

STUDY OF CLINICAL AND HAEMATOLOGICAL PROFILE OF ANEMIA IN CHILDREN AGED 6 MONTHS TO 12 YEARS IN SAURASHTRA REGION

Preksha Patel¹, Kajari Gohil², Shamim Sheikh³

¹⁻²Third year resident, Shri M. P. Shah Government Medical College, Jamnagar, India.

³Assistant Professor MP Shah Medical College, Jamnagar, India.

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Corresponding Author:

Dr. Kajari Gohil,

Email: kajrigohil6912@gmail.com

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ABSTRACT

Background: Anemia is a major global health problem, especially in developing countries like India, despite the fact that this problem is largely preventable & easily treatable. **Aim and objective:** The aim is to study the clinical and hematological profile of anemia in children aged 6 months to 12 years. **Materials and Methods:** It is a prospective study conducted in children presented with anemia in the department of Pediatrics at M. P. Shah medical college. 110 pediatric cases of anemia were included in the study. **Results:** Majority of children were among the age of 5- 8 years. There was Male preponderance. Among different types of anemia studied, iron deficiency was reported predominantly 70/110 (63.6%) Microcytic hypochromic anemia is seen in 72.7% (80/110). Dimorphic anemia was observed in 9.09 % of children. **Conclusion:** Nutritional deficiency anemia is the most common cause of anemia among children less than 12 years. Iron deficiency was found to be most common nutritional deficiency in children followed by megaloblastic anemia.

INTRODUCTION

Anemia is a significant public health problem in developing countries, particularly among children, where it contributes substantially to morbidity, impaired cognitive development, and growth retardation. According to the World Health Organization (WHO), anemia is defined as a

hemoglobin concentration lower than normal for age and sex. For children aged 6 months to 12 years, anemia is diagnosed when hemoglobin levels fall below 11 g/dL.^[1] In India, the burden of pediatric anemia remains alarmingly high despite various national health initiatives. As per the National Family Health Survey-5 (NFHS-5) data, 67.1% of children were found to be anemic—an increase from 58.6% reported in NFHS-4.^[2]

Table 1: Criteria used for diagnosing anemia:-WHO Criteria for Anemia and Grade of severity^[6]

	Population	Non-Anemia (Gm/dL)	Anemia (Gm/dL)		
			Mild	Moderate	Severe
1.	Children 6-59 months of age	11	10.0-10.9	7.0-9.9	<7.0
2.	Children 5-11 years of age	11.5	11.0-11.4	8.0-10.9	<8.0
3.	Children 12-14 years of age	12	11.0-11.9	8.0-10.9	<8.0
4.	Non-pregnant women (15 years of age and above)	12	11.0-11.9	8.0-10.9	<8.0
5.	Pregnant women	11	10.0-10.9	7.0-9.9	<7.0
6.	Men (15 years of age and above)	13	11.0-12.9	8.0-10.9	<8.0

The etiology of anemia in Indian children is multifactorial, with iron deficiency being the most common cause, followed by vitamin B12 and folate deficiencies, hemoglobinopathies, chronic infections, and parasitic infestations.^[3,4] Nutritional anemia, which arises due to inadequate intake or absorption of essential micronutrients, is particularly prevalent in lower socio-economic strata.^[4] Infections such as malaria and hookworm, along with conditions like

thalassemia, also contribute to the hematological burden in various regions of India.^[5]

Clinically, anemia in pediatric populations may present with nonspecific signs such as pallor, irritability, poor feeding, lethargy, and developmental delays. In severe cases, it may lead to cardiomegaly, breathlessness, and even congestive heart failure.^[4] Despite being largely preventable and treatable, anemia continues to be underdiagnosed and

inadequately managed in many parts of India, especially in rural and underserved populations.^[2]

Aim and objective: The main objective is to study the clinical and hematological profile of anemia in children less than 12 years.

MATERIALS AND METHODS

This prospective study was conducted at M. P. Shah Medical college, Jamnagar for duration of 6 months from November 2024 to April 2025. The children with age 6 months to 12 years, who were admitted in pediatric ward with history of severe pallor were selected randomly and included irrespective of sex, and duration of disease. An Informed consent was taken from parents of all children who were included in the study. A detailed history was recorded with particular emphasis on symptoms suggestive of anemia such as weakness and easy fatigability, breathlessness on exertion, pica.

A thorough clinical examination of every child was done especially for pallor, nail changes, glossitis,

fundus of eye, cardio vascular involvement in form of tachycardia, haemic murmur, congestive cardiac failure, raised JVP and edema. Routine Investigations for anemia and its causes was done. i.e. Hb estimation, complete hemogram, peripheral smear, Reticulocyte count, serum vitamin B12, serum folic acid, stool for worm infestation were done in all patients.

Inclusion Criteria: Patients with anemia in age group of 6 months to 12 years admitted in pediatric ward.

Exclusion Criteria: children more than 12 years of age. out patients who were not admitted in the hospital.

RESULTS

A total of 110 cases aged 6 months to 12 years were included in the study. Males are more affected than female. [Table 2]

Table 2: Gender wise distribution

Gender	Number(n=110)	Percentage(%)
Male	68	61%
Female	42	39%

Out of 110 cases, total 68 patients were male child and 42 cases were female child. The proportion of anemia was seen to be greater in male (68%) than

female children (39%).the most common affected age group was 6 months to 2 years of children. [Table 3]

Table 3: Age wise distribution

Age of patients	No. of cases	%
6 months to 2 years	41	37 %
2 to 5 years	28	25 %
5 to 8 years	31	29 %
8 to 12 years	10	09 %
Total	110	100 %

Out of 110 cases, least numbers of cases were of age group of 8 to 12 years of age (9%). Out of 110 cases maximum number of cases (59) were of moderate degree anemia. [Table 4]

Table 4: Severity of anemia (according to Hb%)

Grade of anemia	No. of cases	%
Mild	20	18.18
Moderate	59	53.63
Severe	31	28.19
Total	110	100

About 59 children (53.63%) had moderate degree anemia. 31 children (28.19%) had severe degree anemia and 20 children (18.18%) had mild degree

anemia. On general examination all children were present with pallor followed by fever which was seen in.

Table 5: Clinical signs and symptoms

Clinical signs and symptoms	No. of cases	%
Pallor	110	100%
Fever	60	54.4%
Icterus	30	27.2%
cough	40	36.3%
cold	40	36.3%
Shortness of breath	20	18.1%
Hyperpigmentation	25	22.7%
weakness	90	81.8%
splenomegaly	24	21.8%

Vomiting	12	10.9%
Tremors	10	9.09%
History of pica	30	27.2%
koilonychia	40	36.3%

Peripheral blood smear: out of 110 cases most numbers of cases (80) of microcytic blood picture

followed by normocytic (20) and dimorphic (10) blood picture.

Table 6: Peripheral blood smear

Blood smear finding	No. of cases	%
Microcytic	80	72.7%
Normocytic	20	18.1%
Dimorphic	10	9.09%

Among different types of nutritional anemia studied, iron deficiency was reported predominantly 70/110 (63.6%) followed by megaloblastic anemia 10/110 (9.09%). Least were aplastic anemia and hemolytic

anemia with 5 cases. Incidence of iron deficiency anaemia is more in females i.e., 53(75%) compared to males 17(25%).

Table 7: RBC indices in anemias

RBC indices	No. of cases	%
PCV↓	80	72.7%
MCV↓	70	63.6%
MCV↑	12	10.9%
MCH↓	70	63.6%
MCH↑	10	9.09%
MCHC↓	80	72.7%
MCHC normal	30	27.2%
RDW↑	70	63.6%
RDW↓	40	36.3%

Note: PCV: packed cell volume; MCV: mean corpuscular volume; MCH: mean corpuscular hemoglobin; MCHC: mean corpuscular hemoglobin concentration; RDW: red cell distribution width.

Compering the RBC indices, show iron deficiency anemia have low PCV, low MCV, low MCH and high RDW. In megaloblastic anemia low PCV, high MCV and low RDW. While haemolytic anemia show high RDW and other cases present with normocytic normochromic blood picture with normal RBC indices.

DISCUSSION

The term 'nutritional anemia' encompasses all pathological conditions in which the blood hemoglobin concentration drops to an abnormally low level, due to a deficiency in one or several nutrients. The main nutrients involved in the synthesis of hemoglobin are iron, folic acid, and vitamin B. Iron deficiency is by far the first cause of nutritional anemia worldwide.

In our clinical study, total 110 patients of anemia were taken, among which anemia was seen more commonly in children between the ages of 5 to 8 years. Divya Regina, et al study included total of 1007 subjects belonging to 6-11 years. The maximum numbers were 9 years old (22%).^[6] Male preponderance was observed in this study. Srinivas Other authors observed female preponderance.^[6,7,8] While Gupta S et al similar findings in their study.^[9] The most common cause of anemia in this study was iron deficiency (63.6%) while megaloblastic anemia

with 9.09% followed by sickle cell disorders, thalassemia and Aplastic anemia with 5% were less common causes. Srinivas Madoori et al was found that of 58% (183) children were anemic due to iron deficiency anemia while 9 % (29) were thalassemic and 27% (85) were sickle cell disorder.^[7] 5% (16) cases had megaloblastic anemia and 2% (6) with aplastic anemia. Venkatesh G, et al reported iron deficiency anemia the most common followed by dimorphic anemia and megaloblastic anemia.^[10]

The prevalence of iron deficiency anemia was more in females i.e., 53(75%) than males 17(25%). Ramana shastry, et al observed similar findings in their study.^[11] Peripheral smear examination showed Microcytic hypochromic anemia in 72.7% (80/110). Dimorphic anemia was seen in 9.09 %. Normocytic Normochromic anemia is seen in 18.1 % of patients. In Venkatesh G observed Microcytic hypochromic anemia in 54.4%, macrocytic hypochromic anemia is seen in 11.8% and dimorphic anemia is seen in 36.6% of patients.^[10] In Iron deficiency anemia PCV, MCV, MCHC, MCH are decreased and RDW is increased. Under iron deficiency condition, formation of Hb is reduced resulting in a reduction of MCH. The transmembrane protein (ferroportin) is responsible for the transfer of iron from enterocytes and monocytes/macrophages to the circulation. It was found that ferroportin mRNA expression was significantly reduced in monocytes of anemic subjects compared with controls. Importantly, the decreased expression of ferroportin was paralleled by increased iron storage in monocytes of anemia of chronic disease patients as estimated by

hyperferritinemia. As a functional consequence of decreased ferroportin expression and the subsequent reduction of cellular iron export, intracellular iron levels will increase which interferes in the process of erythropoiesis, thus decreasing expression of monocytes leading to decrease in Hb. In this study, inverse relationship of RDW was seen with the Hb in iron deficiency anemia; however, no such correlation happened with non iron deficiency anemia.^[11]

There is a strong association between MCV and MCH in iron deficiency and megaloblastic conditions.^[12] It was observed that association between high MCV (above cut-off) and high MCH (above cut off) as well as a higher peripheral blood monocyte count with venous thrombosis indicates association of these blood indices in vivo.^[13]

CONCLUSION

The present study identifies nutritional deficiency anemia as the leading cause of anemia among children aged less than 12 years, with iron deficiency being the most prevalent, followed by megaloblastic anemia. These findings underscore the urgent need for public health interventions targeting preventable forms of childhood anemia.

We recommend the development and implementation of structured awareness programs emphasizing improved water, sanitation, and hygiene (WASH) practices, as well as nutritional education for parents and caregivers. Counseling should focus on the importance of consuming iron-rich foods and ensuring adequate iron supplementation, particularly in high-risk populations. Special attention must be directed toward children from low-income households and socioeconomically marginalized communities, who are disproportionately affected by nutritional anemia.

Sustained, community-based interventions integrating health education, nutrition, and social support are essential to reduce the burden of anemia and improve the overall health outcomes of school-aged children.

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