

Original Research Article

Prevalence and risk factors of anemia in under five-year-old children in children's hospital

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ABSTRACT

Background: Anemia is a global public health problem affecting both developing and developed countries with major consequences for human health as well as social and economic development. This study is conducted to assess the proportion of children, aged between 6 months to 5 years having anemia and risk factors of iron deficiency anemia among selected children with anemia.

Methods: The present cross-sectional study was conducted in 500 children between the age of 6 months to 5 years, who were admitted (in patients) to the Department of Pediatrics of Dr. BR Ambedkar Medical College, Bangalore, were selected and screened for anemia by hemoglobin estimation. This study was carried out from November 2012 to April 2014. Among those children with hemoglobin <11 g/dl, were screened for iron deficiency anemia (Serum ferritin estimation is done). Among these 500 children, 100 children with a hemoglobin level of 11 gm/dl and serum ferritin <12 µg/L were taken up for detailed study. All the collected data was tabulated and statically analysed by using appropriate methods

Results: 77.8% of screened children were found to have anemia. In studied children 38% had mild anemia, 54% had moderate anemia and 8% had severe anemia. Male outnumbered than female in the ratio of 1.17:1. More than 50% presented with acute gastroenteritis. 79% of anemic children had malnutrition. 24% of anemic children were low birth weight. Dimorphic anemia was common in 6months to 5 years age group. Mean hemoglobin level was 9.26. Mean ferritin, mean serum iron, TIBC, transferrin saturation was 7.23 µg/l, 52.60µg/dl, 346.89mg/dl and 16.31% respectively

Conclusions: The diet deficient in iron and other essential nutrients is the single most important cause of anemia in children of this age Diarrhea was the chief associated symptom in more than half the cases studied. Hence it is essential to make provision for safe drinking water and to improve sanitary facilities periodic deworming measure is advised, to reduce parasitic infestation which also contributes to the development of anemia.

Keywords: Anemia, Iron deficiency anemia, Hemoglobin, Microcytic hypochromic anemia, Serum ferritin

INTRODUCTION

Anemia is a global public health problem affecting both developing and developed countries with major consequences for human health as well as social and economic development. According to the data of the

World Health Organization (WHO), the prevalence of iron deficiency anemia (IDA) in industrialized countries and in non-industrialized countries is 10-20% and 50-60%, respectively.¹ Anemia in children is an important health problem in almost all the developing countries of the world with an estimated prevalence of 43%.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 preschool-aged children; of these 293 million children, 89 million live in India.³ The third National Family Health Survey (NFHS) 2005-2006 revealed that at least 80% of Indian children aged 12-23 months are anemic.⁴

Anemia has a variable impact on physical development and children show poor attentiveness, memory and academic performance.⁵ Children who suffer from anemia have delayed psychomotor development and impaired performance; in addition, they experience impaired coordination of language and motor skills, equivalent to a 5-10-point deficit in intelligence quotient.⁶⁻⁹ Anemia is associated with socioeconomic, biological, environmental and nutritional factors. In Karnataka, population-based information is available on anemia in under 5-year old children; however, data on this problem and associated factor in hospitalized children are scarce. This study is conducted to assess the proportion of children, aged between 6 months to 5 years having anemia and risk factors of iron deficiency anemia among selected children with anemia.

METHODS

Hospital based cross sectional study over a period of 1 year 6 months from November 2012 to April 2014. 500 children between the age of 6 months to 5 years, who were admitted (in patients) to the Department of Pediatrics of Dr. BR Ambedkar Medical College, Bangalore, were selected and screened for anemia by hemoglobin estimation. The institutional ethics committee approved our study. Informed consent was taken from patient attenders.

Inclusion criteria

- Children in the age group of 6 months to 5 years;
- Those children with hemoglobin level less than 11 gm/dl;
- Those children with serum ferritin level less than 12µg/L

Exclusion criteria

- Children with hemolytic anemia and bleeding diathesis
- Children with chronic disease
- Children with anemia secondary to leukemia, aplastic anemia.

On admission, a detailed history of the patient was recorded; a thorough physical examination was carried out and below mentioned investigations was done and recorded on a proforma. Blood and stool samples were collected from the patient. Among those children with hemoglobin <11 g/dl, were screened for iron deficiency anemia (serum ferritin estimation is done). Among these

500 children, 100 children with a hemoglobin level of 11gm/dl and serum ferritin <12 µg/l were taken up for detailed study.

Following haematological investigations done in enrolled patients: hemoglobin and haematocrit estimation, white blood cell count: total and differential, total red blood cell count, reticulocyte count, mean corpuscular volume, mean corpuscular hemoglobin concentration, red cell distribution width, erythrocyte sedimentation rate, peripheral blood smear examination, serum iron, serum ferritin, transferrin saturation and TIBC. The WHO criterion (hemoglobin <11 g/dL) was used to diagnose anemia. To categorize the degree of anemia, the following cut-off points were used: 10.0-10.9 g/dL, mild anemia: 7.0-9.9g/dL, moderate anemia: < 7 g/dL, severe anemia.

Sample size

For estimating proportion, 500 cases admitted to pediatric ward were taken. A convenient sample of 100 children with a hemoglobin level of 11gm/dl and serum ferritin level of <12µg/l was taken up for detailed study.

Statistical analysis

Data were entered into a Microsoft excel spreadsheet and then analyzed by SPSS 20.0.1 and graph pad prism version 5. Data have been summarized as mean and standard deviation for numerical variables and count and percentages for categorical variables. Chi-square test or Fischer's exact test, Z-test (standard normal deviate) was used to test the significant difference between two proportions

RESULTS

The proportion of anemia in children between 6 months to 5 years of age was 77.8%. Such high proportion explains the need for extra nutritional requirement during this period due to rapid growth. Among 500 children screened, 111 children (22.2%) had normal level of hemoglobin. 137 children (26.6%) had mild anemia followed by 234 children (46.8%) had moderate anemia and 18 children (3.6%) had severe anemia. Of the 100 children, who were studied in detail 72 cases (72%) were due to iron deficiency.

Table 1: Age distribution of children with iron deficiency anemia.

Age in months	Number of children with iron deficiency anemia	Percentage of children with iron deficiency anemia
6 months-2 years	39	39%
2-5 years	61	61%
Total	100	100%

18 cases (18%) showed dimorphic blood picture indicating deficiency of iron and other essential hematopoietic factors, mainly folic acid. Nutritional deficiency was the single most important causative factor in the development of anemia in children under present study.

Table 2: Distribution of past history in studied iron deficiency anaemic children.

Relevant past history	No. of cases	Percentage
Diarrhea	31	31
Parasitic infestations	18	18
H/O bleeding	-	-
H/O drug ingestion	-	-
H/O blood transfusion	3	3

Table 3: Distribution of morphological types of anemia in studied children.

Type of anemia	Age in months		Total	%
	6 months to 2 years	2 to 5 years		
Microcytic anemia	12	25	37	37
Normocytic anemia	12	33	45	45
Dimorphic anemia	12	6	18	18
Total	36	64	100	100

Rice and milk were the chief diet of these children, both of which are deficient in iron. Mean caloric intake in 6 months to 2 years children was 923.88 calories/day. (Normal requirement at this age is about 1100 cal/day). Between 2-5 years children mean calorie intake was 1131/day, whereas normal requirement is about 1100-1400/day. Mean protein intake in children between 6 months to 2 years was 15.57 gm/day. Between 2-5 years children Mean protein intake was 19.14 gm/day. 24 children (24%) had low birth weight and this contributed to occurrence of severe anemia at an early age. Parasitic infestations were found in 26 cases (26%) which contributed to recurrent diarrhea and malabsorption of essential nutrients including iron. Occult blood in stools was noticed in 11 cases (11%).

However, the cause and effect relationship with anemia could not be established. 75 children (90%) with anemia belonged to lower socio-economic status. Anemia in these children is due to deficient intake of essential nutrients, poor hygiene leading to increased incidence of infection and parasitic infestations.

DISCUSSION

In the present study, 500 children between the ages of 6 months to 5 years were screened for anemia, 77.8% of

children found to have anemia. Saba F et al have reported anemia in 72.79% of children below 5 years of age.¹⁰ Sahu T et al has reported anemia in 93.8% of children below 5 years in their community-based study.¹¹ According to WHO global database of anemia 1993-2005, 74.3% of under five children are anemic. NFHS-3 showed prevalence of anemia in 78.9% of under five children. The proportion of anemia in males outnumbered the females, the ratio being 1.17: 1 in the present study. This confirms with the study of Saba F et al who have reported a ratio of 1.4:1. Study conducted by rosemary Ferreira et al also showed higher incidence of anemia in male children.¹² The higher incidence of anemia in male children may be due to the Prevailing custom of caring more for the male child who were being brought to hospital for treatment, more frequently.

Among the 500 children screened for anemia, none of them with hemoglobin >11gms/dl had clinical evidence of pallor. Among children with mild anemia (Hb: 10-10.9 gm/dl) only 44.7% had clinical evidence of pallor. Among children with moderate anemia (Hb 7-9.9 gm/dl) 94.4% had clinical evidence of anemia. Among children with severe anemia (Hb <7 gm/dl) 100% had evidence of pallor. Thus, pallor is a significant clinical sign of anemia in children with hemoglobin <10 gm/dl (moderate and severe anemia). But, most important fact is that if clinical evidence of pallor alone is used to diagnose anemia, 24% of cases would be missed.

In the present study 31% of children had history of recurrent diarrhea which correlated with the study of rosemary Ferreira et al (43.9%).¹² Parasitic infestation with round worm was seen in 18% of the cases but hookworm infestation was not seen in any case. This is probably due to age group of the present study (<5 years). History of normal birth weight was present in 76 cases. 24 children (24%) were of low birth weight. Among them 14 had moderate anemia and 3 children had severe anemia. Preterm and low birth weight infants are known to develop severe iron deficiency anemia and the onset is much earlier in infancy due to low iron stores at birth and rapid catch up growth. 15 of these 24 cases (64.7%) had Gr II/III/IV malnutrition which also contributed to the development of anemia.

Mean caloric intake in 6 months to 2 years children was 923.88 calories/day. (Normal requirement at this age is about 1100 cal/day). Between 2-5 years children, mean calorie intake was 1131/day, whereas normal requirement is about 1100-1400/day. Mean protein intake in children between 6 months to 2 years was 15.57 gm/day. Between 2-5 years children mean protein intake was 19.14 gm/day. 79 children (79%) under the present study were under nourished which is similar to the report by Sharma et al (74%). 38% belonged to Grade I malnutrition, 25% belonged to Grade II, 12% belonged to Grade III and remaining 4% of children belonged to Grade IV malnutrition. This substantiates the fact that adequate nutrition is most essential for normal erythropoiesis. Of

the 100 children, 90 children (90%) belonged to lower class (Kuppuswamy's classification). Only 10 children (10%) belonged to lower middle class. Children from lower socio-economic status are prone for recurrent diarrhea, repeated respiratory tract and other infections. They are also prone for parasitic infestations. Their diet is also deficient in iron content. All these factors have contributed to development of anemia in these children. Mehrotra SK et al have reported that 78.4% of anemic children in their study belonged to lower socio-economic status.¹³

Limitations of study of this study were: Sample size in the present study is small and need more sample size reduce bias. Long-term follow up is necessary in iron deficiency patients to record long term neurodevelopmental outcome. Underlying diseases may be the contributing factors for iron deficiency anemia in our patients; detailed etiological diagnosis was not made because of lack of investigation facilities

CONCLUSION

The diet deficient in iron and other essential nutrients is the single most important cause of anemia in children of this age. Diarrhoea was the chief associated symptom in more than half the cases studied. Hence it is essential to make provision for safe drinking water and to improve sanitary facilities. Periodic deworming measure is advised, to reduce parasitic infestation which also contributes to the development of anemia. Iron supplementation to all preschool children and emphasis is given in RCH programme (Reproductive and child health) for iron supplementation to pregnant women, which should be implemented in true spirit, ensuring good compliance to prevent the ill effects of iron deficiency on foetus.

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