

Study on clinical and hematological profile of Anemia in children aged 5 to 12 years in rural Telangana

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Abstract

Introduction: 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:** The aim is to study the clinical and hematological profile of anemia in children aged 5 years to 12 years. **Material and Methods:** It is a prospective hospital based study conducted in children presented with anemia in the department of Pediatrics at Maheshwara Medical College and Hospital, Patancheru, Telangana. 110 pediatric cases of anemia were included in the study. **Results:** Majority of children were among followed by 5- 6 years. Among different types of anemia studied, iron deficiency was reported predominantly 80/110 (72.7%) followed by megaloblastic anemia 20/110 (18.1%). There was female preponderance. Microcytic hypochromic anemia is seen in 81.8% (90/110). Dimorphic anemia was observed in 9.09 % of children. **Conclusion** Nutritional deficiency anemia is the most common cause of anemia among children aged 5 years to 12 years. Iron deficiency was found to be most common nutritional deficiency in children followed by megaloblastic anemia.

Key words: Anemia, Iron deficiency, Microcytic anemia, Nutritional anemia

Introduction

Anemia is a major global health problem, especially in developing countries like India, despite the fact that this problem is largely preventable & easily treatable.

It is the commonest disease affecting humankind and is responsible for morbidity and mortality among general population. About 30% or nearly one third of world's population is suffering from anemia due to various causes [1- 4].

Anemia can be of various types, but most common in developing countries is nutritional anemia. Nutritional anemia can be due to Iron deficiency (most common cause), Folic acid deficiency, Vitamin B12 deficiency or may be combination of these factors, which can present with dimorphic picture.

These conditions are seen in all types of medical practice ranging from neonatology to geriatrics and public health and are an ongoing concern to all physicians. Other types include hemolytic anemia, which can be either congenital or acquired.

Congenital causes include membrane defect, hemoglobin defects and enzyme defect while acquired causes can be immune or non- immune. Aplastic anemia, anemia due to blood loss and anemia of chronic disease are the some other types of anemia [5].

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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

Iron deficiency is the most common and widespread nutritional disorder in the world [7]. It is the only nutrient deficiency which is also significantly prevalent in all industrialized nations. According to the data of the World Health Organization (WHO), the prevalence of iron deficiency anemia (IDA) in industrialized countries and in non-industrialized countries is 10–20% and 50–60%, respectively [8].

Iron deficiency impairs the cognitive development of children from infancy through adolescence. It also damages immune mechanisms and is associated with increased morbidity rates. The importance of iron deficiency and anaemia as a public health problem has been increasingly recognized by health authorities and policy makers. Although efforts are targeted primarily to prevent iron deficiency, it is still the most common nutrient deficiency all over the world [8]. About half of the population in the developing countries has iron deficiency anaemia. Preschool, school and adolescent children and women in childbearing age are at increased risk. Iron deficiency anaemia affects 30% of the world population [9,10].

Aim

The main objective is to study the clinical and hematological profile of anemia in children aged 5 years to 12 years.

Materials & Methods

This prospective study was conducted at Maheshwara medical college and hospital, Patancheru, Telangana, for duration of 1 year between May 2016 - April 2017 after obtaining Ethical committee clearance. The children aged 5 years to 14 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. Hemoglobin was estimated by Sahli's method and expressed in gm%, peripheral smear was stained by Leishman's stain. Anemia was classified morphologically based on peripheral smear findings. PCV, MCV, MCH, MCHC and RDW were determined by automated cell counter. Normal values were taken as follows: PCV 35-45%, MCV 77-95fl, MCH 25-33pg, MCHC 31-37gm/dl and RDW 14.5-18.5.

Reticulocyte count was done by Brilliant crystal stain method, serum iron determination was done by Ramany's dipyrindyl method, Total iron binding capacity was determined by Ramsay's method, serum vitamin B12 and folic acid was determined by Architect method.

Inclusion criteria: Patients with anemia in age group of 5 years to 14 years admitted in pediatric ward.

Exclusion criteria: children less than 2 years and teenagers more than 14 years. out patients who were not admitted in the hospital. Patients having mild to moderate anemia, severe anemia due to malaria, and patients collapsed due to congestive cardiac failure within 12 hours of admission, communicable diseases like HIV, tuberculosis & hepatitis were excluded.

Statistical Analysis- Data were entered in Microsoft Excel 2007 and all statistical analyses were performed. SPSS for Windows version 17.0, Chicago, USA, was also used for data analysis. Descriptive characteristics (mean and standard deviation) and percentage were performed for each parameter separately. Chi-square and independent *t*-test were used for proportions and mean comparisons between groups, respectively. Pearson's correlation tests were performed to examine the relationships between hematological indicators.

Results

A total of 110 cases aged between 4- 12 years were included in the study. The most common affected age- group was 7- 8 years (54.5%) (Table 2)

Table-2: Age-wise distribution of cases.

Age in years	No. of cases	%
5-6 years	30	27.3
7-8 years	60	54.5
9-10 years	10	9.09
11-12 years	10	9.09
Total	110	100

There was female preponderance in this study. (63.6% compared to males (36.3%). Weakness & fatigability were the most common presenting symptom observed in 81.8% of children. On General examination Pallor was seen in 100% of patients, knuckle pigmentation in 18.1%, and koilonychia in 36.3%. (Table 3)

Table-3: Clinical signs and symptoms.

Clinical signs and symptoms	No. of cases	%
Pallor	110	100%
Icterus	30	27.2%
Fever	45	40.9%
Cough	30	27.2%
Hyperpigmentation	20	18.1%
Weakness and fatigability	90	81.8%
Splenomegaly	20	18.1%
Tremors	20	18.1%
Hepatomegaly	30	27.2%
petechiae	10	9.09%
Vomitings	30	27.2%
Shortness of breath	20	18.1%
History of Pica	30	27.2%
koilonychia	40	36.3 %

About 60 (54.5%) children had severe anemia. 30(27.2%) moderate anemia and 20 (18.1%) mild anemia. (table 4)

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

Grade of Anemia	Males	Females	Total	%
Mild	10	10	20	18.1
Moderate	10	20	30	27.2
Severe	20	40	60	54.7
Total	40	70	110	100

Peripheral smear examination: Microcytic hypochromic anemia is seen in 81.8% (90/110). Dimorphic anemia is seen in 9.09 %. Normocytic Normochromic anemia is seen in 9.09 % of patients.

Among different types of nutritional anemia studied, iron deficiency was reported predominantly 80/110 (72.7%) followed by megaloblastic anemia 20/110 (18.1%). Least were aplastic anemia and hemolytic anemia 5 cases each (4.5 %). incidence of iron deficiency anaemia is more in females i.e., 60(75%) compared to males 20(25%) while for megaloblastic anemia incidence was more in males i.e., 15(75%) compared to 5(25%) females.

Table-5: Showing relation of RBC indices in anemia.

Relation of RBC indices in anemia.	Iron deficiency anemia	Megaloblastic anemia
PCV↓	80(72.7%)	20(18.1%)
MCV↓	80(72.7%)	-
MCV↑	-	20(18.1%)
MCH↓	80(72.7%)	-
MCH↑	-	20(18.1%)
MCHC↓	80(72.7%)	20(18.1%)
MCHC normal	-	20(18.1%)
RDW↑	80(72.7%)	-
RDW↓	-	20(18.1%)

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

In Iron deficiency anemia PCV, MCV, MCHC, MCH are decreased and RDW is increased.

In megaloblastic anemia PCV decreased, MCV and MCH are increased, and MCHH are normal.

18.1 % patients having serum level < 30 µg/dl while 72.7% patients having serum Iron level between 30-60µg/dl.

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. Folic acid deficiency is less wide-spread and is often observed with iron deficiency. Vitamin B deficiency is far rarer.

About 110 patients of anemia between the age group of 5 years to 12 years have been studied. 54.2% of them were in the age-group 7-8 years old. Venkatesh G et al study included 9124 patients of

which anemia was found in 7412(81.2%) and severe anemia in 202 patients, prevalence of severe anemia being 2.2% [11]. Divya Regina, et al study included total of 1007 subjects belonging to 6-11 years. The maximum numbers were 9 years old (22%) [12].

Female preponderance was observed in this study (males 40/110 (36.3%). Srinivas Other authors have also observed similar findings in their study [12,13,14]. While Gupta S et al showed male preponderance [15].

The most common cause of anemia in this study was iron deficiency (58%) while sickle cell disorders 27%, 9 % were thalasemic and 5 % cases had

megaloblastic anemia and 2 % Aplastic anemia 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 thalasemic and 27% (85) were sickle cell disorder [13]. 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 [11].

The prevalence of iron deficiency anemia was more in females i.e., 60(75%) than males 20(25%). while megaloblastic anemia was prevalent in males i.e., 15(75%) compared to females (25%). Venkatesh G, et al observed similar findings in their study [11].

Peripheral smear examination showed Microcytic hypochromic anemia in 81.8% (90/110). Dimorphic anemia was seen in 9.09 %. Normocytic Normochromic anemia is seen in 9.09 % 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 [11].

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 [16]. 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 [17].

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 [18].

There is a strong association between MCV and MCH in iron deficiency and megaloblastic conditions [19]. 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 [20].

Conclusion

In the present study Nutritional deficiency anemia is the most common cause of anemia among children aged 5 years to 12 years. Iron deficiency was found to be most common nutritional deficiency in children followed by megaloblastic anemia.

We recommend awareness creation on water and sanitation and nutritional counseling to parents on consumption of iron-rich foods and iron supplementation to prevent anemia among young children with special emphasis on those from low income group and socioeconomic deprived communities.

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