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Original Research Article

A Study of Etioclinicopathological Profile of Moderate to Severe Anemia in Pre-School Children in and around Dehradun

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ABSTRACT

Background

Anemia is a common health problem in preschool children. It is characterized by a decreased concentration of hemoglobin and red blood cells, which can lead to impaired physical and cognitive development. The prevalence of anemia in preschool children varies depending on the country and region. In India, the prevalence of anemia is estimated to be between 30% and 70%. The present study was carried out with an aim to study the etiology and clinico-pathological profile of moderate to severe anemia in pre-school children.

Methods

This was a cross-sectional study conducted in department of paediatrics SGRR institute and medical health sciences Dehradun India from April 2016 to March 2023, with an aim to determine prevalence of moderate to severe anemia and its etiology in preschool children aged 6 to 60 months .

Results

In a population of 2220 preschool children aged 6 to 60 months prevalence of moderate to severe anemia was 24.8%. This was higher among females (30.4%) than males (19.1%). Iron deficiency anemia was the most common type of anemia (69.0%), followed by vitamin B12/folic acid deficiency anemia (18.2%). Microcytic hypochromic anemia was the most common morphology of anemia (70.9%).

Conclusion

Majority of children in present study had anemia (59.9%). Prevalence of mild, moderate and severe anemia was 35.1%, 18.9% and 5.9% respectively. Microcytic hypochromic type was the most common type (n=390; 70.9% Iron deficiency anemia was most common (n=380; 69%) followed by Vitamin B12/Folic acid deficiency (n=100; 18.2%).

Keywords: anemia, preschool children, iron deficiency anemia, vitamin B12/folic acid deficiency anemia

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INTRODUCTION

Anemia is defined as decreased concentration of haemoglobin and RBC mass as compared to the values in age-matched controls. There are three primary causes: reduced production of red blood cells, which may result from deficiency in nutrients or hormones, or from disease or other conditions; excessive destruction of red blood cells, often a hereditary problem; and excessive blood loss.[1] Worldwide, anemia among preschool children is one of the serious public health problems. Globally 1.62 billion people are anemic, while among the preschool children the prevalence of anemia is 47.4%.[2] In India, about 89 million children are anemic.[3] Thus, India is the highest contributor to child anemia among the developing countries.[4] According to the latest national representative survey of India, 70% children are anemic in the age group of 6–59 months, including 3% severely anemic, 40% moderately anemic, and 26% mildly anemic.[5] Anemia is the most predominant factor for morbidity and child mortality,[6-8] and hence, it is a critical health issue for preschool children in India.[9] Nearly half the children aged 6-59 months in Uttar Pradesh and Uttrakhand have moderate to severe anemia.[5] Moderate to severe anemia (Hb <10.0 gm/dl) is a serious nutritional anomaly that requires an early recognition and management based on correct diagnosis of etiology and clinic-pathological profile of children which might further help to establish a correlation between different etiologies and clinic-pathological profile of anemia in children. This might help in evolving simplified criteria based on clinical and pathological profile independently or in combination to differentiate between different etiologies of anemia, and to suggest appropriate corrective measures in accordance with the specific etiology of the deficiency. The present study was carried out with an aim to study the etiology and clinico-pathological profile of moderate to severe anemia in pre-school children.

AIM AND OBJECTIVES

The present study was carried out with an aim to study the etiology and clinic-pathological profile of moderate to severe anemia in pre-school children. This aim was achieved with the help of following objectives:

1. To find out the hospital based prevalence of moderate to severe anemia and its different types in children attending hospital.
2. To establish the etiology like iron deficiency anemia, pernicious anemia, folic acid deficiency anemia, thalassemia and hemolytic anemia in moderate to severe anemic patients.
3. To study the clinico-pathological profile of moderate to severe anemic children.

MATERIALS & METHODS

Present cross sectional study was conducted in the Department of Pediatrics in collaboration with Department of Pathology, SGRR Medical College, Dehradun from April 2016 – March 2023.The sampling frame was children aged 6 months to 5 years having moderate to severe anemia. Trauma victims or patients with injury resulting in severe blood loss, individuals having undergone blood transfusion within three months, child suffering from multiple congenital anomaly were excluded from the study. The ethical approval for conducting the study was obtained from the Institutional Ethical Committee. Informed consent was taken from the guardians of all the subjects before enrolling in the study. All the subjects falling in the sampling

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frame were invited through their guardians to participate in the study. Only those willing to participate in the study were enrolled in the study. After obtaining informed consent from the subjects, demographic details were noted and a blood sample was obtained for the assessment of haemoglobin. On the basis of outcome of haemoglobin assessment, the subjects were categorized for their anemic status based on the WHO criteria: Hb ≥11 mg/dl (Non-anemic), Hb 10-10.9 (Mild anemia), Hb 7-9.9 (Moderate anemia) and Hb < 7 (Severe anemia). Detailed clinical, pathological, dietary and medical history of children were obtained in order to ascertain the etiology. In all the subjects diagnosed as anemic, complete blood picture and general blood picture was done. Serum ferritin and iron levels were assessed in all microcytic hypochromic anemia to ascertain the cause of anemia as iron deficiency anemia. In cases having macrocytic anemia, vitamin B12 and folic acid levels were assessed. In subjects having normocytic normochromic anemia, hemolysis, blood loss or bone marrow hypoplasia were ascertained by performing tests as indicated by general blood picture which included reticulocyte count, hemoglobin electrophoresis, test for sickle cells and Coomb's test. Bone marrow examination was performed if required.

Statistical Analysis

Statistical analysis was done using Statistical Package for Social Sciences version 28 (IBM Corporation, SPSS Inc., Chicago, IL, USA). Chi-square test and independent samples t-test was used to compare the study parameters. The multivariate logistic regression analysis was carried to find the significant factors affect the prevalence of anemia. The p-value<0.05 was considered significant.

RESULTS

The present study was conducted in the Department of Pediatrics in collaboration with Department of Pathology, SGRR Medical College, Dehradun with an aim to study the etiology and clinico-pathological profile of moderate to severe anemia in pre-school (aged 6 to 60 months) children. A total of 2220 children were included in the study. More than one third of the children were between 24-35 month (38.3%) followed by 12-23 (28.8%), 48-60 (17.1%), 36-47 (9%) and <12 (6.8%) month. About half of the children were male (49.5%). More than half of the children belonged to rural area. More than half (54.1%) of the children were vegetarian (Table 1)

	No. of Children	**Prevalence of Moderate to Severe Anemia**		**p-value[1]**
Age in Months		No.	%	
<12	150	60	40.0	0.36
12-23	640	140	21.9	
24-35	850	230	27.1	
36-47	200	60	30.0	
48-60	380	60	15.8	
Gender				
Male	1100	210	19.1	0.0001*
Female	1120	340	30.4	
Place of Residence				
Rural	1210	280	23.1	0.53
Urban	1010	270	26.7	

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 8, 2023

Dietary Habit				
Vegetarian	1200	270	22.5	0.39
Non-vegetarian	1020	280	27.5	

Table 1: Association of prevalence of moderate to severe anemia with demographic profile of children

[1]Chi-square test, *Significant

The prevalence of moderate to severe anemia was observed to be higher among those who had exclusively breastfed upto 1-2 month (29.2%) than 5-6 (27.8%), 3-4 (20.5%) and >6 (14.3%) month. However, this trend was statistically not significant (p>0.05) [Table 2].

Duration in Months	**No. of Children**	**Prevalence of Moderate to Severe Anemia**		**p-value[1]**
		No.	**%**	
1-2	480	140	29.2	0.53
3-4	880	180	20.5	
5-6	790	220	27.8	
>6	70	10	14.3	

Table 2: Association of prevalence of moderate to severe anemia with duration of exclusive breastfeeding

[1]Chi-square test

There was no significant (p>0.05) association between prevalence of moderate to severe anemia with family history of anemia. Chest drawing was present in 30.9% Manifestation of parasitic infections was present in 29.1% of the children who were having moderate to severe anemia. The prevalence of stunting was observed among 36.9% and wasting was among 41% of the children. The prevalence of underweight was in 42.8% of the children. The prevalence of mild anemia was 35.1% and moderate was 18.9% and severe anemia was found to be 5.9%. The prevalence of moderate to severe anemia was higher among the children of age <12 month than other age groups, however, this was statistically not significant (p>0.05). The prevalence was found to be significantly (p=0.0001) higher among females (30.4%) than males (19.1%). There was no significant (p>0.05) association of the prevalence of moderate to severe anemia with place of residence and dietary habit. Serum ferritin deficiency was observed among 400 children and serum iron deficiency was found in 380 children. However, B_{12} /Folic acid deficiency was seen in 100 children. Iron deficiency anemia was most common followed by B12/Folic acid deficiency anemia. Microcytic hypochromic anemia was found in 70.9% of the children and macrocytic normochromic was found in 10.9% and macrocytic hypochromic anemia was seen in 7.3% (Table 3).

Types of Anemia	**No. (n=550)**	**%**
Iron deficiency anemia	380	69.0
Vitamin B_{12}/Folic acid deficiency anemia	100	18.2
Hemolytic	40	7.4
Aplastic anemia	20	3.6
Thalassemia	10	1.8
Morphology of Anemia	**No. (n=550)**	**%**
Microcytic hypochromic	390	70.9
Macrocytic normochromic	60	10.9

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 8, 2023

Macrocytic hypochromic	40	7.3
Normocytic normochromic	40	7.3
Mixed hypochromic	20	3.6

Table 3: Types and morphology of anemia

DISCUSSION

Anemia is one of the most common health problems in the world and one of the important clinical marker of the underlying disorder. Prevalence of anemia in preschool children, particularly between 6 months and 5 years varies in different countries. Anemia is graded as mild if Hb% is above 10 gms/dl and below the normal range for age & sex, moderate if Hb% is 7-10 gms/dl, severe if Hb% is < 7 gms/dl.[10] Iron Deficiency Anemia is the most wide spread micronutrient deficiency in India.[11] Globally, 50% of anemia is attributable to iron deficiency and accounts for around 841,000 deaths annually worldwide. Africa and parts of Asia bear 71% of the global mortality burden. National family health survey (NHFS)-2 data shows that 74% children between the age of 6 – 35 months are anemic.[12]

In the present study, more than one third of the anemic children were between 24-35 month (38.3%) followed by 12-23 (28.8%), 48-60 (17.1%), 36-47 (9%) and <12 (6.8%) month. About half of the children were male (49.5%). More than half of the children belonged to rural area. The family history of anemia was present among one third of the children. Manifestation of parasitic infections was the most common symptom among the children in this study. Prevalence of stunting, wasting and underweight was among more than one third of the children. In a population-based, cross-sectional survey of 858 children 6-35 months of age in western Kenya by Foote et al[13], the stunting was significantly associated the prevalence of severe anemia. The prevalence of moderate to severe anemia was significantly (p=0.0001) higher among females compared with males and was higher among under one year of age in the present study. Similar finding had been reported by Kadhim and Nawsherwan.[14] There was no difference in the prevalence of moderate to severe anemia between rural and urban children. This finding is inconsistent with the findings of Dey et al.[15] in which rural children were at higher risk being anemic. This might be due that the present study was a hospital based and their study was a community based. Anemia was reported among both vegetarians and non-vegetarians, however, the difference was statistically not significant in the present study. George et al.[16] (2000) also reported similar findings in which among 927 vegetarians, 86 (9.27%) were anemic and among 2,706 non-vegetarians, 328 (12.1%) were anemic.

In the present study, the prevalence of moderate to severe anemia was observed to be higher among those who had exclusively breastfed upto 1-2 month (29.2%) than 5-6 (27.8%), 3-4 (20.5%) and >6 (14.3%) month, however, this trend was statistically not significant (p>0.05). Pasricha et al.[3] found that Children's ferritin levels were directly associated with their iron intake and CRP levels and with maternal hemoglobin level and inversely associated with continued breastfeeding and the child's energy intake. Respiratory distress was present in 30.9% and manifestation of parasitic infections was present in 29.1% of the children who were moderate to severe anemia. This finding is similar to Goswami et al.[17] The morphological classification of anemia in this study revealed that microcytic hypochromic anemia was the predominant class (70.9%) followed by macrocytic anemia (18.2%). This result is nearly identical to the study by Kadhim and Nawsherwan[14] who found that types of anemia were microcytic (60.7%) and macrocytic (12.6%). In present study Iron deficiency anemia was the most common type of anemia (69%) followed by vitamin B_{12} /Folic acid deficiency anemia (18.2%). The result is consistent with Gomber et al[18] in which pure or mixed iron deficiency

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anemia was the commonest type of anemia noted in 68.42 per cent (65 of 95) children followed by pure or mixed B12 deficiency noticed in 28.42 per cent (27 of 95) anemic children.

CONCLUSIONS

1. The present study was carried out with an aim to evaluate the prevalence of moderate to severe anemia among children in a tertiary care facility at Dehradun and to describe the etioclinicopathological profile of moderate to severe anemia. For this purpose, a total of 2220 children attending the facility were enrolled in the assessment. Their hemoglobin levels were assessed to assess the prevalence of anemia and its severity. The following were the key findings of the study:

1. Majority of children in present study had anemia (59.9%). Prevalence of mild, moderate and severe anemia was 35.1%, 18.9% and 5.9% respectively. Combined prevalence of moderate to severe anemia was 24.8%.
2. Prevalence of moderate-to-severe anemia was maximum in age 7-12 months (40.0%) and minimum in age range 48-60 months (15.8%). Peak prevalence was seen in <12 months and 36-47 months age groups. There was a significant association between age and prevalence of moderate-to-severe anemia.

2. Prevalence of moderate-to-severe anemia was higher in girls (30.4%) as compared to boys (19.1%), however, this association was not significant statistically.
3. No significant association of moderate-to-severe anemia prevalence with place of residence, dietary habit, duration of exclusive breastfeeding and family history could be established.
4. Clinical features like fever, vomiting and clinical manifestations of infection were inversely associated with moderate to severe anemia thus suggesting that moderate-to-severe anemia was more commonly associated with subclinical features and chronic conditions.
5. Dyspnea was more common in moderate-to-severe anemia cases (23.6%) as compared to normal/mild anemia cases (9.6%) and this difference was significant statistically too.
6. A strong association between malnutrition (underweight, stunting or either of two) and prevalence of moderate to severe anemia was established. All the children with moderate to severe anemia were malnourished as compared to 28.7% of normal/mild anemia cases.
7. Biochemical assessment findings showed serum ferritin deficiency in 72.7% while serum iron deficiency was seen in 69.1% of children. There were 100 (18.2%) children had Vitamin B_{12}/Folic acid deficiency. A similar number (n=100; 18.2%) patients had raised LDH.
8. Microcytic hypochromic type was the most common type (n=390; 70.9%) followed by macrocytic normochromic (n=60 10.9%) type. There were 40 (7.3%) cases each with macrocytic hypochromic and normocytic normochromic types. Mixed hypochromic type was seen in 20 (3.6%) cases.
9. Iron deficiency anemia was most common (n=380; 69%) followed by Vitamin B12/Folic acid deficiency (n=100; 18.2%). Hemolytic anemia was ascertained as the etiology in 40 (7.4%) patients while 20 (3.6%) patients had aplastic anemia. There were ten cases (1.8%) with ®-Thalassemia trait.

On the basis of above findings it can be concluded that prevalence of moderate to severe anemia was quite low (24.8%) in our settings which might be attributable to the better socioeconomic profile of the facility users, relatively lower prevalence of anemia as such in this part of country and probably owing to better implementation of maternal and child health care programmes. The clinicoetiopathological profile of moderate-to-severe anemia showed age, malnutritional and subclinical factors as the major risks thus establishing nutritional deficiency

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(iron deficiency/vitamin B12/folic acid deficiency) as the major etiologies of anemia. The findings in present study were quite interesting and probably for the first time presented such elaborate account of clinico-etiopathological profile of moderate to severe anemia in children. Further studies to corroborate the findings are recommended.

BIBLIOGRAPHY

1) Irwin JJ, Kirchner JT. Anemia in children. Am Fam Physician 2001;64(8).
2) Bharati S, Pal M, Chakrabarty S, 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.
3) Pasricha S, Black J, Muthayya S, et al. Determinants of anemia among young children in rural India. Pediatrics 2010;126(1):140-9.
4) Benoist B, McLean E, Egli I, et al. Worldwide Prevalence of Anaemia 1993-2005: WHO Global Database on Anaemia, WHO, Geneva, Switzerland 2008.
5) International Institute for Population Sciences and Macro International (IIPS and Macro Int.), National Family Health Survey (NFHS-3), 2005-06, Key Findings, International Institute for Population Sciences, Mumbai, India 2007.
6) Walter T, de Andraca I, Chadud P, et al. Iron deficiency anemia: adverse effects on infant psychomotor development. Pediatrics 1989;84(1):7-17.
7) Arlappa N, Balakrishna N, Laxmaiah A, et al. Prevalence of anaemia among rural pre-school children of Maharashtra, India. Indian J Community Health 2012;24(1):4-8.
8) Gao W, Yan H, Dang S, et al. Severity of anemia among children under 36 months old in Rural Western China. PLoS One 2013;8(4).
9) Jain NB, Laden F, Guller U, et al. Relation between blood lead levels and childhood anemia in India. Am J Epidemiol 2005;161(10):968-73.
10) Sachdev HPS, Chaudhary P. Nutrition in children: Developing country concerns Reprint. 1995;1.
11) Kapil Umesh Ed, Status of micronutrient malnutrition in India and intervention strategies to combat them, Indian Journal of Pediatrics 2002;69:58.
12) National Family Health Service-2 1998-1999, International Institute of Population sciences, Mumbai 2000.
13) Foote EM, Sullivan KM, Ruth LJ, et al. Determinants of anemia among preschool children in rural, western Kenya. Am JTrop Med Hyg 2013;88(4):757-64.
14) Kamil KH, Mohammad NS. A laboratory study of anemia in children aged 6 months to 6 years in Erbil City. Medical Journal of Babylon 2014;11:2.
15) Dey S, Gosawmi S, Dey T. Identifying predictors of childhood anaemia in north-east India. Journal of Health and Population Nutrition 2013;31(4):462-70.
16) George KA. Anaemia and nutritional status of preschool children in Kerala, Indian Journal of Pediatrics 2000;67(8):575-57.
17) Krishna GB, Raghunath P, Sudipta C, et al. Spectrum of Hemoglobin Variants in the Population of Northern Region of West Bengal: An Ethnogenetic Proposition. J Family Med Prim Care 2014;3(3):219-23.
18) Gomber S, Kumar S, Rusia U, et al. Prevalence and etiology nutritional anaemia in early childhood in an urban slum. Indian J med Res 1998;73:107-269.