International Journal of Medical Research Professionals
P-ISSN: 2454-6356; E-ISSN: 2454-6364
DOI: 10.21276/ijmrp

Original Research Article.

Clinicopathological Pattern of Anemia in Children in Age Group Upto 18 Year

Abhay Prakash[1*], Ashutosh Kumar[2], Seema Awasthi[3], Shyamoli Dutta[4], Ankita Mittal[5]

[1*]PG Resident (IIIrd Year), [2]Associate Professor, [3]Professor, [4]Professor & Head, [5]Assistant Professor, Department of Pathology, Teerthanker Mahaveer Medical College & Research Centre, Moradabad, UP, India.

ABSTRACT

Introduction: Anemia is a nutritional problem of Global importance. It is estimated that at least one-third of the population has been at one time anemic.

Objective: To evaluate the prevalence of anemia in patients admitted in Teerthanker Mahaveer Hospital, Moradabad, UP.

Methods: A cross-sectional study was conducted involving 150 male and female childrens aged 6 months to 18 years old, who were hospitalised from Feb 2015 to Aug 2017.

Results: Children with a hemoglobin concentration less than 11g/dl were considered anemic, The relationship between studied variables and anemia was evaluated by passion regression analysis. There was a 56.6% prevalence of anemia (95%CI: 46.6-54.6). Anemia was significantly correlated with low weight (Prevalence ratio-PR=1.39; 95% CI: 1.18-1.64), young age (PR=2.01; 95% CI: 1.57-2.56) and a diagnosis of acute lower respiratory disease (PR=1.57; 95% CI; 1.27-1.96).

Keywords: Anemia, Prevalence, Nutritional Status, Risk Factors.

***Correspondence to:**

Dr. Abhay Prakash,
PG Resident (IIIrd Year),
Department of Pathology,
TMMC & RC, Moradabad,
Uttar Pradesh, India.

Article History:

Received: 04-12-2017, **Revised:** 23-12-2017, **Accepted:** 10-01-2018

Access this article online	
Website: www.ijmrp.com	Quick Response code
DOI: 10.21276/ijmrp.2018.4.1.052	

INTRODUCTION

Iron deficiency is the most common cause of nutritional anemia worldwide followed by folic acid and Vitamin B12 deficiency anemia, Globally 1.62 billion people are anemic, while among the preschool children the prevalence of anemia is 47.4%.[1] In India the prevalence rates are as high as 70% and the efforts to tackle with the problem remain futile.[2] Despite the existence of a national anemia-control program the prevalence of anemia in India between 2000 and 2005 increased from 75.3% to 80.9% in children aged 6 to 36 month.[3-5] Nearly half the children aged 6-59 months in Uttar Pradesh have moderate to severe anemia.[4] Iron deficiency reduces the learning capacity of the children aged below five years, decreases attentiveness, and causes low intelligence and thus, ultimately negatively impacts on the development of the country.[6,7] Low economic status, less education, and poor health of mothers due to meager dietary intake are the main causes of anemia.[8,9] Other less common causes of microcytic anemia in children are thalassemia, and anemia of chronic disease[10], cause of the latter can be either acute leukemia, aplastic anemia (to be ruled out by bone marrow biopsy), hemolytic anemia and hemoglobinop-athies.[11] In this context, the present study is an effort to determine the patterns and various hematological as well as morphological types of anemia in children

MATERIALS AND METHODS

The study was conducted in Department of Pathology in collaboration with Teerthankar Mahaveer Medical College and Research Centre (TMMC & RC), Moradabad, Uttar Pradesh.

Inclusion Criteria

a) Children aged 6 months to 18 years

b) Haemoglobin level less than expected age- and gender-specific normal range.

Exclusion Criteria

a) Children with chronic illnesses or those having high grade fever >103^{o}F

b) Those having systemic abnormalities

c) Children having other primary hematological disorders involving diseases of WBCs and Platelets

Informed consent was obtained from the parents, and the Institutional Ethical Committee approved the study protocol.

During physical examination following signs and symptoms were noted: Pallor, edema, clubbing, skin (dryness, rashes, irritation), abnormal pigmentation, coarse hair, puffiness of face, thinning of eyebrows, nail defects, ulceration, abnormalities in genitalia, hand and feet abnormalities, nose, eyes, cranium, ear and face.

Venous blood was drawn from all the patients and every sample was analyzed for hemoglobin (Hb) concentration, hematocrit (Hct),

erythrocyte indices (mean corpuscular volume, mean corpuscular hemoglobin and mean corpuscular hemoglobin concentration), differential count, Erythrocyte sedimentation rate (ESR), Red cell distribution width (RDW), serum iron levels, total iron binding capacity, serum ferritin and serum vitamin B12 levels. Grading of anemia among different age groups was done using WHO Hemoglobin concentrations for the diagnosis of anemia and assessment of severity criteria.[12] Microscopic evaluation of blood was also done to obtain the microscopic picture. Stool samples were obtained and were evaluated under microscope to rule out intestinal parasitic infections.

For statistical evaluations, mean, standard deviation and Chi-square test were performed. p value less than 0.05 was considered to be statistically significant.

Age and gender	Cut-off for anemia	Cut-off for Mild anemia	Cut-off for Moderate anemia	Cut-off for Severe anemia
Children 6 - 59 months of age	<11 g/dl	10.0-10.9 g/dl	7.0-9.9 g/dl	<7.0 g/dl
Children 5 - 11 years of age	<11.5 g/dl	11.0-11.4 g/dl	8.0-10.9 g/dl	<8.0 g/dl
Children 12 - 14 years of age	<12.0 g/dl	11.0-11.9 g/dl	8.0-10.9 g/dl	<8.0 g/dl
Non-pregnant girls aged 15 yrs or above	<12.0 g/dl	11.0-11.9 g/dl	8.0-10.9 g/dl	<8.0 g/dl
Boys 15 yrs or above	<13.0 g/dl	11.0-12.9 g/dl	8.0-10.9 g/dl	<8.0 g/dl

RESULTS

A total of 150 anemic children falling in sampling frame were enrolled in the study. 61 children (40.7%) were < 5years, 46 children (30.7%) were between 5-11 years, 13 children (8.7%) were in age group of 12-14 years, while 30 children (20%) were in age group of 15 years and above.

According to WHO criteria for diagnosis and assessment of severity of anemia, a total of 30 (20%) children were graded as having mild anemia, 98 (65.3%) were graded as having moderate anemia and remaining 22 (14.7%) were graded as having severe anemia.

Amongst the different age groups, in children < 5years, 21.3% were mildly anemic, 70.5% and 8.2 % were moderately and severely anemic; among the age group between 5-11 years, mild, moderate and severely anemic percentage were 8.7%, 71.7% and 19.6% respectively; among the age group between 12-14 years, mild, moderate and severely anemic percentages were 23.1%, 61.5% and 15.4% respectively; among the age group of 15 years and above, mild, moderate and severely anemic percentages were 33.3%, 46.7% and 20% respectively.

Study showed, majority of the patients were males (91) in comparison to females (59). Moderate to severe anemia was higher in females (86.4%) as compared to that in males (75.8%).

Pallor (64%), koilonychias (35.2%), palpitation (35.3%), dysphagia (32.7%), dyspnoea (28.7%) and lack of concentration (27.3%) were the major signs and symptoms. Generalized weakness (14%) and stomatitis (12%) were some of the less common findings. With increasing severity a significant increase in signs and symptoms were observed ($p<0.05$).

On systemic examination all the patients had normal CVS, CNS and respiratory findings, except for one child, abdominal examination of whom showed mild organomegaly.

With increasing severity of anemia, a significant decline in mean hemoglobin, hematocrit, RBC Count levels were observed ($p<0.001$). RDW showed a significant increase with increasing severity of anemia ($p<0.001$). Mean MCHC levels of patients with severe anemia were significantly lower in severe grade as compared to mild and moderate anemia grades ($p=0.003$). For other parameters, no significant difference among different grades of anemia was observed.

MCH levels were <24 pg/cell in 57 (38%), 24-29 pg/cell in 76 (50.7%) and >29 pg/cell in 17 (11.3%) children. MCHC levels were <32% in 61 (54%), 32-35% in 64 (42.7%) and >35% in 5 (3.3%) children. Hematocrit levels were <32% in 107 (71.3%) and in 32-40% among 43 (28.7%) children. Platelet count was <150,000/cumm in 34 (22.7%) and ≥150,000/cumm in 116 (77.3%) children. TLC levels were <4000/cumm in 5 (3.3%), 4000-11000/cumm in 61 (40.7%) and >11000/cumm in 84 (56%) children. Red blood cell count was $<3.9x10^6$/µL in 72 (48%), $3.9-5x10^6$/µL in 69 (46%) and $>5x10^6$/µL in 9 (6%) children. Red cell distribution width (RDW) (CV) was <14.5% in 41 (27.3%) and ≥14.5% in 109 (72.7%) children. Neutrophils were <35% in 16 (10.7%), 35-70% in 61 (10.7%) and >70% in 73 (48.7%) children. Eosinophil count was <2% in 109 (72.7%), 2-5% in 34 (22.7%) and >5% in 7 (4.7%) children. Monocyte count was <3% in 30 (20%), 3-13% in 118 (78.7%) and >13% in 2 (1.3%) children. Reticulocyte count was >2% in 34 (22.7%) cases. ESR levels were 13-17 mm/hr in 103 (68.7%) and >17 mm/hr in 47 (31.3%) cases.

Mean serum iron levels in mild, moderate and severe anemia were 26.68±3.43, 23.75±5.86 and 22.41±6.27 µg/dL respectively, thereby showing a association between serum iron levels and grade of anemia ($p=0.013$). Serum ferritin levels in mild, moderate and severe anemia grades were 12.58±5.20, 11.67±3.07 and 11.73±3.82 µg/L respectively. Serum iron and S. ferritin levels were most commonly impaired showing values below the cut-off in 140 (93.3%) and 126 (84%) children respectively. Serum TIBC levels were above the cut-off level in 40 (26.7%) while Vitamin B_{12} levels were below the cut-off level in 6 (4%) children

All the children had normal histogram, normal radiology and stool examination findings.

The microscopic picture was microcytic hypochromic in 148 cases (98.7%), whereas only two cases had macrocytic anemia (1.3%).

DISCUSSION

Anemia makes individual susceptible to various health related risks including infection.[13]

Anemia in childhood and infancy has long-lasting neural and behavioral effects too[14], apart from delaying and impairing the growth.[15]

A number of studies on anemia in children have been performed; however, they focus on the prevalence and severity of anemia. Moreover, there are limited or almost no studies available studying this problem in children aged 6 months to 18 years. Hence, the

present study was planned as a hospital-based study evaluating the clinicopathological profile of anemia in children aged 6 months to 18 years.

A total of 150 children free of any haematological disorder affecting white blood cell and platelet counts were enrolled in the study.

In present study, we used WHO criteria for assessment of severity of anemia[15], which is useful as it defines the age and gender-specific cut-off levels of haemoglobin to describe the severity of anemia.

In our study, we found mild, moderate and severe anemia was 20%, 65.3% and 14.7% respectively. Compared to the findings of present study, Saba et al[16], in their study also showed mild, moderate and severe grades of anemia in 12.7%, 75.82% and 11.43% patients, respectively, thus showing a dominance of children with moderate anemia as observed in present study. However, one community based study from rural school children aged 5-15 years[17], reported the severity profile of 1223 anemic children to be dominated by mild anemia (56.1%) followed by moderate anemia (42.9%) and least by severe anemia (0.8%). The difference might be due to the study being conducted on a community and our study being a hospital based study. However, the role of socioeconomic factors, regional differences and other demographic factors could also affect the profile of severity of anemia in different studies.

In present study, maximum numbers of cases were aged <5 years followed by those aged 5-11 years, ≥15 years and 12-14 years in decreasing order, respectively. Mean age of children was 7.64±5.73 years. Similar to present study, Saba et al[16], who conducted their study in a study population aged 6 months to 12 years, age group <5 years comprised 74.0% of study population. Muthsamy et al[18], in their study, had maximum number of anemia patients in age group < 5years. In fact, age group <5 years is highly vulnerable to anemia.[19]

In presents study, majority of anemic children were males (60.7%). However, no significant association between anemia severity and gender could be seen. Saba et al[16], in their study has shown 58.4% males being affected. Muthusamy et al[18], in their study had 55.6% affected males. However, Sharma et al[20] found majority of anemic children to be girls (51.4%). But Chhabra et al[21] in their hospital based study, like our study reported the dominance of males (64.4%). In different community based studies too, a dominance of males over females has been reported, particularly among studies being conducted in children aged ≤5 years of age.[22-24]

In present study, major presenting complaints included pallor (64%), koilonychias (35.2%), palpitation (35.3%), dysphagia (32.7%), dyspnoea (28.7%) and lack of concentration (27.3%). Similar to our study, weakness and pallor have been reported to be the common findings in different studies.[21,25] However, according to WHO, clinically visible pallor appears in children when the Hb level falls below 7-8 gms. Similar to our study, Nalli et al[26], also reported pallor and fatigue as the presenting symptoms in a large majority (87.5% and 72.5%) of their cases.

In present study, red cell distribution width was found to be above normal range (>14.5%) in all the severity grades of anemia. Similar to present study, Saba et al[16], also found mean RDW values to be raised significantly in anemic children. In present study, mean MCV levels ranged from 76.23±14.48 fl to 79.99±7.06 fl in different severity grades of anemia. In their study, Saba et al[16], also showed mean MCV values to be 75.08±9.93 fl in anemic children.

In present study, 59.3% of anemic patients, have deranged WBC count, in comparison to study performed by Muthusamy et al[18], which showed deranged WBC count in 48% cases.

Highly deranged low MCV, Hb and RBC in the present study indicated a high probability of microcytic hypochromic anemia.

Also, in the study, serum iron and ferritin levels decreased and TIBC levels were raised as the severity of anemia increased. In peripheral blood picture, this was further cleared as 98.7% of our cases proved out to have microcytic hypochromic anemia while only two cases had megaloblastic anemia. However, Saba et al[16], in their study found microcytic hypochromic picture in 49%, dimorphic in 24%, normocytic normochromic in 22% and macrocytic in 4% cases. Chhabra et al[21], in their study showed that microcytic hypochromic picture was common in all age groups and was significantly associated with iron deficiency anemia. They also found mean cell volume to be low in 95.3% cases of iron deficiency and high in 81.8% cases of megaloblastic anemia

CONCLUSION

The findings of present study provided a clinicopathological overview of anemia in children in a hospital based study. The present study was perhaps the first providing the overview of anemia in children in such diversified age. Despite being a hospital-based study, the high prevalence of iron deficiency anemia among children indicated role of nutritional deficiencies in determining the anemic status of the children, and perhaps, their vulnerability to illness requiring hospital services.

One of the limitations of the study was our inability to get a detailed record of dietary and nutritional pattern and preferences of the children owing to which the etiology of anemia could not be established completely. Further studies with a comparative data from community along with detailed dietary intake and preference pattern might help in understanding and differentiating the prevalence, pattern and etiology of the anemia in children.

REFERENCES

1. Bharati S, Pal M, Chakrabarty S, and Bharati P. Socioeconomic determinants of iron deficiency anemia among children aged 6 to 59 months in India. Asia-Pacific Journal of Public Health, 2013; 6.

2. Kotecha PV. Nutritional Anemia in Young Children with Focus on Asia and India. Indian J Community Med. 2011; 36(1): 8-16.

3. Kumar A. National nutritional anaemia control programme in India. Indian J Public Health. 1999;43(1):3–5, 16.

4. IIPS. Chapter 10: Nutrition and Anemia. In: National Family Health Survey (NFHS-3) 2005-06, India, September, 2007, p. 289.

5. IIPS. The Second National Family Health Survey (NFHS-2), 1998 –1999. Mumbai, India: International Institute for Population Sciences (IIPS) and ORC Macro; 2000.

6. Zhao A, Zhang Y, Peng Y et al. Prevalence of anemia and its risk factors among children 6–36 months old in Burma. The American Journal of Tropical Medicine and Hygiene, 2012; 87 (2): 306–311.

7. Kapur D, Agarwal KN, Agarwal DK. Nutritional anemia and its control. Indian Journal of Pediatrics 2002; 69 (7): 607–616.

8. Behrman RE, Kleigman RM. Nelson Essentials of Pediatrics: Hematology, WB Saunders, Philadelphia, USA, 2nd edition, 1994.

9. Oski FA. Iron deficiency in infancy and childhood. The New England Journal of Medicine, 1993; 329 (3): 190–193.
10. DeMaeyer E, Adiels-Tegman M. The prevalence of anemia in the world. World Health Stat Q, 1985; 38 (3): 302–316.
11. Irwin JJ, Kirchner JT. Anemia in children. Am Fam Physician, 2001; 64(8).
12. WHO. Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity. Vitamin and Mineral Nutrition Information System. Geneva, World Health Organization, 2011 (WHO/NMH/NHD/MNM/11.1).
13. Viana MB. Anemia and infection: a complex relationship. Revista Brasileira de Hematologia e Hemoterapia. 2011;33(2): 90-92.
14. Lozoff B, Beard J, Connor J, Felt B, Georgieff M, Schallert T. Long-Lasting Neural and Behavioral Effects of Iron Deficiency in Infancy. Nutrition reviews. 2006;64(5 Pt 2):S34-S91.
15. Soliman AT, De Sanctis V, Kalra S. Anemia and growth. Indian Journal of Endocrinology and Metabolism. 2014;18 (Suppl 1):S1-S5.
16. Saba F, Poornima S, Balaji PAR, Varne SRR, Jayashree K. Anemia Among Hospitalized Children at a Multispecialty Hospital, Bangalore (Karnataka), India. J Family Med Prim Care. 2014 Jan-Mar; 3(1): 48–53.
17. Mandot S, Bamnawat S. Prevalence of anemia among rural school children of Rajasthan. Int J Cur Res Rev. 2015;7(15): 40-3.
18. Muthusamy BG, Venugopal V, Sumithra S. Prevalence of anaemia among the hospitalized children in a rural tertiary care teaching hospital. Int J Contemp Pediatr. 2017 Mar;4(2):431-437.
19. Kotecha PV. Nutritional Anemia in Young Children with Focus on Asia and India. Indian J Community Med. 2011; 36(1): 8-16.
20. Sharma A, Abhishek G, Pudasaini S. Prevalence of anemia in children aged 6 months to 15 years: a hospital based study. Journal of Pathology of Nepal 2017; 7: 1168-1171.
21. Chhabra A, Chander V, Singh A, Gupta A, Chandra H, Gaur S. A study of anemia in hospitalized children in a tertiary care hospital in Northern India. J Biomed Pharm. Res.2014;3(2):80-83.
22. Karimi M, Mirzaei M, Dehghani A. Prevalence of anaemia, iron deficiency and iron deficiency anaemia in 6–60 month old children in Yazd's rural area. International Pediatr 2004;19(3):180–4.
23. Sudhagandhi B, Sundaresan S, William WE, Prema A. Prevalence of anemia in the school children of Kattankulathur, Tamil Nadu, India. Int J Nutr Pharmacol Neurol Dis [serial online] 2011;1:184-188.
24. Behera S, Bulliyya G. Magnitude of Anemia and Hematological Predictors among Children under 12 Years in Odisha, India. Anemia 2016; Article ID 1729147: 1-10.
25. Goswami BK, Chakrabarti S, Paul PC, Pramanik R, Raha K, Das S. Clinicohaematological analysis of aplastic anaemia among children of northern districts of West Bengal. J Indian Med Assoc. 2009 Jan;107(1):17-8, 20.
26. Nalli R, Adyar A, Anita S. Study of Etiology and Varied Clinical Features of Megaloblastic Anemia in Adolescents at Niloufer Hospital. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) 2016; 15(1): 16-20.

Source of Support: Nil.

Conflict of Interest: None Declared.

Cite this article as: Abhay Prakash, Ashutosh Kumar, Seema Awasthi, Shyamoli Dutta, Ankita Mittal. Clinicopathological Pattern of Anemia in Children in Age Group Upto 18 Year. Int J Med Res Prof. 2018 Jan; 4(1):262-65. DOI:10.21276/ijmrp.2018.4.1.052