



CLINICO-HEMATOLOGICAL PROFILE OF CHILDREN ADMITTED WITH SEVERE ANAEMIA.

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ABSTRACT

Background: Anemia is the most common nutritional deficiency disorder globally, affecting a quarter of the world population, especially children and women of reproductive age group, resulting in public health problem of paramount importance. Severe anemia is haemoglobin percentage less than or equal to 7gm/dl. There is a paucity of data regarding the prevalence of severe anemia hence we undertook this study to find out prevalence of severe anemia. **Aims and Objectives:** Primary Objective is to describe the clinico-haematological profile of children admitted with severe anaemia. Secondary Objectives are estimation of the prevalence of severe anemia in admitted children and identification of the potentially preventable causes of severe anemia in children **Materials and Methods:** After taking pre-informed written consent this cross-sectional observational study was carried out in 150 patients, aged above 2 months who were admitted with severe anaemia in PICU of M.Y.H, Indore (M.P) from May 2020 to May 2021. Anemia was diagnosed on the basis of haemoglobin level and age. Anemia was classified into different types as per different hematological parameters and other relevant investigations. **Results:** During the study period 226 children were admitted with severe anemia Out of which 76 patients were transfusion dependent thalassemia major patients who were excluded from the study and 150 patients were analysed. Prevalence of severe anemia was found to be 4.8% in present study. Majority of children were of age group 2 months to 5 years. There was male preponderance. Pallor was reported in 100% of patients followed by Fever. It was found that 74.67% of children were anaemic due to iron deficiency anemia, 12% were having sickle cell anemia, other causes were Thalassemia (3.33%), B cell ALL (4.67%), megaloblastic anemia (3.33%) and Aplastic anemia (2%). **Conclusion:** Iron deficiency anemia is a major cause of severe anemia & also the potentially preventable cause worldwide. Anemia control is a global priority. Strategies to combat anemia by forging public private partnership, iron supplementation program, iron fortification of food items (point of care and at the level of manufacturing) and dissemination of awareness regarding anemia and treatment should be implemented. Special care should be taken to diagnose and counsel other major causes of anemia like thalassemia depending on the endemicity.

KEYWORDS : Severe Anemia, Iron deficiency anemia, Sickle cell anemia, Vitamin B12 deficiency, Microcytic, Nutritional anemia.

INTRODUCTION

Anemia is the most common nutritional deficiency disorder globally, affecting a quarter of the world population, especially children and women of reproductive age group, resulting in public health problem of paramount importance.¹ Globally, anemia affects 1.62 billion people, which corresponds to 24.8% of the population. Estimated there are 447 million persons with anemia in India, causing India to contribute almost one quarter to the global burden as calculated by the global burden of disease in 2016.² Highest prevalence is observed in preschool-age children i.e., 47.4%.

Anemia is generally defined as reduction of the hemoglobin (Hb) concentration or Red Blood Cell (RBC) volume below the range occurring in healthy person. severe anemia is said to be present if Hb (g/dl) is less than/equal to 7g/dl.⁷ Generally clinical features may not become apparent until the haemoglobin falls <7-8 g/dl. Clinical findings include pallor, irritability, sleepiness. There are several causes of severe anemia important ones being Thalassemia major, nutritional anemia, aplastic anemia, sickle cell anemia and chronic systemic diseases like CKD.

There is a paucity of data regarding the prevalence of severe anemia and our being a tertiary care center we receive more cases of severe anemia from periphery; hence we undertook this study to find out prevalence of severe anemia and Clinicohaematological profile of these patients with severe anemia. It will help to highlight major causes of severe anemia prevailing in our society, which will further help us to implement measures to overcome such deficit.

AIMS & OBJECTIVES

Primary Objective of the study was to describe the clinico-

hematological profile of children admitted with severe anaemia. Secondary Objectives was to estimate the prevalence of severe anemia and also to identify the potentially preventable causes of severe anemia in admitted children in M.Y.H Hospital and Chacha Nehru Hospital, Indore (M.P)

METHOD

This cross-sectional observational study was conducted for a period of 1 year from May 2020 to May 2021 on 150 pediatrics patients admitted in PICU of Department of Paediatrics MYH and CNBC, Indore (M.P) with chief complaint of Severe anemia and satisfying the inclusion and exclusion criteria after approval from institutional ethics committee. All transfusion dependent thalassemia major patients were excluded.

Prior to enrolment, the parents or guardians were informed about the nature of study and informed written consent was taken. After applying exclusion criteria, a total of 150 patients admitted with severe anemia, during the study period were recruited. Detailed history was recorded with particular emphasis on signs and symptoms suggestive of anaemia such as fever, pallor, lethargy, tremors, petechia, hepatosplenomegaly etc. weakness, easy fatigability, breathlessness on exertion, pica.

On admission, a thorough clinical examination of each child was done and all demographic details of the patient such as age, sex, address were recorded on the predesigned proforma. Nutritional Status of the patient was also recorded. Routine blood investigations such as CBC, peripheral smear, PS for malaria parasite, serum iron, serum iron binding

capacity, serum ferritin, transferrin saturation, B12 levels, Haemoglobin electrophoresis, bone marrow aspiration were done as per unit protocol. With the help of peripheral smear, patients were classified into different morphological types as microcytic, macrocytic dimorphic anemia. During the course of stay patients were managed as per the unit protocol and final diagnosis and etiology of severe anemia were recorded in the proforma.

STATISTICAL ANALYSIS

Data was entered in Microsoft excel 2007 and all statistical analyses were performed. Statistical package for the social sciences (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 - test were used for proportions and mean comparisons between groups, respectively.

RESULTS

During the study period of one year from May 2020 to May 2021, a total 4621 patients were admitted in the Department of Pediatrics, M.G.M Medical College & Hospital, Indore. Out of these 4621 patients, 226 patients were admitted PICU with diagnosis of severe anemia. 76 patients were excluded from the study as they were diagnosed with transfusion dependent thalassemia major. A total of 150 patients were included in the present study and were analyzed. Prevalence of severe anemia was found to be 4.8% in the present study calculated with the formula below:

Total patients admitted with severe anemia/ Total number of patients admitted x 100 = 4.8%. out of 150 patients maximum number of cases of severe anemia were found in the age group of 2 month to 5 years (72%), followed by 5.1 year to 10 year (25%) and then > 10 year (3%) (Table 1). Of the 150 patients, 84 (56%) were male and 66 (44%) were female patients. Ratio (male: female) = 1.27:1 (Table 2 & Graph 2). Of all the patients, majority (53%) had normal nutritional status while 29 % fell in the criteria of SAM. (Table 1). The most common clinical feature in all patients was found to be pallor (100%) followed by 95 patients with fever (63.3%) and 79 patients with lethargy (52.6%).on examination hepatomegaly was seen in 44 patients (29.33%), Breathlessness & Pedal edema in 43 (28.67%) patients each, icterus in 26 (17.33%), hyperpigmentation & Petechiae in 10 (6.67%) patients each, bleeding manifestations in 8 (5.33%) and tremors in 5 (3.33%) patients (Table 2).

Among the type of anemia, the most commonly observed morphological type on peripheral smear was microcytic hypochromic (77.33%) followed by Dimorphic type (10.67%) other less commonly observed types were normocytic hypochromic (7.33%), macrocytic (3.33%) and normocytic normochromic (1.33%). (Graph 1).

Most common etiology was found out to be Iron deficiency anemia (74.6%) followed by sickle cell anemia (12%). Other causes were Thalassemia (3.33%), B cell ALL (4.67%), megaloblastic anemia (3.33%) and Aplastic anemia (2%) (Table 3). Amongst the Iron deficiency anemia, maximum no. of cases was found in the age group of 2 month to 5 years (60.71%), followed by 5.1 year to 10 year (37.50%) and then > 10 year (1.71%)

(Graph 2). In patient with iron deficiency anemia (112 patients) iron studies were done and following mean values of the parameters were found as following 35.75 mcg/dl for Serum iron, 645.84 mcg/dl for TIBC, 25.09 ng/ml for Serum ferritin and 5.7% for transferrin saturation levels (Table 4) .

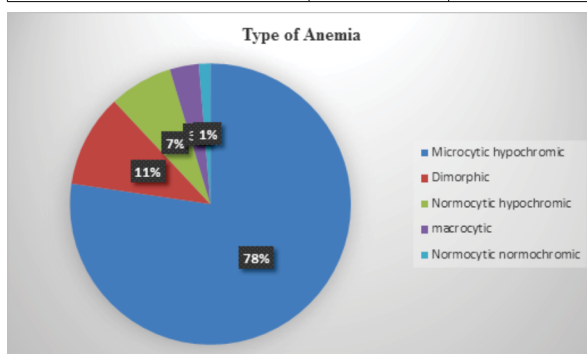
Table 1: Distribution Of Patients According To Age Group, Sex And Nutritional Status

Variable	Frequency N	Percentage %
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Age	2 months - 5 years	107	71%
	>5-10 years	38	25%
	> 10 years	5	3%
	Total	150	100%
Gender	Female	66	44%
	Male	84	56%
	Total	150	100%
Nutritional status	Normal	79	53%
	SAM	44	29%
	MAM	27	18%
	Total	150	100%

Table 2. Distribution Of Patients According Clinical Profile

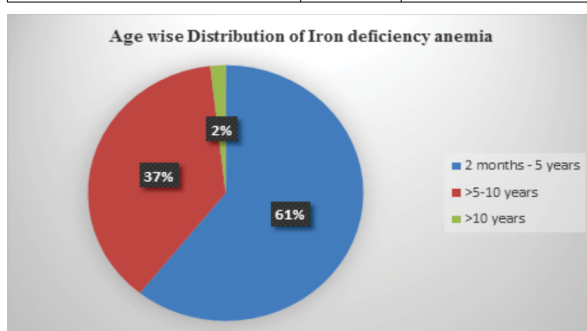
Clinical profile	N	%
Fever	95	63.33%
Lethargy	79	52.67%
Breathlessness	43	28.67%
Cough/Coryza	25	16.67%
Pallor	150	100%
Hepatomegaly	44	29.33%
Splenomegaly	28	18.67%
Icterus	26	17.33%
pedal edema	43	28.67%
Hyperpigmentation	10	6.67%
Petechiae	10	6.67%
Bleeding manifestations	8	5.33%
Tremors	5	3.33%



Graph 1. Distribution Of Patient According Morphological Type

Table 3. Distribution Of Patients According To Etiology

Etiology	N	Percent
Iron deficiency anemia	112	74.67%
Sickle Cell Anaemia	18	12.00%
B-Cell ALL	7	4.67%
Thalassemia	5	3.33%
Megaloblastic anemia	5	3.33%
Aplastic Anemia	3	2.00%
CKD	2	1.33%
Malaria	2	1.33%
AML	1	0.67%
Total	150	100.00%



Graph 2: Age Wise Distribution Of Iron Deficiency Anemia

Table 4: Mean (sd) Of Lab Parameters Of Iron Deficiency Anemia Patients

Indices	Mean values
Serum iron (65-175mcg/dl)	35.75
TIBC (225-535mcg/dl)	645.84
Serum ferritin (10-290 ng/ml)	25.09
Transferrin saturation levels (13-45%)	5.7

DISCUSSION

The present study was a cross-sectional observational study aimed at describing clinico haematological profile, prevalence of severe anaemia and to identify potentially preventable causes of severe anemia in children. During the study period of one year from May 2020 to May 2021, the total number of patients admitted in Department of Pediatrics M. Y. hospital Indore were 4621. Out of these admissions, 226 were diagnosed with severe anemia. After excluding transfusion dependent thalassemia major patients (76), we evaluated 150 patients with severe anemia in our study. The prevalence of severe anemia was found out to be 4.8%. The high prevalence can be attributed to being a tertiary care centre visited by many patients referred from peripheral centres.

The prevalence of anemia at our centre was found out to be 28% in admitted patients which was in discordance with prevalence of 67 % in age group 6 months to 5 years as stated in the fifth round of the National Family Health Survey conducted in 2019–21(NFHS5). This discordance in the data can be explained as in our Centre patients with severe anemia and some with moderate anemia with some other comorbidities were only admitted whereas children with mild and moderate anemia were managed on OPD basis hence were not recorded.

In our study severe anemia was found to be more in age group of 2 month to 5 years (72%), consistent with findings of National Poshan Abhiyaan 2022 in which anemia was most prevalent among children under 5 years of age.¹ The results of the study were in concurrence with Choudhary et al. (2021)⁵ who reported anemia to be most common amongst children of 1 to 5 years (37.7%) of age group. This could be due to increased diseases burden in under five population as compared to other age groups owing to their poor nutritional status, breast feeding beyond 6 months, improper complimentary diet. A higher preponderance of Severe Anemia was observed in males as compared to females in our study. 84 (56%) patients out of the 150 patients, were males and 66 (44%) were female patients. Male to female ratio of Ratio of 1.27:1 was observed. The reason for this difference may be because of admission bias for male child in developing countries like ours. The results of our study were in concurrence with study done by Choudhary et al. (2021). He reported a total of 138 cases severe anemia in his study out of which 46 (33.33%) were female and 92 were male (66.7%).⁵

It was observed from our study that of all the patients, majority (53%) had normal nutritional status while 29 % fell in the criteria of SAM. the results were in concordance with Dwivedi D et al.⁸ (2017) at Shyam Shah Medical College Rewa, in this study a total of 100 children with a diagnosis of SAM were included in the study and another 101 children were enrolled in the study as controls, Prevalence of anaemia was 85% in SAM group and 81.2% in controls although this finding was not statistically significant, also Majority of SAM children had moderate anaemia (42%).

On general examination Pallor (100%) was present in all patients in the present study. Fever (63.33%) and lethargy (52.7%) were the most common presenting symptoms of the patients in our study, in a similar study done by Choudhary et al.⁵ (2021) at Chirayu Medical college, Pallor was seen in 100% of patients followed by fatigability was the most common presenting symptom observed in 83.33% of children.

Peripheral smear examination showed that the most commonly observed morphological type in our study was microcytic hypochromic (77.33%) Followed by Dimorphic type (10.67%). Other less commonly observed types were normocytic hypochromic (7.33%), macrocytic (3.33%) and normocytic normochromic (1.33%) This was similar to results of Choudhary et al.⁵ (2021) who observed, microcytic hypochromic anemia in 74%, Dimorphic anemia was seen in 10.4%. Normocytic hypochromic anemia is seen in 15.6% of patients. A study by Venkatesh et al.⁹ (2013) observed microcytic hypochromic anemia in 54.4%, and dimorphic anemia is seen in 36.6% of patients.⁹

The common etiology found in our study is iron deficiency anemia 112(74.76%) followed by sickle cell anemia (12%), B-Cell ALL (4.67%), thalassemia (3.33%), megaloblastic anemia (3.3%) aplastic anemia (2%). In a similar study done by Madoori et al.¹⁰ (2015) 58% of children were found to be anaemic due to Iron deficiency anaemia, 27% because of sickle cell anaemia, 9% due to thalassemia, 5% due to megaloblastic anaemia and 2% due to aplastic anaemia.⁹ Choudhary et al.⁵ (2021) at Chirayu Medical College, Bhopal also reported is Iron deficiency anemia (57.3%) as the most common cause found in the study while thalassemia 15.6%, 10.4% cases had megaloblastic anemia and 5.2 % had aplastic anemia. The increased prevalence of sickle cell anemia in our study population is due to our hospital being a referral centre for nearby tribal areas such as Jabua and Dhar district of, Madhya Pradesh, India. Prevalence of sickle cell anemia disorder is very high amongst tribal population. In our study since iron deficiency anemia was found out to be the most common cause of severe anemia and hence it was identified as the most potentially preventable cause of severe anemia in children. In the present study, the mean value of serum ferritin was 25.09ng/ml. A study done by Deeksha k et al.¹¹ (2002) found that ferritin was more sensitive marker for diagnosis of IDA. Another study done by Paiva AA et al.¹² (2000) also documented that plasma ferritin levels decrease when there is a deficiency of iron that is not complicated by another concomitant disease.

Limitations of our study was the small study population, so a study in future should be planned with longer duration for a larger sample size in order to corroborate the evidence found in this research and to eliminate random error.

CONCLUSION

Iron deficiency anemia was found to be the most common cause of severe anemia in the present study. The results of this study emphasize the role of nutrition in prevention of severe anemia. Iron deficiency is an important public health problem in developing countries like ours. Prompt screening for iron deficiency, especially in population of under-five years, as increased diseases burden in under 5 years population was found in our study. Importance to supplementation with iron to low-birth-weight babies, proper complementary feeding counselling in under 5 years age population, oral iron and folic acid supplementation for pregnant women should be done.

Appropriate screening and subsequent diagnostic testing will allow most cases of iron deficiency anemia to be diagnosed at the earliest. Combating iron deficiency anemia should be a priority making every endeavour towards implementing adequate public policies, strengthening community actions, promoting people's involvement and reformulating healthcare services. As our study also showed high prevalence of sickle cell patients, feasible option for its prevention is to promote education and awareness programs and intensive screening in all the state with micro mapping to assess the true burden.

REFERENCES

1. McLean E, Cogswell M, Egli I, Wojdyla D, de Benoist B. Worldwide prevalence of anaemia, WHO Vitamin and Mineral Nutrition Information System, 1993-2005. *Public Health Nutr.* 2009;12(4):444-54.
2. Ministry of Health and Family Welfare (MoHFW), Government of India, UNICEF and Population Council. Comprehensive National Nutrition Survey (CNNS) National Report. New Delhi. 2019.
3. Keikhaei B, Zandian K, Ghasemi A, Tabibi R. Iron deficiency anemia among children in southwest Iran. *Food and Nutrition Bulletin*. The United Nations University; 2007;28(4):406-11.
4. Kliegman, Stanton, St Geme, Schor. Nelson text book of Pediatrics. 1st South East Asia ed; Saunders Elsevier; 2015. p. 2309.
5. Choudhary P, Kumar S, Ambhore J. Clinical and hematological profile of anemia in children aged 6 months to 12 years at tertiary care hospital in central India. *Int J Contemp Pediatr* 2021;8:1704-8.
6. Parthasarathy A, Nair MKC, Menon PSN, Gupta P, et al. IAP text book of Pediatrics. 5th ed. Jaypee Brothers Medical Publishers (P) Ltd; 2013. p. 644-7. <https://doi.org/10.5005/jp/books/11894>.
7. Janjale A, Pande S, Sonawane R, Ahire N, Sonawane S. A Study of Severe Anemia in Children in a Tertiary Care Institute. *MVP Journal of Medical Sciences* 2018; 5(1):33-38.
8. Dwivedi, D., Singh, V., Singh, J., & Sharma, S. (2018). Study of Anaemia in Children with Severe Acute Malnutrition. *Journal of Nepal Paediatric Society*, 37(3), 250-253.
9. Venkatesh G, Soubhagya Talawar, Bela H Shah, Clinical Profile of Anemia in Children. *IOSR Journal of Dental and Medical Sciences* 2013;10(5):65-69.
10. Madoori S, Ramya C, Valugula S, Sandeep G, Kotla S. Clinico hematological profile and outcome of anemia in children at tertiary care hospital, Karimnagar, Telangana, India. *Int J Res Med Sci.* 2015;3:3567-71.
11. Kapur D, Agarwal KN, Sharma S. Detecting iron deficiency anemia among children (9-36 months of age) by implementing a screening program in an urban slum. *Indian Pediatr.* 2002 Jul;39(7):671-6.
12. Paiva AA, Rondó PHC, Guerra-Shinohara EM. Parameters for the assessment of iron status. *Revista de Saúde Pública.* 2000; 34(4): 421-6.