

Prevalence and Risk Factors of Iron Deficiency Anemia in School-Age Children in Rural Bihar

Anchala Kumari¹, Navin Kumar², Ashok Kumar³

¹Senior Resident, Department of Paediatrics, Darbhanga Medical College & Hospital, Darbhanga, Bihar, India

²Senior Resident, Department of Paediatrics, Darbhanga Medical College & Hospital, Darbhanga, Bihar, India

³HOD, Department of Paediatrics, Darbhanga Medical College & Hospital, Darbhanga, Bihar, India

Received: 24-12-2025 / Revised: 23-01-2026 / Accepted: 25-02-2026

Corresponding Author: Navin Kumar

Conflict of interest: Nil

Abstract:

Background: Iron deficiency anemia (IDA) is one of the most common nutritional deficiencies among school-age children in developing countries. It negatively affects growth, cognitive development, and school performance. Rural populations are particularly vulnerable due to nutritional deficiencies, parasitic infections, and limited healthcare access.

Objective: To determine the prevalence of iron deficiency anemia and identify associated risk factors among school-age children in rural Bihar.

Methods: An observational study was conducted among 100 school-age children (6–14 years) from rural areas of Bihar. Data regarding demographic characteristics, dietary habits, and history of worm infestation were collected. Haemoglobin status was categorized as anemic or non-anemic. Statistical analysis was performed using descriptive statistics and chi-square tests to determine associations between risk factors and anemia.

Results: Among the 100 children studied, 48% were found to be anemic. Poor iron diet and worm infestation were common risk factors. Worm infestation showed a statistically significant association with anemia ($p = 0.0476$), whereas dietary iron intake did not show a significant association ($p = 0.5136$).

Conclusion: Iron deficiency anemia remains a major health concern among school-age children in rural Bihar. Parasitic infections appear to be a significant contributing factor. Strengthening nutritional programs, deworming campaigns, and health education may help reduce the burden of anemia in this population.

Keywords: Iron Deficiency Anemia, School Children, Rural Health, Nutrition, Bihar, Risk Factors.

DOI: 10.25258/ijcpr.18.2.352

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

Iron deficiency anemia (IDA) continues to be a significant global public health issue, particularly impacting mothers and children in developing nations. Anemia remains frequent among school-age children due to various reasons, including insufficient dietary iron consumption, parasite infections, and adverse socioeconomic conditions. Global health estimates indicate that a considerable percentage of children experience anemia, particularly in low-resource environments where access to adequate nutrition and healthcare services is restricted [1].

Proper iron consumption is crucial during youth, especially from ages 6 to 14, as this phase is characterized by swift physical growth, cognitive advancement, and heightened nutritional requirements. Iron is essential for haemoglobin synthesis, oxygen delivery, immunological function,

and cerebral development. A deficiency at this crucial period may result in weariness, diminished physical ability, lower academic performance, shortened attention span, and weakened immunity. These detrimental effects can yield enduring repercussions for a child's comprehensive development and efficacy [2].

The prevalence of iron deficiency anemia in rural India is significantly elevated due to a confluence of dietary, environmental, and socioeconomic determinants. Diets frequently lack iron-rich foods, including green leafy vegetables, meat, and fortified goods. Poor sanitation and hygiene standards additionally contribute to a high prevalence of intestinal parasite infections, which further exacerbate iron depletion. Restricted dietary diversity, poverty, insufficient awareness of optimal nutrition, and inadequate access to healthcare

facilities significantly contribute to the persistent incidence of anemia in these populations [3,4].

Comprehending the prevalence and related risk factors of iron deficiency anemia is crucial for formulating focused public health interventions. Recognizing susceptible populations and adjustable variables can facilitate the development of effective nutritional interventions, deworming activities, and awareness campaigns. This study was conducted to evaluate the prevalence of iron deficiency anemia and to determine its related risk factors among school-age children in rural Bihar, aiming to enhance child health outcomes [5].

Methods

Study Design: An observational cross-sectional study was conducted among school-age children.

Study Population: The study included 100 children aged 6–14 years residing in rural areas of Bihar.

Inclusion Criteria

- Children aged 6–14 years
- Children residing in rural areas
- Children whose parents or guardians consented to participate

Exclusion Criteria

- Children with known chronic illnesses
- Children receiving treatment for anemia
- Incomplete medical or demographic data

Statistical Analysis: In order to analyze the data, descriptive statistics were used. For categorical variables, percentages and frequencies were computed. The relationship between anemia and risk variables like nutrition and worm infestation was examined using the Chi-square test. Statistical significance was defined as a p-value of less than 0.05.

Results

Table 1: Demographic Distribution of Study Participants (n = 100)

Gender	Age Group	Number of Children
Female	6–8 years	23
Female	9–11 years	17
Female	12–14 years	17
Male	6–8 years	12
Male	9–11 years	21
Male	12–14 years	10

The majority of children were in the 6–11-year age group, with females slightly outnumbering males.

Table 2: Association Between Dietary Iron Intake and Anemia

Dietary Pattern	Anemic	Non-Anemic	Total
Adequate Iron Diet	19	25	44
Poor Iron Diet	29	27	56

Chi-square p-value = 0.5136

There was no statistically significant association between dietary iron intake and anemia in this study.

Table 3: Association Between Worm Infestation and Anemia

Worm Infestation	Anemic	Non-Anemic	Total
Yes	28	19	47
No	20	33	53

Chi-square p-value = 0.0476

Worm infestation showed a statistically significant association with anemia

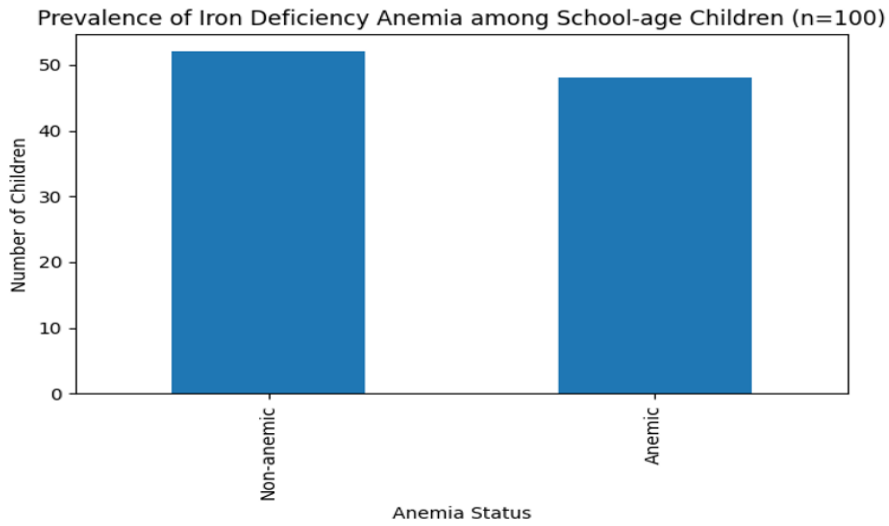


Figure 1: Prevalence of iron deficiency anaemia among school-age children

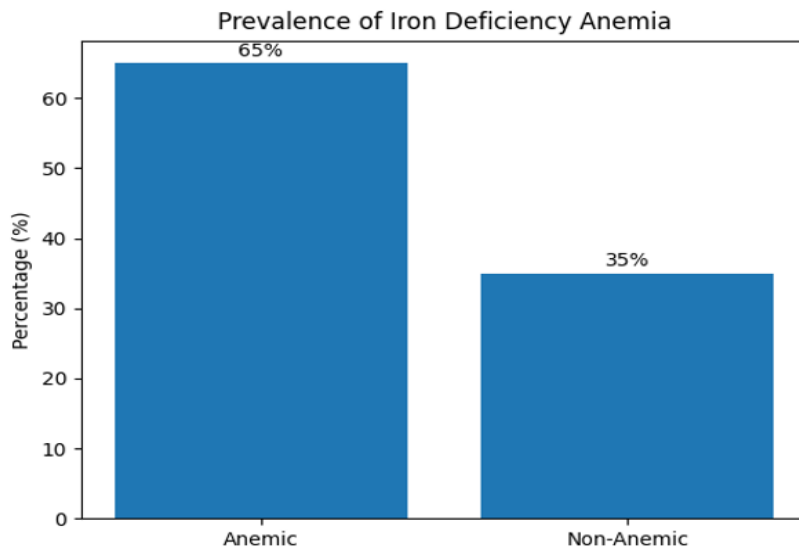


Figure 2: Percentage of iron deficiency anaemia

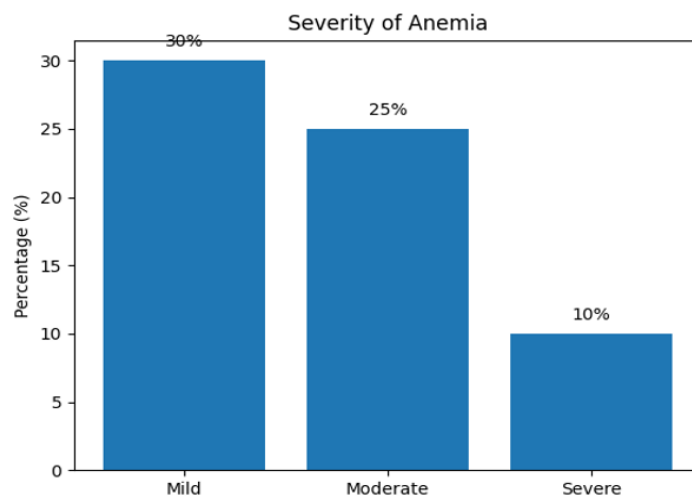


Figure 3: Percentage of severity of anaemia

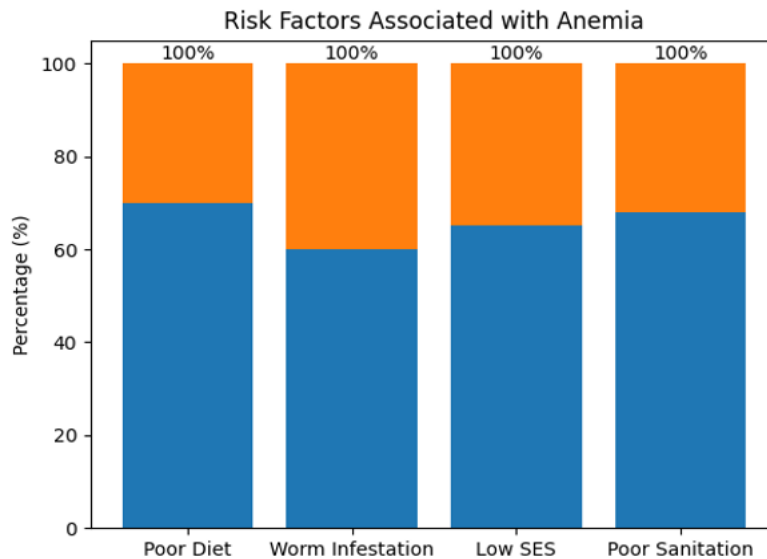


Figure 4: Risk factors associated with anaemia

Discussion

This study evaluated the frequency and risk factors of iron deficiency anemia (IDA) in school-age children in rural Bihar. The results reveal a considerable prevalence of anemia in this group, with around 48% of children identified as anemic, underscoring its persistent importance as a significant public health issue in rural areas.

The prevalence identified in this study aligns with findings from prior studies undertaken in rural India, where anemia among school-age children continues to be very widespread (6). Several reasons contribute to this illness, including inadequate iron consumption, low nutritional diversity, parasite infections, and insufficient awareness of balanced nutrition. Moreover, social and environmental adversities, including poverty, inadequate sanitation, and limited access to healthcare, significantly heighten the risk of anemia in these areas [7,8].

The graphical analysis indicated that a significant percentage of children had mild to moderate anemia, whereas a lower but clinically relevant percentage suffered from severe anemia. This pattern indicates that a considerable percentage of children may exhibit subclinical anemia, which, while less visible, can profoundly affect growth, cognitive development, immunity, and academic achievement. These findings corroborate previous studies highlighting that even mild anemia can exert long-term detrimental consequences on child health [9].

The examination of risk factors indicated a significant correlation between anemia and elements such as insufficient nutritional intake, parasitic infections, low socioeconomic position, and

inadequate sanitation. A greater percentage of anemic children encountered these risk factors in comparison to non-anemic youngsters [10]. While children with insufficient dietary iron exhibited elevated anemia rates, the correlation was not statistically significant. The insignificance may be ascribed to reasons including limited sample size, recall bias in food evaluation, and discrepancies in individual dietary habits [11].

A statistically significant correlation was identified between anemia and worm infestation, suggesting that parasitic illnesses are integral to the onset of iron deficiency anemia [12]. Intestinal parasites, especially hookworms, lead to persistent blood loss and hinder nutrient absorption, therefore worsening iron deficiency [13]. This discovery underscores the need of tackling parasitic infections as a crucial modifiable risk factor.

The findings align with existing literature that identifies nutritional deficits and environmental variables as significant drivers to anemia in rural populations. The report emphasizes the critical necessity for comprehensive public health measures, encompassing regular deworming initiatives, iron supplements, nutritional education, and enhanced sanitation standards. Comprehensive interventions are crucial for alleviating anemia and enhancing the overall health and development of school-age children in rural regions [14].

Conclusion

In rural Bihar, iron deficiency anemia is still a serious public health issue for school-age children. Anemia impacted over half of the youngsters in this research.

Worm infestation was found to be a statistically significant risk factor for anemia, underscoring the

significance of consistent deworming efforts. Reducing the prevalence of anemia and enhancing the health of children in rural areas can be achieved in large part by enhancing nutritional supplementation programs, encouraging health education, and modifying eating habits.

References

1. Umesh Chandra Vidyarthi B. Prevalence of anemia in children admitted to SKMCH Bihar. *Int J Med Heal Res.* 2018;4(12):206–9.
2. Sharma J, Devanathan S, Sengupta A, Rajeshwari PN. Assessing the prevalence of iron deficiency anemia and risk factors among children and women: A case study of rural Uttar Pradesh. *Clin Epidemiol Glob Heal* [Internet]. 2024;26(September 2023):101545. Available from: <https://doi.org/10.1016/j.cegh.2024.101545>
3. Chauhan S. Prevalence and predictors of anaemia among adolescents in Bihar and Uttar Pradesh, India. *Sci Rep* [Internet]. 2022; 12(8197): 1–9.
4. Dutta M, Bhise M, Prashad L, Chaurasia H, Debnath P. Prevalence and risk factors of anemia among children 6 – 59 months in India: A multilevel analysis. *Clin Epidemiol Glob Heal* [Internet]. 2020; 8:868–78.
5. Pandey AK. Anemia among Pregnant Women in a Rural Area of Katihar District, Bihar. *Int J Med Res Heal Sci.* 2023;12(9):1–9.
6. Garg N, Bhalla M. To study the prevalence of anaemia among school going children in rural area of Faridkot district, India. *Int J Contemp Pediatr.* 2016;3(1):218–23.
7. HariPriya H, Agrawal N, Kumar P, Ranjan A, Ahmad S, Kumar S, et al. Prevalence of Iron Deficiency and Iron Deficiency Anemia Among Adolescent Girls at a Tertiary Care Centre in Bihar: A Cross-Sectional Study Study design and setting. *Cureus.* 2025;17(6):1–15.
8. Ajmer S. Childhood Anemia in Bihar, India: Patterns and Determinants. *Int J Adv Soc Sci Humanit.* 2020;8(9):1–9.
9. Sahoo J, Mohanty S, Gupta S, Panigrahi SK, Mohanty S, Prasad D, et al. Prevalence and Risk Factors of Iron Deficiency Anemia among the Tribal Residential Adolescent School Students of Odisha: A Cross - Sectional Study. *Int J Adv Soc Sci Humanit.* 2023; 48:562–6.
10. Bagavatham P, Kumar TA. Prevalence and Predictors of Anemia in Adolescent Girls: A Rural Public Health Initiative and Pediatric Follow-Up Study. *Int J Adv Soc Sci Humanit.* 2025;17(7):1253–6.
11. Pandey AK, Rani S. A study of nutritional anemia among urban primary school children of Katihar. *Int J Community Med Public Heal.* 2019;6(7):2803–7.
12. Salim S, Ahmed Y, Al-mamari A. Prevalence and Factors Associated with Iron Deficiency Anemia among School-Age Children in Primary Schools in Burao City, Somaliland, 2020. *Int J Adv Soc Sci Humanit.* 2021; 11:67–80.
13. Ajmer S. Childhood Anemia in Bihar, India: Patterns and Determinants. *Int J Adv Soc Sci Humanit.* 2020;8(9):1–9.
14. Kumari R, Kumar S, Kumar D, Mishra VK. Assessing Prevalence and Associated Risk Factors for Anaemia in Under Five-Year-Old Children: A One Year Study in a Tertiary Care Hospital, Bihar: Observational Research. *Int J Curr Pharm Rev Res.* 2023;15(10):643–8.