



ETIOLOGY, CLINICAL PROFILE AND FACTORS AFFECTING SEVERE ANEMIA IN ADMITTED CHILDREN UNDER 5 YEARS OF AGE.

Haematology

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ABSTRACT

Anemia is a preventable & easily treatable global health problem, especially in developing countries. In India prevalence is approximately 51%. The NFHS 2005-2006 revealed that at least 80% of Indian children aged 12-23 months are anemic. Most children with anemia are asymptomatic and have abnormal Hb or hematocrit level on routine screening. Anemia in infancy and early childhood is associated with behavioral and cognitive delays, and lower scores on test of mental and motor development. **Aims & Objectives:** To study Etiology, clinical profile and factors associated with severe anemia. **Materials and Methods:** The study will be carried out at Department of Pediatrics and Pathology Nalanda Medical College and Hospital, Patna. The patients of age group 6 months to 59 months having severe anemia (Hb <7 gm/dl). **Results:** Out 200 patients 104 belongs to iron deficiency anemia (52%), 48 belongs to megaloblastic anemia (24%). The mean hemoglobin is 5.41 that ranges from 2 to 7 with standard deviation of 1.389. mean MCV is 75, MCH 20, MCHC 26. Most of anemic pt. belongs to grade 3 and 4 degree of malnutrition (76%) and upper middle and lower middle class of Kuppuswami SES (91%). **Conclusions:** Prevalence of anaemia in children admitted at Department of Pediatrics, Nalanda Medical College, Patna is high. Characteristics most strongly associated with severe anemia included unemployment among caregivers and malnutrition. Iron deficiency anaemia and megaloblastic anaemia were the common types.

KEYWORDS

INTRODUCTION

Anemia is one of major global health problem, especially in developing countries like India. Despite the fact that this problem is largely preventable & easily treatable, the disease is quite prevalent in preschool children, pregnant and lactating women. (1) About 30% or nearly one third of world's population is suffering from anemia due to various causes. (2) The World Health Organization (WHO) has estimated that globally 1.62 billion people are anemic, with the highest prevalence of anemia (47.4%) among pre-school children. The fourth National Family Health Survey (NFHS) 2015-2016 revealed prevalence of anemia in children aged 6-59 months to be 58.6%, of which rural population is affected more than urban. (3) Estimates in high-risk Indian populations suggest that total anemia prevalence may be as high as 50% to 80%, with as many as 10% to 20% having moderate to severe anemia. (4)

The risk factors of anemia most often cited in the literature are low family income and low maternal level of education, lack of access to healthcare services, inadequate sanitary conditions, and a diet with poor quantities of iron. (5) Among infants, the following characteristics confer special risks: low socioeconomic status, consumption of cow's milk before 6 months of age, low birth weight, and prematurity. Most common type of anemia in developing countries is nutritional anemia. Nutritional anemia can be due to iron deficiency (most common cause), folic acid deficiency, and Vitamin B12 deficiency or may be combination of these. Other types include hemolytic anemia, which can be either congenital or acquired. Congenital causes include membrane defect, haemoglobin 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. (6) Global cause-specific analysis have tended to focus only on tracking iron deficiency or on single country or region. (7-9). In view of magnitude and consequences of severe anemia, this study was planned with the aim to identify the significant socio-economic, demographic risk factors and etiology of severe anemia in Indian children of 6-59 months by means of statistical modeling.

MATERIALS AND METHODS

This observational cross sectional study was conducted in a tertiary care hospital from north India during the period from March 22 to June 2023. The patients of age group 6 months to 59 months admitted in pediatric ward having severe anemia (Hb <7 gm/dl) as per WHO criteria were subjects of our study. (11)

A convenient sample size of 200 was considered for study.

Consecutive sampling was done amongst admitted children in hospital. An informed consent was obtained from the parents of

enrolled children. Child with Hb >7 gm/dl, age <6 or >59 months, lack of parental consent, history of recent surgery or blood transfusion and child with known cause of anemia or active bleeding were excluded from study. 2 mL of venous blood was drawn under aseptic precautions in an EDTA containing vacutainer and sent immediately to the laboratory for hematological testing. Automated Blood Cell Counter (MS-9-3-S), Digital Photochlorimeter/ Hemoglobinometer hematology analyzer was used to evaluate parameters: Hemoglobin concentration (Hb), RBC indices MCV, MCH, MCHC, Hematocrit (PCV), RBC count, TLC, DLC and Platelet Count (PC).

Slides were stained with Leishman's stain for morphological study and for malarial parasites. Reticulocytes count was done using brilliant cresyl blue stain. Bone marrow aspiration in children was done preferably in posterior superior iliac crest because it contains most cellular marrow and there are no vital organs in close proximity, in children younger than 18 months of age antero-medial surface of tibia was preferred. Diagnosis of hemoglobinopathies and thalassemias were made using High Performance Liquid Chromatography (HPLC). Other investigations like serum ferritin level, Vitamin B12 levels, folic acid level, Total iron binding capacity (TIBC) were performed using direct Chemiluminescence technology method. The reference range of MCV was taken as 80-100 fL, MCH is taken as 27-32 pg, and MCHC 32-36 g/dL. Microcytic anemia was taken as MCV value less than 80 fL and MCH less than 27. Macrocytic is taken when MCV was greater than 100 fL. Normocytic normochromic is taken when all hematological indices are within normal range.

The data was collected as per the performance and entered in Excel spreadsheet and appropriate statistical method was applied to get necessary outcome.

RESULTS

Clinical and demographic profile

Record of 200 children were finally analyzed (Patients enrolled: 108; 8 patients were excluded as per exclusion criteria) (Table 1). There was a slight female preponderance $n=110$ (55%) in our study. The age for presentation ranged from 7 months to 59 months [mean 29.4 (13.8)]. 30 children were delivered prematurely (gestational age <37 weeks). 128 children were breastfed exclusively for first 6 months of life however only 10 children received adequate complementary feeding as per infant and young child feeding practice. Maternal anemia was present 72 children. As per modified Kuppuswami scale, 72 children belonged to upper middle, 102 to lower middle and 24 to upper lower class however there was no patient in upper and lower socioeconomic status. As per Indian Academy of Pediatrics (IAP) classification for malnutrition, 42 children had grade 1, 110 had grade 2, 42 had grade 3 and 2 had grade 4 malnutrition.

On clinical examination all children were visibly pale, 20 children had icterus, 8 children had hepatosplenomegaly and 6 children had lymphadenopathy.

Etiology of severe anemia

Most common morphological variant of anemia was found to be microcytic hypochromic (84), followed by macrocytic (46), dimorphic (36) and normocytic normochromic (34) (Table 2).

Nutritional anemia was the single most common cause of severe anemia (n=160). In nutritional anemia 102 children had iron deficiency, 30 children had vitamin B12 deficiency, 22 children had combined vitamin B12 and folic acid deficiency and 6 children had isolated folic acid deficiency. Other causes of anemia were thalassemia (18), hereditary spherocytosis (6), malignancy (6), malaria (4), aplastic anemia (4) and bleeding diathesis (2) (Table 3).

Table 1: Baseline clinical profile of children with severe anemia (n=100)

Variables	Frequency (Percentage)
Sex Male	90
Female	110
Age <2 Years	72
>2 Years	126
Delivery status Preterm	60
Term	140
Exclusive breastfeeding till 6 months Yes	128
No	72
Adequate complementary feeding after 6 months Yes	10
No	190
Maternal anemia Present	72
Absent	126
Socioeconomic status (As per modified kuppuswami scale)	
Upper	0
Upper middle	72
Lower middle	51
Upper lower	24
Lower	0
Caregiver education	
Illiterate	46
Primary	130
Secondary	22
College	2
Nutritional status (As per IAP classification)	
No malnutrition	4
Grade I malnutrition	42
Grade II malnutrition	110
Grade III malnutrition	42
Grade IV malnutrition	2
Clinical examination	
Pallor	200
Icterus	20
Hepatosplenomegaly	8
Lymphadenopathy	6

Table 2: Classification on basis of RBC morphology

Morphology	Frequency (Percentage)
Normocytic normochromic anemia	34
Microcytic hypochromic anemia	84
Macrocytic anemia	46
Dimorphic anemia	36

Table 3: Etiology of severe anemia in children

Etiology	Frequency (Percentage)
Iron def. anemia	102
Megaloblastic anemia (Vitamin B12 deficiency)	30
Combined megaloblastic anemia (Vitamin B12 and Folic acid deficiency)	22
Thalassemia	18
Megaloblastic anemia (folic acid deficiency)	6
Hereditary spherocytosis	6

Malignancy	6
Malaria	4
Aplastic anemia	4
Bleeding diathesis	2
Total	100

DISCUSSION

The present study was undertaken due to a limited data on etiology and predisposing factors associated with severe anemia in the children admitted to the hospitals so that preventive measures can be applied to high-risk population. Anemia is a very common accompaniment of patients admitted for various reasons to the hospital and presence of severe anemia may alter the presentation of many conditions as well as affect the management decisions in certain settings. The results of this study emphasize the role of nutrition in prevention of severe anemia because approximately 80% of patients had anemia secondary to nutritional deficiency. But the study also discourage sole use of hemoglobin values for treatment of severe anemic children with hematinic as only half the patients in our study were found to be iron deficient.

They must be investigated to find out the cause and type of anemia before starting treatment. Like previous studies iron deficiency was found to be the most common cause of severe anemia but approximately half the patients had anemia due to causes other than iron deficiency. We found high prevalence of anemia due to nutritional deficiencies other than iron including folic acid and vitamin B12. 58 out of 200 patients had either vitamin B12 or folic acid deficiency or both, which is significantly higher than other studies.

In our study we observed higher prevalence of exclusive breastfeeding compared to national data. As per NFHS- 4, 54.9% of children under-6 months are exclusively breastfed while in our study 64% children were exclusively breastfed. This study highlights the importance of adequate complementary feeding for prevention of severe anemia as 95% of children in our study did not receive adequate complementary feeding as per infant and young child feeding practice.

Authors' Contribution:

Both Authors contributed in study design, abstracting and analysing data, statistical analysis and interpretation, writing the manuscript.

Conflicts of interests

Authors declare no conflicts of interests.

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