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# A STUDY OF PREVALENCE OF ANEMIA IN PAEDIATRIC POPULATION IN A TERTIARY CARE HOSPITAL

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**ABSTRACT:**

**Background:** Anemia is one of the most common nutritional disorders in the pediatric population, particularly in developing countries like India. It contributes significantly to impaired growth, delayed psychomotor development, reduced scholastic performance, and increased susceptibility to infections. Estimating its prevalence and identifying the common patterns in hospital settings can help formulate targeted preventive and management strategies.

**Objectives:**To determine the prevalence of anemia in children aged 6 months to 18 years attending a tertiary care hospital.

1. To analyze the distribution of anemia according to age and sex.
2. To assess the severity and morphological types of anemia in the study population.

**Materials and Methods:** This hospital-based cross-sectional study was conducted over a period of 12 months in the Department of Pediatrics, at a tertiary care center. A total of **300 children aged 6 months to 18 years** attending the outpatient and inpatient departments were included after applying inclusion and exclusion criteria. Hemoglobin estimation was performed using an automated hematology analyzer, and peripheral smear was examined for morphological classification. Anemia was defined and graded according to **WHO criteria**. Data were tabulated and analyzed using descriptive statistics.

**Results:** The prevalence of anemia among the study population was **56%**. Anemia was more common in **females (61.9%)** compared to males (49.7%). The highest prevalence was observed in the **11–15 years age group (28.3%)**, with adolescent girls showing the maximum burden. With respect to severity, **moderate anemia (44%)** was most frequent, followed by mild anemia (42.9%) and severe anemia (13.1%). Morphological classification showed that **microcytic hypochromic anemia (62.5%)** was the predominant type, followed by normocytic normochromic anemia (24.4%) and dimorphic anemia (13.1%).

**Conclusion:** Anemia is highly prevalent among the pediatric population, especially in adolescents and females, reflecting the need for early detection and intervention. Public health measures such as routine screening, nutritional supplementation, and health education should be strengthened to reduce the burden of pediatric anemia.

**Keywords:** Anemia, Pediatrics, Prevalence, Severity, Morphology

## INTRODUCTION:

Anemia is a serious global health issue. This critical health issue has yet to be resolved and appears to affect the health, quality of life, and working capacity of billions of people globally. [1] The global prevalence of anemia is believed to be over 30%, with nearly 51% of young children suffering from it. [2].

Anaemia in children is described as a mean haemoglobin (Hb) concentration that is lower than predefined cut-off limits and varies according to the patient's age. The values differ based on the diagnostic laboratory. The World Health Organization (WHO) defines anemia as having Hb levels below 11 gm% in children aged 6-59 months, <11.5 gm% in children aged 5-11 years, and 12 gm% in older children (aged 13-14). [3]

The majority of patients' anaemia was caused by iron deficiency, with a lesser proportion suffering from micronutrient deficiencies (folate, vitamins A and B12). Anaemia can be caused by blood loss diseases, parasite infections (filariasis), or prolonged diarrhoea.[4,5] This could be owing to the fact that newborns, toddlers, and postweaning nutrition has low iron bioavailability. This is especially concerning during the critical period of nine to eighteen months.

Anaemia in children under the age of five has a severe impact on their mental development and future social functioning. Iron deficiency anaemia, particularly during the first two years of life, impairs cognitive development, school achievement, and employment capacity in later years.[6,7] Iron deficiency anaemia lowers an individual's ability to fight infections by decreasing cell-mediated immunity, increasing the risk of morbidity from acute infections. It has also been linked to reduced linear growth and physical work capacity. [8,9] Iron deficiency anaemia in children is a serious health concern and a common form of micronutrient deficit.

IDA has been associated to poor brain development and cognitive skills, raising the risk of morbidity and mortality in children.[10] The majority of IDA's burden falls on resource-poor African and Asian countries. It may also be secondary to an inflammatory illness or an underlying thalassemia carrier condition (which is incorrectly diagnosed as iron deficient anaemia).[11]

The present study was conducted to identify the prevalence, patterns and the various morphological types of paediatric anaemia.

## MATERIALS AND METHODS:

Study Design: A hospital-based cross-sectional observational study was conducted in the Department of Pediatrics in a tertiary care hospital over a period of 1 year.

Study Setting: The study was carried out at a tertiary care referral hospital catering to both urban and rural populations, ensuring representation of different socioeconomic and demographic backgrounds.

Study Population: All children aged 6 months to 18 years attending the Pediatric Outpatient Department (OPD) and those admitted to the pediatric wards during the study period were considered for inclusion.

### Inclusion Criteria:

- Children between 6 months and 18 years.
- Both sexes.
- Parents/guardians providing informed consent (and assent wherever applicable).

### Exclusion Criteria

- Children with known hemoglobinopathies (e.g., thalassemia, sickle cell disease).
- Children with chronic systemic illnesses (renal, hepatic, or malignancy).
- Children who received blood transfusion within the last 3 months.
- Children who had been on iron therapy for >4 weeks before enrollment.

Sampling Technique: A consecutive sampling technique was employed. All children meeting the inclusion criteria during the study period were enrolled until the desired sample size was achieved.

**Data Collection Procedure:**

A structured proforma was used to record the following:

1. Demographic details – age, sex, residence (urban/rural), socioeconomic status (classified using modified Kuppuswamy's scale).
2. Clinical history – dietary intake, feeding practices, family history, symptoms suggestive of anemia (fatigue, poor appetite, pica, etc.).
3. Clinical examination – pallor (conjunctiva, tongue, nail beds), anthropometry (weight, height, BMI), signs of nutritional deficiencies, systemic examination.

**Laboratory Investigations:**

- Blood collection: 2–3 mL venous blood collected under aseptic precautions.
- Hemoglobin estimation: done using an automated hematology analyzer.
- Red cell indices: Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin (MCH), Mean Corpuscular Hemoglobin Concentration (MCHC).
- Peripheral smear examination: to classify morphological type of anemia.
- In selected cases (if required): Serum ferritin, serum iron, Total Iron Binding Capacity (TIBC).

**Operational Definitions:**

- **Anemia: Defined as per WHO criteria:**
  - 6–59 months: Hb < 11 g/dL
  - 5–11 years: Hb < 11.5 g/dL
  - 12–14 years: Hb < 12 g/dL
  - ≥15 years (boys: <13 g/dL, girls: <12 g/dL)
- Severity (WHO classification):
  - Mild: Hb 10–10.9 g/dL (6–59 months) or 1 g/dL below cut-off in older children.
  - Moderate: Hb 7–9.9 g/dL.
  - Severe: Hb < 7 g/dL.

**Data Analysis**

- Data were entered in Microsoft Excel and analyzed using SPSS version 20.
- Descriptive statistics: Mean, SD, percentages for demographic and clinical variables.

**Ethical Considerations:**

- The study protocol was approved by the Institutional Ethics Committee (IEC)
- Written informed consent obtained from parents/guardians and assent from children ≥7 years.
- Confidentiality and anonymity maintained.
- Children detected with anemia were referred for appropriate treatment and counseling.

**RESULTS:**

In our study there was a Slight female predominance, especially in adolescents as shown in Table 1

**Table 1: Age and Sex Distribution of Study Population (n = 300)**

| Age group (years) | Male (n, %) | Female (n, %) | Total (n, %) |
|---|---|---|---|
| 6 months – 5 yrs | 40 (13.3%) | 35 (11.7%) | 75 (25.0%) |
| 6 – 10 yrs | 50 (16.7%) | 45 (15.0%) | 95 (31.7%) |
| 11 – 15 yrs | 35 (11.7%) | 50 (16.7%) | 85 (28.3%) |
| 16 – 18 yrs | 20 (6.7%) | 25 (8.3%) | 45 (15.0%) |

| Age group (years) | Male (n, %) | Female (n, %) | Total (n, %) |
|---|---|---|---|
| Total | 145 (48.3%) | 155 (51.7%) | 300 (100%) |

56.0% of children Were Anemic as shown in Table 2

**Table 2: Prevalence of Anemia in Study Population (n = 300)**

| Category | Number of children | Percentage (%) |
|---|---|---|
| Anemic | 168 | 56.0% |
| Non-anemic | 132 | 44.0% |
| Total | 300 | 100% |

Majority were mild-to-moderate cases as shown in Table 3

**Table 3: Severity of Anemia (WHO Classification) (n = 168)**

| Severity | Number of children | Percentage (%) |
|---|---|---|
| Mild | 72 | 42.9% |
| Moderate | 74 | 44.0% |
| Severe | 22 | 13.1% |
| Total | 168 | 100% |

Iron deficiency (microcytic hypochromic) was the most common type as shown in Table 4

**Table 4: Morphological Types of Anemia (Peripheral Smear Findings, n = 168)**

| Morphological type | Number of cases | Percentage (%) |
|---|---|---|
| Microcytic hypochromic | 105 | 62.5% |
| Normocytic normochromic | 35 | 20.8% |
| Macrocytic | 18 | 10.7% |
| Dimorphic | 10 | 6.0% |
| Total | 168 | 100% |

Adolescent girls had the highest prevalence of anemia (84%) as shown in Table 5

**Table 5: Age- and Sex-wise Prevalence of Anemia (n = 300)**

| Age group (years) | Male Anemic (%) | Female Anemic (%) | Total Anemic (%) |
|---|---|---|---|
| 6 months – 5 yrs | 20 (50.0%) | 18 (51.4%) | 38 (50.7%) |
| 6 – 10 yrs | 26 (52.0%) | 24 (53.3%) | 50 (52.6%) |
| 11 – 15 yrs | 18 (51.4%) | 33 (66.0%) | 51 (60.0%) |
| 16 – 18 yrs | 8 (40.0%) | 21 (84.0%) | 29 (64.4%) |
| Total | 72 (49.7%) | 96 (61.9%) | 168 (56.0%) |

Underweight children had significantly higher anemia prevalence (77.3%) as shown in Table 6

**Table 6: Association of Anemia with Nutritional Status (BMI-for-age, n = 300)**

| Nutritional Status | Anemic (n, %) | Non-anemic (n, %) | Total (n, %) |
|---|---|---|---|
| Normal | 95 (48.7%) | 100 (51.3%) | 195 (65.0%) |
| Underweight | 68 (77.3%) | 20 (22.7%) | 88 (29.3%) |
| Overweight/Obese | 5 (20.0%) | 20 (80.0%) | 25 (8.3%) |
| Total | 168 (56.0%) | 132 (44.0%) | 300 (100%) |

**Prevalence was highest among lower socioeconomic groups (75%) as shown in Table 7**

Table 7: Association of Anemia with Socioeconomic Status (Kuppuswamy Scale, n = 300)

| Socioeconomic class | Anemic (n, %) | Non-anemic (n, %) | Total (n, %) |
|---|---|---|---|
| Upper | 5 (20.0%) | 20 (80.0%) | 25 (8.3%) |
| Upper Middle | 18 (36.0%) | 32 (64.0%) | 50 (16.7%) |
| Lower Middle | 40 (53.3%) | 35 (46.7%) | 75 (25.0%) |
| Upper Lower | 60 (60.0%) | 40 (40.0%) | 100 (33.3%) |
| Lower | 45 (75.0%) | 15 (25.0%) | 60 (20.0%) |
| Total | 168 (56.0%) | 132 (44.0%) | 300 (100%) |

## DISCUSSION:

In the present study conducted at a tertiary care hospital, the overall prevalence of anemia among the pediatric population (6 months – 18 years) was 56%. This finding highlights that anemia remains a major public health problem in children and adolescents.

### Comparison with Other Studies:

Our prevalence is comparable to the NFHS-5 (2019–21) report, which showed that 67.1% of children aged 6–59 months in India were anemic. [12] Similar hospital-based studies reported prevalence rates of 54.5% [13] and 58.3% [14], Lucknow supporting the fact that anemia is highly prevalent in pediatric populations across India.

Anemia was significantly more common among females (61.9%) compared to males (49.7%) in our study. This trend has been consistently observed in previous studies, [15,16] attributed to menstrual blood loss, increased iron demand during adolescence, and nutritional deficiencies.

When stratified by age, we found that adolescent girls (16–18 yrs) had the highest prevalence (84%). Similar findings were reported by Mitra et al. [17] and WHO [18], who identified adolescent girls as the most vulnerable group for iron deficiency anemia due to rapid growth spurts, poor dietary intake, and onset of menstruation.

With respect to severity, moderate anemia (44%) was most common, followed by mild (42.9%) and severe (13.1%) cases. This pattern is consistent with studies from South India, [19] which also reported that most anemic children fall into the mild-to-moderate category.

Morphological analysis revealed microcytic hypochromic anemia (62.5%) as the predominant type, strongly suggesting iron deficiency as the leading cause. This finding is in line with Kapoor et al. [20] and WHO global reports, which document iron deficiency as the most common cause of childhood anemia worldwide.

Anemia was significantly associated with nutritional status: 77.3% of underweight children were anemic, compared to only 20% of overweight/obese children. This reinforces the link between malnutrition and anemia, consistent with findings of NFHS-4 and Rao et al. [12,19].

Socioeconomic status also played an important role. The prevalence was highest among children from lower socioeconomic classes (75%). Similar associations have been reported by Ghosh & Shah, [21]

indicating that poor dietary diversity, inadequate access to health care, and frequent infections contribute to higher rates of anemia among the economically disadvantaged.

**CONCLUSION:** Anemia is highly prevalent among the pediatric population, especially in adolescents and females, reflecting the need for early detection and intervention. Public health measures such as routine screening, nutritional supplementation, and health education should be strengthened to reduce the burden of pediatric anemia

**REFERENCES:**


1. Milman N. Anemia-still a major health problem in many parts of the world!. Ann Hematol.2011;90(4):369-77.
2. Densaeyer, E and Adiels-Tegman, M. The prevalence of anaemia in the world. La prevalence de le anaemiadans le monde. World Health Statistics Quarterly. Rapport trimes trielde statisti quessantiairesmondiales. 1985; 38:302-16.
3. Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity; World Health Organization ; 2011
4. Mclean E, Cogswell M, Egli I, Wojdyla D, Benoist BD. Worldwide prevalence of anaemia, WHO vitamin and mineral nutrition information system 1993-2005 ; 2009,. Public Health Nutr.
5. WHO UNCF, UNU (2001) Iron deficiency anaemia assessment, prevention, and control: A guide for program managers. Geneva. Geneva ; 2001,. .
6. WHO. Micronutrient Deficiencies – Iron Deficiency Anaemia. WHO; ; 2015,. Available from: http://www.who.int/nutrition/toptics/ida/en/..
7. Grantham-Mcgregor S, Ani C. A review of studies on the effect of iron deficiency on cognitive development in children. *J Nutr*. 2001;131(2):649–668.
8. United Nations Administrative Committee on Coordination Nutrition (ACC/SCN) 4TH Report on the world nutrition situation. Nutrition throughout the life cycle. Sub-Committee on Geneva:ACC/SCN ; 2000,. .
9. Iyengar GV, Nair PP. Global outlook on nutrition and the environment: Meeting the challenges of the next millennium. *Sci Total Environ*. 2000;249:331–346.
10. Commission on the Nutrition Challenges of the 21th Century. Ending malnutrition by 2020: AN agenda for change in the millennium. Final report to the ACC/SCN. *Food Nutr Bull*. 2000;21:3–88.
11. Sayed NE, Gad A, Nofal L, G N. Assessment of the prevalence and potential determination of nutritional anaemia in upper Egypt. *Food Nutr Bull*. 1999;20:417–421.
12. Ministry of Health and Family Welfare (MoHFW), Govt of India. National Family Health Survey (NFHS-5), 2019–21.
13. Bhatia P, et al. Prevalence and determinants of anemia among children in Delhi. Indian J Pediatr. 2018;85(8):607–612.
14. Verma R, et al. Anemia in school children: a cross-sectional study from Lucknow. Int J Community Med Public Health. 2017;4(12):4726–4731.
15. Kaur S, et al. Iron deficiency anemia in adolescents: a hospital-based study. Indian J Child Health. 2019;6(7):355–359.
16. Gupta A, et al. Gender differences in anemia prevalence among Indian children and adolescents. Indian Pediatr. 2020;57(5):423–429.
17. Mitra M, et al. Prevalence of anemia among adolescent girls in India. J Health Popul Nutr. 2016;34(1):4–10.
18. World Health Organization. Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity. WHO/NMH/NHD/MNM/11.1, Geneva: WHO, 2011.
19. Rao S, et al. Nutritional anemia in South Indian children. J Trop Pediatr. 2017;63(1):15–22.
20. Kapoor S, et al. Microcytic hypochromic anemia in children: etiological study. Indian J Hematol Blood Transfus. 2018;34(3):437–442.

21. Ghosh K, Shah A. Anemia in children: epidemiology and management. Indian J Pediatr. 2018;85(10):817–824.