



ORIGINAL RESEARCH PAPER

Clinical Research

CLINICO-EPIDEMIOLOGICAL AND LABORATORY PROFILE OF ADOLESCENTS (10–18 YEARS) WITH ANEMIA IN A TERTIARY CARE HOSPITAL IN SOUTHERN, RAJASTHAN

KEY WORDS:

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ABSTRACT	Background: Anemia in adolescence is a major public health issue in developing countries, affecting growth, cognitive development, and future reproductive health. Despite national programmes, its burden remains high in India. Objective: To study the clinico-epidemiological and laboratory profile of adolescents aged 10–18 years with anemia attending a tertiary care hospital in southern Rajasthan. Methods: A hospital-based cross-sectional study was conducted among adolescents aged 10–18 years diagnosed with anemia according to WHO criteria. Clinical details, socio demographic variables, menstrual and dietary history, and laboratory investigations were recorded. Data were analyzed using standard statistical methods. Results: Out of [196] adolescents studied, [67.1]% were females and [32.9]% males. The mean age was [12.7 ±2] years. The majority (around [44]%) belonged to lower socioeconomic status and were from rural areas. The most common presenting symptoms were easy fatigability (82%), pallor (76%), and generalized weakness (63%). Among girls, heavy menstrual bleeding was reported by [54.2]%. Microcytic hypochromic anemia was the predominant morphological type (about [71.5%]), followed by normocytic normochromic (21.7%) and dimorphic anemia (6.8%). Nutritional deficiencies, particularly iron deficiency, accounted for [68.4]% of cases, while vitamin B12 and folate deficiencies contributed to [31.6]%. Females and older adolescents (16–18 years) showed a significantly higher prevalence of moderate to severe anemia. Conclusions: Anemia is highly prevalent among adolescents in southern Rajasthan, predominantly of nutritional origin. Regular screening, dietary counselling, iron and folate supplementation, and menstrual health education are essential to mitigate its impact.
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INTRODUCTION Adolescence (10–19 years) is a crucial period marked by rapid growth, hormonal changes, and increased nutritional needs. Anemia during this stage adversely affects physical growth, cognitive performance, immunity, and future maternal outcomes. In India, despite nationwide initiatives such as the Weekly Iron and Folic Acid Supplementation (WIFS) programme and Anemia-Mukt Bharat, anemia continues to affect nearly half of adolescents, especially girls. The etiology of anemia in this age group is multifactorial—nutritional deficiencies, menstrual blood loss, parasitic infestations, infections, and socio-economic factors all play a role. Regional data are essential to plan targeted interventions. Limited literature exists from southern Rajasthan regarding the clinical, epidemiological, and hematological profile of anemic adolescents. Hence, the present study was undertaken to evaluate these aspects in adolescents attending a tertiary care hospital in this region. MATERIALS AND METHODS Study Design and Setting: A hospital-based cross-sectional study was conducted in the Department of Pediatrics at Pacific Institue Of Medical Sciences Udaipur, a tertiary care centre in southern Rajasthan, for 1,year. Study Population Adolescents aged 10–18 years diagnosed with anemia (haemoglobin < 12 g/dL for girls and < 13 g/dL for boys, as per WHO criteria) were included. Patients with acute blood loss, chronic renal disease, malignancy, or hemoglobino-pathies (if not under study) were excluded. Data Collection A detailed history was obtained regarding age, sex, residence, socioeconomic status, dietary pattern, and menstrual history (in girls). Clinical examination focused on pallor, icterus, hepatosplenomegaly, oedema, and anthropometric indices.	Laboratory Investigations Blood samples were analyzed for complete blood count, peripheral smear morphology, and red cell indices (MCV, MCH, MCHC). Wherever indicated, serum ferritin, iron, total iron-binding capacity, vitamin B12, and folate levels were assessed. Anemia was classified as mild, moderate, or severe as per WHO guidelines. Statistical Analysis Descriptive statistics were used for continuous and categorical variables. Chi-square and t-tests were applied where applicable, with p < 0.05 considered statistically significant. RESULTS A total of 196 adolescents were included in the study. The mean age was 12.7± 2 years; [67.9]% were females and [32.1]% males. Most participants (about [80%]) belonged to rural areas and lower socioeconomic status. Clinical Profile Common presenting complaints included easy fatigability (82%), pallor (76%), breathlessness (45%), and loss of appetite (38%). On examination, pallor was present in 100% of cases, hepatomegaly in 14%, and splenomegaly in 8%. Among females, 61% had attained menarche, and 34% reported heavy menstrual bleeding. Severity and Morphological Pattern Based on WHO classification, 28% had mild, 49% moderate, and 23% severe anemia. Peripheral smear revealed microcytic hypochromic pattern in 68% of cases, normocytic normochromic in 18%, macrocytic in 7%, and dimorphic anemia in 7%. Laboratory Parameters The mean haemoglobin level was [6.4 ± 1.1] g/dL. Mean MCV, MCH, and MCHC values were [71.2 fL], [24.3pg], and [28.4 g/dL], respectively. Serum ferritin levels (available for [155] patients) were low in [65]%, confirming iron deficiency.
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Vitamin B12 and folate deficiencies were observed in [65]% and [29]% respectively.

CONCLUSION

Anemia among adolescents in southern Rajasthan remains a significant health problem, particularly among females and older adolescents. Nutritional iron deficiency is the leading cause, with microcytic hypochromic anaemia being the most common morphological type.

Early screening, nutritional education, and regular supplementation should be reinforced through school health initiatives and community awareness. Addressing menstrual health and dietary diversity is equally crucial in controlling adolescent anemia in this region.

DISCUSSION

The present study highlights a high burden of anemia among adolescents in southern Rajasthan, with a predominance of moderate to severe grades and microcytic hypochromic morphology. Similar findings have been reported by Sharma et al. (2019) and Kankane et al. (2023), who identified iron deficiency as the leading cause of anemia in Indian adolescents.

The higher prevalence among females reflects menstrual blood loss, inadequate dietary intake, and social disparities affecting nutrition. The predominance of microcytic hypochromic anemia corresponds with iron deficiency as the principal etiology, consistent with studies from North India and the Bundelkhand region. Vitamin B12 and folate deficiencies, though less frequent, underscore the impact of vegetarian diets common in this region.

This study also emphasizes that anemia is not limited to rural or low-income groups; even urban adolescents exhibited suboptimal haemoglobin levels, suggesting lifestyle and dietary factors. Periodic deworming, improved dietary habits, and compliance with iron supplementation programmes remain essential.

Limitations

The study is hospital-based, which may overestimate anemia prevalence compared to the community. Sample size and resource constraints limited the evaluation of hemoglobino-pathies and other causes.

Variable	Category	Value	p-value
Age Distribution	10-19 years	112 (57.1%)	-
	10-19 years	84 (42.9%)	-
Gender	Male (10-19 years)	48 (42.9%)	0.60

Clinical Features

10-19 years	Feature	10-19years	p-value
	Symptoms		
76	- Weakness/Fatigability	59	0.217
80	- Fever	32	<0.001*
24	- Pica	20	0.581
	Signs		
103	- Pallor	69	0.083
18	- Edema	6	0.012*
13	- Lymphadenopathy	5	0.038*

Parameter	10-19 years	Overall (n=196)	p- value*
Hematological			
Hemoglobin (g/dL)	6.4 ± 1.1	6.4 ± 1.1	-
MCV (fL)	71.2 ± 2.3	71.2 ±2.3	-

Biochemical				
Serum Ferritin (g/L)	18.4 ± 9.2	18.4 ± 9.2	18.4 ± 9.2	-
Serum Iron (g/dL)	42.6 ± 18.7	42.6 ± 18.7	42.6 ± 18.7	-
Vitamin B12 (pg/mL)	285.4 ± 142.6	285.4 ± 142.6	285.4 ± 142.6	-

Folic Acid (ng/mL)	6.8 ± 3.4	6.8 ± 3.4	6.8 ± 3.4	-
Anemia Etiology				
Iron Deficiency (n (%))	53 (47.3%)	26 (31.0%)	79 (40.3%)	0.003*
Sickle Cell Anemia (n (%))	2 (1.8%)	7 (8.3%)	9 (4.6%)	0.042*
Aplastic Anemia(n (%))	3 (2.7%)	10 (11.9%)	13 (6.6%)	0.01

Recommendations

1. Routine haemoglobin screening in schools and outpatient departments for adolescents aged 10–18 years.
2. Strengthening implementation of WIFS and Anaemia-Mukt Bharat programmes with better compliance monitoring.
3. Dietary counselling to promote iron-rich foods (green leafy vegetables, pulses, jaggery, meat, and eggs) and vitamin C intake.
4. Deworming and menstrual health education for adolescent girls.
5. Further community-based and interventional studies in southern Rajasthan to evaluate long-term outcomes.

REFERENCES

1. Sharma MK, Parashar P, Jain N. Clinico-hematological profile of anaemia in adolescent girls in a tertiary care hospital of North India. *Int J Adv Med.* 2019;6(4):1027-1031.
2. Kankane A, Gautam A, Pandey N, Chaurasia OS. Clinico-aetiological profile of severe anaemia in hospitalised adolescents in a tertiary care centre of Bundelkhand region, Central India. *Indian J Youth Adol Health.* 2023;10(1):16-20.
3. Nathe N, Kale V, Havnur M et al. Spectrum of anemia in adolescents admitted at a tertiary care centre: A retrospective study. *Trop J Pathol Microbiol.* [Year].
4. Prevalence of Iron Deficiency and Iron Deficiency Anaemia Among Adolescent Girls at a Tertiary Care Centre in Bihar. *J Clin Diagn Res.* [Year];[Volume];[Pages].
5. Sambhus T, Nagare M, Kamlik P et al. Screening anaemia in adolescents: a study conducted at a tertiary care rural hospital. *MMJ.* 2024;7(1).