Journal of Cardiovascular Disease Research

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 1, 2022

Prevalence of Anaemia among Paediatric and its Clinical profile at Tertiary Care Teaching Hospital

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Abstract

INTRODUCTION

Pediatric anemia is one of the major health burden in India and in major parts of the world, as it results in reduced exercise tolerance, slower rate of growth, impaired development and delayed wound healing [1]. Anemic children are also at a higher risk of death due to complications associated with malnutrition and infection. Prevalence rate of anemia is an essential indicator of the nutritional status within the pediatric population. In the United States, around 18% of the children and in the developing countries about 82% of the children are anemic [2] Because of these factors, the study of the etiopathogenesis of anemia in infancy and childhood has attracted wide attention in the recent years in India [3,4].

MATERIALS AND METHODS

A prospective study, for a period of 3 years at Department of Medicine and Community Medicine, Tertiary care Teaching Hospital was conducted after obtaining ethical committee clearance of the institute. The children who were admitted in the hospital with sign of Pallor were selected as per inclusion criteria into the study. An informed consent was taken from parents, detailed history was recorded with particular emphasis on symptoms suggestive of anaemia such as weakness and easy fatiguability, breathlessness on exertion, pica. A thorough clinical examination of every child was done.

Routine Investigations for anaemia and its causes were done. Anaemia was classified morphologically based on peripheral smear findings. Packed-cell volume (PCV), mean

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 1, 2022

corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC) and red cell distribution width (RDW) were determined by automated cell counter. Hemoglobin was estimated by Sahli's method and expressed in gm%, peripheral smear was stained by Leishman's stain. Reticulocyte count was done by brilliant crystal stain method, serum iron determination was done by Ramany's dipyridyl method, Total iron binding capacity was determined by Ramsay's method, serum vitamin B12 and folic acid was determined by architect method.

Results

The present study comprised of 400 subjects, out of which 58% were males and 42% were females (table 1).

Dimorphic, Macrocytic, Microcytic Hypochromic, Normocytic Hypochromic and Normocytic Normochromic Anaemia were reported in 12%, 4%, 50%, 4% and 30% of the subjects respectively. Maximum cases were of Microcytic Hypochromic type as shown in table 2.

Table 3 shows the distribution of anemia according to Vit. B12 and Folic acid. Total 50 patients were studied. 12 cases of macrocytic anemia, 12 had Vitamin deficiency (8 with reduced Vit B12, 3 with reduced Folic acid and in 1 case both were reduced) i.e. 22.2%. In 28 cases of Dimorphic anemia, 38 had Vitamin deficiency (19 with reduced Vit. B12, 10 with reduced folic acid and in 2 cases both were reduced) i.e. 72.2% as shown in Table 3. Therefore 34 cases were diagnosed with

Discussion

The present study comprised of 400 subjects, out of which 59% were males and 41% were females. These results were inaccordance with study done by Taskesen et al[16], Jain et Al[17] and Gupta Set al[18]. Taskesen et al[16] in his study found 57% boys and43%were girls. Jain et al[17] havealso reported increased incidence in males (71%) compared to girls (29%). Chauhan et al[19] reported dissimilar results who reported44.2% boys and 55.8% girls in theirstudy. Sastry CPV et al[1] also found female preponderance in their study (males 40/110 (36.3%).

Conclusion

In the current study, the preschool children are found to be the most affected. Hence, it is recommended that, this age group is compulsorily screened for anemia. A uniform definition of screening criteria and an effective system to respond to abnormalities is the need of the hour. The current study was taken up, keeping this need in view

Keywords: *Complete hemogram; Microcytic hypochromic anemia; Iron deficiency anemia; acute gastroenteritis*

INTRODUCTION

Pediatric anemia is one of the major health burden in India and in major parts of the world, as it results in reduced exercise tolerance, slower rate of growth, impaired development and delayed wound healing [1]. Anemic children are also at a higher risk of death due to

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complications associated with malnutrition and infection. Prevalence rate of anemia is an essential indicator of the nutritional status within the pediatric population. In the United States, around 18% of the children and in the developing countries about 82% of the children are anemic [2] Because of these factors, the study of the etiopathogenesis of anemia in infancy and childhood has attracted wide attention in the recent years in India [3,4]

In most children, anemia is asymptomatic but has abnormal hemoglobin levels on routine screening. A child with anemia would not always have pallor or all other related symptoms, so acquiring a complete history and elucidating proper physical examination can help in identifying the cause of anemia [2]. The iron stores are easily restored during the first few months of life even when the hemoglobin levels tend to fall. Thus iron deficiency is very rare to induce anemia until the reach of six months. Glucose-6- phosphate dehydrogenase (G6PD) deficiencies occur more commonly in males. Habits Pica or geophagia usually results in iron deficiency. History of recent drug use may suggest G6PD deficiency or aplastic anemia and so does viral illness cause red cell aplasia. Recurrent diarrheal episodes show suspicion of malabsorptive occult blood loss that occurs in inflammatory bowel disease. The physical examination constitutes an important aspect, but is essentially normal in most children with anemia. Findings that suggest chronic anemia include irritability, pallor, glossitis, a systolic cardiac murmur, delayed growth and changes in the nailbed.

Acute anemia presents clinically with jaundice, splenomegaly, tachypnoea, hematuria, tachycardia and even congestive heart failure. Anemia is defined as a reduced hemoglobin concentration as compared to the levels in agematched controls. 2 in screening situations, when anemia is encountered, the patient should undergo a complete blood count evaluation (CBC). Anemia can be classified into microcytic, normocytic and macrocytic types based on the Mean Corpuscular Volume (MCV) estimation.

Next, anemia work-up includes peripheral smear examination and reticulocyte count measurement. Peripheral smear indicate the etiology of the anemia based on the red cell morphology. Basophilic stippling representing clumped ribosomes is in thalassemia syndromes, iron deficiency anemia and lead poisoning. Howell-Jolly bodies (nuclear fragments) are noted in asplenia, pernicious anemia and severe iron deficiency. The reticulocyte percentage is essential in segregating anemia due to decreased RBC production from a hemolytic anemia (increased RBC destruction). Bone marrow disorders or aplastic anemia show a low reticulocyte count, whereas a hemolytic process or active blood loss represents higher reticulocyte count. Corrected reticulocyte counts more than 1.5 indicates increased RBC production [2,5,6]

If the diagnosis is still not clear after the analysis of the initial laboratory findings, other confirmatory studies may be required. In very low MCV, serum iron level and total iron binding capacity (TIBC) estimation is suggested. In case of suspicion of hemolysis, G6PD assay, hemoglobin electrophoresis, direct Coombs' test, lactate dehydrogenase (LDH), and bilirubin (indirect) estimation may help in arriving at a diagnosis. Anemic children with an elevated MCV, requires vitamin B12 and folate to be estimated in doubtful cases. [7,8,9] Eenzymopathies by RBC enzyme panel,

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 1, 2022

hereditary spherocytosis by osmotic fragility testing, membranopathies by membrane protein studies are other confirmatory tests that can be employed. In certain circumstances, such as a suspected hematologic malignancy, a bone marrow aspiration may be indicated [10, 11,12,9,13]

Anemia most prevalent iron deficiency related health complexity in India. The recent data predicted that approximately 58.6% of children are suffered from anemia. The women population is more prone than men that accounts for 53.2% of non-pregnant and 50.4% of pregnant women were found to be anemic as in 2016 as per the National Family Health Survey (NFHS) [14]. The various patterns of anemia in children are often represented by their underlying etiopathogenetic factors while the investigation of anemia is mainly hematological. For evaluating anemia, a detailed clinical history combined with necessary examination and complete blood counts with peripheral smear examination are the basic steps. In the current study, evaluation of the hematological and the biochemical parameters, if necessary, were done to classify the clinic hematological patterns of anemia and their etiology in children. The prospective of this study was to identify the prevalence, patterns and the various morphological types of paediatric anaemia.

MATERIALS AND METHODS

A prospective study, for a period of 3 years at Department of Medicine and Community Medicine, Tertiary care Teaching Hospital was conducted after obtaining ethical committee clearance of the institute. The children who were admitted in the hospital with sign of Pallor were selected as per inclusion criteria into the study. An informed consent was taken from parents, detailed history was recorded with particular emphasis on symptoms suggestive of anaemia such as weakness and easy fatiguability, breathlessness on exertion, pica. A thorough clinical examination of every child was done.

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Inclusion criteria used in the study was children of age group 6 months to 12 years with pallor, admitted in Medical College and Hospital, while exclusion criteria was infants less than 6 months of age and teenagers more than 12 years old, out patients who were not admitted in the hospital, patients who collapsed due to congestive cardiac failure within 12 hours of admission and patients with communicable diseases like human immunodeficiency virus (HIV), tuberculosis and hepatitis were excluded.

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 1, 2022

Data were entered in Microsoft excel 2023 and all statistical analyses were performed. Statistical package for the social sciences (SPSS) for Windows version 25.0, 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 - test were used for proportions and mean comparisons between groups, respectively.

Results

The present study comprised of 400 subjects, out of which 58% were males and 42% were females (table 1).

Table 1: Gender distribution of the study population (N=250)

Gender	Number	Percentage
Male	235	59
Female	165	41
Total	400	100

Dimorphic, Macrocytic, Microcytic Hypochromic, Normocytic Hypochromic and Normocytic Normochromic Anaemia were reported in 12%, 4%, 50%, 4% and 30% of the subjects respectively. Maximum cases were of Microcytic Hypochromic type as shown in table 2.

Table 2: Distribution according to the types of Anaemia based upon the morphology

Type	Number	Percentage
Dimorphic anaemia	48	12
Macrocytic anaemia	16	4
Microcytic Hypochromic Anaemia	200	50
Normocytic Hypochromic Anaemia	16	4
NormocyticNormochromic Anaemia	120	30
Total	4000	100.0

Table 3 shows the distribution of anemia according to Vit. B12 and Folic acid. Total 50 patients were studied. 12 cases of macrocytic anemia, 12 had Vitamin deficiency (8 with reduced Vit B12, 3 with reduced Folic acid and in 1 case both were reduced) i.e. 22.2%. In 28 cases of Dimorphic anemia, 38 had Vitamin deficiency (19 with reduced Vit. B12, 10 with reduced folic acid and in 2 cases both were reduced) i.e. 72.2% as shown in Table 3. Therefore 34 cases were diagnosed with

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Table 3: Distribution of anemia according to Vit. B12 and Folic acid (N=50)

Anemia type	Only Vit. B12 ↓	Only Folic acid ↓	Both ↓	Total	Percentage
Macrocytic (N=12)	8	3	1	12	24
Dimorphic (N=38)	19	10	7	36	72

Table 4: Distribution of Anemia according to Iron profile (N=400)

Type of Anemia	S.Iron	TIBC	S. Ferritin	Total	Percentage
IDA	↓	↑	↓	184	46

Table 5: Comparison of bone marrow findings with peripheral blood smear(N=15)

	Peripheral blood picture			
Type of Anemia on bone marrow	Microcytic hypochromic	Macrocytic	Dimorphic	Total (%)
Nutritional Deficiency	9	Nil	1	10 (66.6 %)
Megaloblastic anemia	nil	4	Nil	4 (26.6 %)
ITP	2	Nil	Nil	2 (13.3%)
Aplastic	2	Nil	Nil	2(13.3%)

Discussion

The present study comprised of 400 subjects, out of which 59% were males and 41% were females. These results were inaccordance with study done by Taskesen et al[16], Jain et Al[17] and Gupta Set al[18]. Taskesen et al[16] in his study found 57% boys and43%were girls. Jain et al[17] have also reported increased incidence in males (71%) compared to girls (29%). Chauhan et al[19] reported dissimilar results who reported44.2% boys and 55.8% girls in their study. Sastry CPV et al[1] also found female preponderance in their study (males 40/110 (36.3%).

In the present study, Dimorphic, Macrocytic, Microcytic Hypochromic, Normocytic Hypochromic and Normocytic Normochromic Anaemia were reported in11.2%, 3.2%, 50%, 4% and 30% of the subjects. Sastry C.P.V[1] in his study found that peripheral smear examination showed Microcytichypochromic anemia in 81.8% (90/110). Dimorphic anemia was seen in 9.09 %. Normocytic Normochromic anemia was seen in 9.09 % of

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 1, 2022

patients. Venkatesh G[20] observed Microcytic hypochromic anemia in 54.4%, macrocytic hypochromic anemia is seen in 11.8% and dimorphic anemia is seen in36.6% of patients[5].

In the present study, Vitamin B12and Folic acid deficiency was found in 6.4%and 6% of the nutrition deficient subjects

Sastry C.P.V[1] reported Vitamin B12deficiency anemia in 5% of the subjects.Madoori[21] et al also found that 5% (16) cases had megaloblastic anemia. Venkatesh G[20], et al reported iron deficiency anemiathe most common followed by dimorphicanemia and megaloblastic anemia. Early diagnosis and treatment is important in cases of vitamin B12 deficiency to prevent neurological and haematological complications. Diet rich in vitamin B12and vitamin B supplements are important in the prevention and treatment of nutritional vitamin B12deficiency. Strategies to improve vitamin B12 status in children should be developed such as creating awareness regarding intake of proper dietand vitamin B supplements by pregnant and lactating mothers, proper method of weaning and timely introduction of adequate complementary feeding in infants and introducing a modified meal plan in Anganwadis and schools to incorporatevitamin B rich food to children. In the National Nutritional Anemia Prophylaxis Programme, vitamin B supplementation should be given along with iron and folic acid to prevent vitamin B12 deficiency in children[19]

In the present study, iron deficiency anemia was found in 184 patients i.e.46%. Ferritin is the intracellular storage form of iron found chiefly in the cytoplasm of the cells of the reticuloendothelial system. It can be quantitated in serum using immunoenzymatic assays. Serum ferritinconcentrations have been documented to give an accurate indication of the amount of storage iron in healthy individuals and inpatients with iron deficiency or iron overload[22]. It is the most specific biochemical test for iron deficiency anemia (IDA) because it correlates with total body iron stores. Low serum ferritin concentration reflects depleted iron stores. When compared with other iron statusparameter, serum ferritin is one of the lowest biologically varying iron status markers, thus making it one of the most useful parameters. Ali et al[22] in his study of 398 patients found lack of ironstores in 119 patients. Of these, the serum ferritin waselevated in 40 patients (29.89%) despite lack ofdemonstrable iron in the marrow specimen. They concluded that a low serum ferritinvalue probably indicates iron depletion,while an elevated value does not excludethat possibility[22]

In the present study, 7 cases werediagnosed as nutritional deficiency anemia on bone marrow and 7 (77.7%) were diagnosed as Iron deficiency anemia with iron stores (Perl stain) ranging from 0 to 2. Approximately similar results were reportedby Tabassum et al[23,] Pujara et al[2] and Bableshwar et al[25.]

Conclusion

In the current study, the preschool children are found to be the most affected. Hence, it is recommended that, this age group is compulsorily screened for anemia. A uniform definition of screening criteria and an effective system to respond to abnormalities is the need of the hour. The current study was taken up, keeping this need in view

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