemia, sickle cell disease, bleeding disorders, or history of blood transfusion
4. Not willing to participate in the study.

World Health Organization. Guideline on haemoglobin cutoffs to define anaemia in individuals and populations. The WHO 2024 guideline specifies: Age 6–23 months: Hb <10.5 g/dL and 24–59 months: Hb <11.0 g/dL.^[6]

Study Procedure: A total of N=659 eligible children were enrolled through daily screening of admissions during the study period. For each child, data on age, sex, feeding history including exclusive breastfeeding, animal milk, formula feeds, duration, complementary feeding, junk food intake, and primary diagnosis were recorded in a predesigned proforma along with clinical findings. Two millilitres of venous blood in EDTA were collected. Hematological parameters, including hemoglobin, total WBC count, and red cell indices MCV, MCH, MCHC were estimated using a SYSMEX KX-21 automated hematology analyzer. Peripheral blood smears were prepared, stained with Leishman stain, and reviewed by a pathologist. Anemia was defined based on the World Health Organization Guideline on haemoglobin cutoffs to define anaemia in individuals and populations. The WHO 2024 guideline specifies: Age 6–23 months: Hb <10.5 g/dL and 24–59 months: Hb <11.0 g/dL. Severity was classified as: Mild 10.0-10.9 g/dL, Moderate 7.0-9.9 g/dL, Severe <7.0 g/dL.

Statistical Analysis: All the available data were refined, segregated, and uploaded to EpiData version 3.1 and analyzed using SPSS version 26.0. Continuous variables were represented as mean and standard deviation. Descriptive statistics were presented as frequencies and percentages. Association between severity of anemia and study variables was assessed using the Chi-square test. A p-value <0.05 was considered statistically significant.

RESULTS

The description of Demographic profile and WBC count is given in [Table 1]. Out of N=659 children, 18.36% were aged 1–6 months, 40.52% were aged 7–24 months, and 41.12% were aged 25–60 months. Males were 56.9%, and females were 43.1%. Total WBC count was within the normal range in 41.73% of children and abnormal in 58.27%. Respiratory diseases were the common clinical presentation, found in 39.91% of children, followed by infective diseases in 35.96%. Gastrointestinal and central nervous system diseases were present in 6.07% and 6.83% of children, respectively. Cardiovascular and renal diseases were present in 1.67% and 0.46% of children, respectively, while 9.11% had other clinical diagnoses.

Table 1: Demographic profile and WBC count of the cohort)

Parameter	Frequency (n)	Percentage (%)
Age group (months)		
1–6 months	121	18.36
7–24 months	267	40.52
25–60 months	271	41.12
Total	659	100.00
Gender		
Male	375	56.90
Female	284	43.10
Total	659	100.00
Total WBC count		
Normal	275	41.73
Abnormal	384	58.27
Total	659	100.00

Estimation of hemoglobin in this study of 659 children found that 91.3% had anemia, and 8.65% had hemoglobin levels within the normal range. Moderate anemia was found in 59.97% of cases and mild anemia in 20.64% of cases. Severe anemia was found to exist in 12.75% of cases [Table 2]. Systemic illness evaluation found frequent

disease was respiratory disease in 39.9% of cases followed by infective diseases in 35.9% of cases. Gastrointestinal disease and central nervous system disease was in 6.07% and 6.83% respectively. The history of junk food intake showed that 67.68% were involved in junk food intake, and 32.32% had no reported history of junk food intake.

Table 2: Hemoglobin status, system of illness, and history of junk food intake)

Hemoglobin status		
Normal	57	8.65
Mild anemia	136	20.64
Moderate anemia	382	57.97
Severe anemia	84	12.75
Total	659	100.00
System of illness		
Respiratory	263	39.91
Infective diseases	237	35.96
Renal	3	0.46
Gastrointestinal	40	6.07
Central nervous system	45	6.83
Cardiovascular	11	1.67
Others	60	9.11
Total	659	100.00
History of junk food intake		
Yes	446	67.68
No	213	32.32
Total	659	100.00

Feeding Practices among the hospitalized children are depicted in [Table 2 and Figure 2]. N=121 children aged 1–6 months were receiving exclusive breastfeeding. Among children aged 7–24 months, N=214 were classified as receiving mixed feeding, while N=53 were included under

other feeding practices. Among children aged 25–60 months, N=152 were receiving animal milk with complementary feeding, and N=119 were included under other feeding practices [Table 3].

Table 3: Age-wise distribution of feeding practices among hospitalized children

Age group	Exclusive breastfeeding, n (%)	Mixed feeding, n (%)	Animal milk + complementary feeding, n (%)	Other feeding practices, n (%)	Total
1–6 months	121 (100.0)	—	—	—	121
7–24 months	—	214 (80.1)	—	53 (19.9)	267
25–60 months	—	—	152 (56.1)	119 (43.9)	271
Total	121 (18.4)	214 (32.5)	152 (23.1)	172 (26.1)	659 (100.0)

The distribution of red cell indices according to age showed [Table 4] that MCV <75 fL was observed in 57 (47.1%) children aged 1–6 months, 134 (50.2%) children aged 7–24 months, and 135 (49.6%) children aged 25–60 months. The

association between age group and MCV category was not statistically significant ($p=0.093$). The MCH value of <25.4 pg was observed in 43.0%, 45.3%, and 59.9% of children in the 1–6, 7–24, and 25–60-month age groups, respectively.

The association between age group and MCH category was statistically significant $p < 0.0001$. Similarly, $MCHC < 32.9$ g/dL was observed in 44.6%, 49.4%, and 60.7% of children in the respective age groups, with a statistically significant

association ($p = 0.0001$). These findings indicate a greater proportion of children with reduced MCH and MCHC in the older age group.

Table 4: RBC morphology

Age group	Microcytic hypochromic, n (%)	Normocytic normochromic, n (%)	Macrocytic hyperchromic, n (%)	Total
1–6 months	50 (41.3)	50 (41.3)	21 (17.4)	121
7–24 months	128 (47.9)	117 (43.8)	22 (8.2)	267
25–60 months	104 (38.4)	144 (53.1)	23 (8.5)	271

Chi-square; $df = 4$; $\chi^2 = 14.487$; $p = 0.0059$ (Significant)

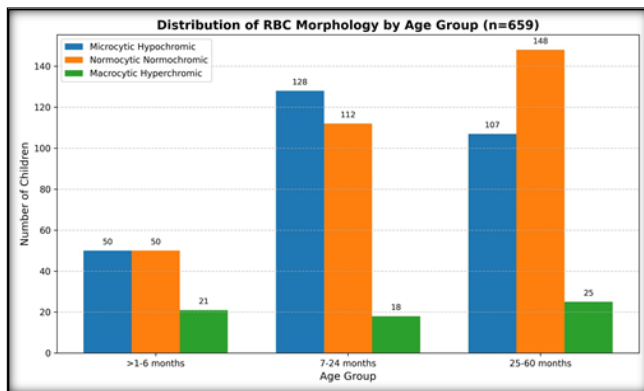


Figure 1: shows the age-wise distribution of anemia according to RBC morphology.

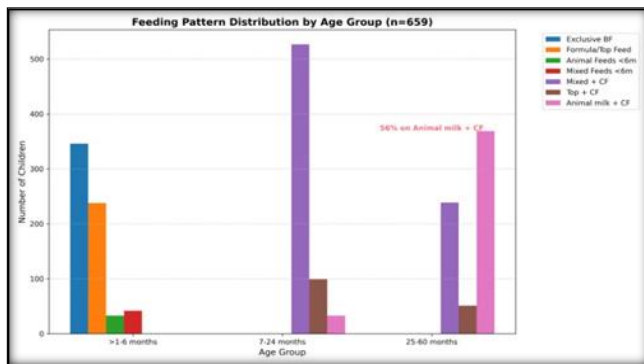


Figure 2: presents the age-wise distribution of feeding practices.

DISCUSSION

The present study found a very high burden of anemia among hospitalized children below the age of 5 years. Out of 659 children, 602 (913.5%) were found to have anemia. The predominant category of anemia was moderate anemia in 57.97% of cases, followed by mild anemia in 20.64% of cases. The prevalence of severe anemia was lower, at 12.75% of cases. This prevalence is considerably higher than other Indian surveys and studies such as NFHS-5 for India (67.1%) and Telangana (70.0%), as well as the 40.5% prevalence reported among children aged 12–59 months in the Comprehensive National Nutrition Survey (CNNS) 2016–18.^[6,7] One reason could be that we included a hospital-based population, which is not a true reflection of normal populations, because these participants were

admitted for various illnesses; therefore, the anemia prevalence could be higher. Therefore, in a strict sense, these findings could not be interpreted as an estimate of community prevalence. The higher prevalence of moderate anemia in this cohort is clinically important. The physiological explanation is that young children have high physiological requirements for iron because of rapid expansion of blood volume, tissue growth, and neurodevelopment. The other reasons, including inadequate dietary iron intake, poor iron bioavailability, and increased requirements during growth, can contribute to iron deficiency during early childhood.^[9] The Indian Academy of Pediatrics also emphasizes nutritional deficiencies as an important contributor to childhood anemia and recommends evaluation and management based on clinical history, examination, and hematological findings, with serum ferritin used when confirmation of iron deficiency is required.^[10] The analysis of feeding pattern in this study showed that there are many potential nutritional vulnerabilities. The results showed that in children aged 7–24 months, mixed feeding was higher at 80.1%, while among those aged 25–60 months, 56.1% were reported to receive animal milk in addition to complementary feeding. About 67.68% had a history of junk-food consumption habits. These findings suggest that dietary quality may be an important area for intervention. However, because the present analysis did not establish an anemia-by-feeding-practice association using appropriate analysis, these observations should be considered descriptive rather than evidence of an independent causal relationship. Studies from India in the past on this topic have shown similar associations between childhood anemia and nutritional, socioeconomic, and illness-related factors.^[8]

Microcytic hypochromic morphology was seen in 41.3% of children aged 1–6 months, 47.9% of children aged 7–24 months, and 38.4% aged 25–60 months. There was a significant difference in the distribution of RBC morphologies between age groups ($p = 0.0059$). This relative increase in microcytic hypochromic morphology in the age group 7–24 months is biologically plausible, as this is the period of rapid growth and dependence on complementary feeding. However, the combination of microcytosis and hypochromia is not sufficient to establish iron-deficiency anemia; other conditions may result in the same hematologic pattern, such as anemia associated with inflammation and inherited hemoglobin disorders.^[9,11] It should also be noted that respiratory and infectious diseases are important causes of admission of children. Altered iron metabolism and impaired erythropoiesis are the two ways by

which inflammation and infection can cause anemia. In the absence of biochemical iron studies, the absence of anemia in the present study may not be definitive evidence of iron-deficiency anemia since ferritin is an acute-phase reactant.^[11,12] In future studies, serum ferritin should be included, as well as an inflammatory marker like CRP, if applicable, the transferrin saturation, and other relevant tests. Results of the study reinforce efforts to enhance age-appropriate infant and young-child feeding practices, dietary diversification, and established anemia-prevention strategies. While interventions like micronutrient fortification of complementary food may be effective in improving hemoglobin levels and reducing the prevalence of anemia, prevention and treatment should be based on the underlying cause and not be based on the assumption that all anemic children in a hospital setting have nutritional iron deficiency. Based on the above results, systematic assessment of anemia in children admitted to hospital is needed, in addition to nutritional advice and proper follow-up after discharge.

CONCLUSION

The present study found a high burden of anemia among hospitalized children under 5 years of age, with moderate anemia being the predominant severity category. Microcytic hypochromic morphology was common, particularly among children aged 7–24 months, and RBC morphology varied significantly across age groups. Frequent consumption of junk food and suboptimal feeding practices indicate potentially important nutritional concerns. However, morphological findings alone cannot confirm iron deficiency. These findings emphasize the importance of early identification and appropriate evaluation of anemia, age-appropriate complementary feeding, dietary diversification, nutritional counseling, and timely management of underlying causes among young children.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. International Institute for Population Sciences (IIPS), ICF. National Family Health Survey (NFHS-5), 2019–21: India. Mumbai: IIPS; 2021. Pdf available on <https://dhsprogram.com/pubs/pdf/FR375/FR375.pdf> [Last accessed May 15th 2026]
2. Lozoff B, Beard J, Connor J, Felt B, Georgieff M, Schallert T. Long-lasting neural and behavioral effects of iron deficiency in infancy. *Nutr Rev*. 2006;64(5 Pt 2):S34-43.
3. World Health Organization. WHO guidance helps detect iron deficiency and protect brain development. Geneva: World Health Organization; 2020. (World Health Organization)
4. Camaschella C. Iron-deficiency anemia. *N Engl J Med*. 2015;372(19):1832-43.
5. World Health Organization. Guideline on haemoglobin cutoffs to define anaemia in individuals and populations. Geneva: World Health Organization; 2024. Available from <https://www.who.int/publications/i/item/9789240088542> [Last accessed on May 20th 2026]
6. Khurana R, Kanvinde P, Mudaliar S. Revised WHO Guidelines on Hemoglobin Cutoffs to Define Anemia in Individuals and Populations. *Indian Pediatr*. 2024 Jul 15;61(7):671-674.
7. Yadav K, Ramaswamy G, Puri S, Vohra K, Achary T, Jaiswal A, et al. Prevalence and determinants of anemia due to micronutrient deficiencies among children aged 12–59 months in India—Evidence from Comprehensive National Nutrition Survey, 2016–18. *PLOS Glob Public Health*. 2024;4(1): e0002095.
8. Armitage AE, Moretti D. The importance of iron status for young children in low- and middle-income countries: a narrative review. *Pharmaceuticals (Basel)*. 2019;12(2):59.
9. Chandra J, Dewan P, Kumar P, Mahajan A, Singh P, Dhingra B, et al. Diagnosis, treatment and prevention of nutritional anemia in children: recommendations of the Joint Committee of Pediatric Hematology-Oncology Chapter and Pediatric and Adolescent Nutrition Society of the Indian Academy of Pediatrics. *Indian Pediatr*. 2022;59(10):782-801.
10. Suchdev PS, Williams AM, Mei Z, Flores-Ayala R, Pasricha SR, Rogers LM, et al. Assessment of iron status in settings of inflammation: challenges and potential approaches. *Am J Clin Nutr*. 2017;106(Suppl 6):1626S-1633S.
11. World Health Organization. WHO guideline on use of ferritin concentrations to assess iron status in individuals and populations. Geneva: World Health Organization; 2020. <https://www.who.int/publications/i/item/9789240000124> [Last accessed on May 20th 2026]
12. Jefferds MED, Irizarry L, Yousafzai AK, et al. Home fortification of complementary foods reduces anemia and diarrhea among children aged 6–18 months in Bihar, India: a large-scale effectiveness trial. *J Nutr*. 2021;151(7):1894-1904.
13. World Health Organization. Daily iron supplementation in children 6–23 months of age. Geneva: World Health Organization; 2023. Available from <https://www.who.int/publications/i/item/9789241549523> [Last accessed June 1st 2026]
14. World Health Organization. Accelerating anaemia reduction: a comprehensive framework for action. Geneva: World Health Organization; 2023. Available from <https://www.who.int/publications/i/item/9789240074033> [Last accessed on June 8th 2026]