ORIGINAL RESEARCH ARTICLE
pISSN 0976 3325 | eISSN 2229 6816
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# Study of Severe Nutritional Anaemia in Children 1-5 years of Age: Can We Do Better?

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**Financial Support:** None declared
**Conflict of Interest:** None declared


**How to cite this article:**
Shah NS, Shah HH, Shah AB, Gupta R, Vadodaria S. Study of Severe Nutritional Anemia in Children 1-5 Year of Age in a Tertiary Care Hospital. Natl J Community Med 2019; 10(7): 416 – 419

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**Date of Submission:** 03-03-19
**Date of Acceptance:** 31-07-19
**Date of Publication:** 31-07-19

## ABSTRACT

**Introduction:** Nutritional anemia in young children is one of the most prevalent health hazard in developing countries like India, despite of various policy initiated since long. Present study was done to know correlated factors, clinical presentations, type of severe nutritional anemia in children 1-5 years of age.

**Methods:** All admitted children between 1-5 years of age having severe nutritional anemia (Hb level <7 gm%)were enrolled in study. Detailed demographic profile, nutritional status, clinical presentation was recorded. Anemia were classified According to haematological & morphological profile, serum iron and B12 levels. Final outcome was observed.

**Results:** Total 160 patients were enrolled. we have observed that age<3 years, lower socio economic class and malnutrition were significantly associated with severe anemia (p value<0.001). Only 13.75% patients presented with sign and symptoms of anemia per se.136(88%) patients were diagnosed having IDA and rest were having B12 deficiency or mixed deficiency.

**Conclusion:** Severe anemia is a hidden threat in younger children and it needs to be screened and early intervened by strong implementation of different supplementation programme and we can do much better to decrease morbidity and mortality due to same.

**Keywords:** Severe anemia, morbidity,screening

## INTRODUCTION

Anemia is a major public health problem and one of the major causes of mortality and morbidity in children, despite of economic growth and preventive efforts. Deficiency of several nutrients can lead to nutritional anemia which is one of the prevalent cause of anaemia. Anaemia burden is like a iceberg in society ,it is always a hidden entity and its manifestation are not as disease per se. More then 3.5 billion people [1,2,3]are affected by nutritional anemia and in developing countries simultaneously malaria and worm infestations are increasing the load. Nutrtional anemia can be prevented and treated at low cost. Often programs and projects to prevent and control anemia have been constrained by the erroneous perception that effective and practical interventions are not available.[4] According to NFHS 3 about 50 million children less than 5 years are suffering from moderate to severe anemia and this data do not show any differences of ICMR data of 1970-1980 showing persistence of anemia epidemic in India.[5,6] WHO / UNICEF / UNU(1-7) strongly advocate that when there is a prevalence of anemia above 40%, a universal supplementation is required. [7]However, clinically speaking, to know burden of severe anemia a screening is desirable and that is reflected in India's eleventh Five-year Plan's[8] nutritional goals, where all children are recommended to be screened.

Present study is aimed to evaluate demographic profile, nutritional status, clinical presentations, morphological and haematological profile and outcome in children of 1-5 years of age having severe nutritional anemia.

## METHODOLOGY

A prospective observational study was done over period of one year after ethical committee approval and informed written consent of one of the parents in a tertiary care hospital .All patients admitted in pediatric ward between 1 to 5 years of age having Hb level less than 7 gm% were considered having severe anemia as per WHO definition[2, 3] and were enrolled in study. Patients having chronic anemia, history of blood transfusion in last 4 weeks, and chronic anemias due to any other chronic diseases were excluded from study. Detailed demographic data including age, sex and socioeconomic status were noted. Nutritional status was recorded and categorise in normal, moderate acute malnutrition (MAM) and severe acute malnutrition (SAM) as per WHO classification[7]. Clinical presentations of all patients were noted. Signs and symptoms related to anemia were observed. Detailed haematological profile, morphological profile and serum B12 and iron level were observed and accordingly nutritional anemia was further classified in to iron deficiency, megaloblastic and dimorphic anemia. Final outcome of were noted.

## RESULTS

Total 160 patients were enrolled in study. We have observed that 71.25% patients were from toddler group and almost all (80.62%)were from urban lower socioeconomic class.(p value significant) 12% children were having severe acute malnutrition and 61% had even moderate malnutrition, thus malnutrition was associated with nutritional deficiency anemia (p value significant).

On observing clinical presentation and analysing all data we have observed that only 22 (13.75%) patients presented with sign and symptoms related to severe anemia per se.

All other patients presented with other disease, admitted for same and severe anemia was incidental finding in them.

4.3% children presented with Hb level between 1-3% and all presented with congestive cardiac failure. On observing haematological and morphological profile iron deficiency anemia was main aetiology of severe anemia.

According to haematological & morphological profile and serum iron and B12 level we have observed that 85% children had iron deficiency as a cause of severe anaemia and 6.25% had megaloblastic anemia and 8.75% had dimorphic picture. Most of the children were discharged within 7 days with oral supplements only 4 patients expired within 24 hours due to co morbid illness.

**Table 1: Demographic factors and nutritional status in severe anemia**

| Demographic factors | Children (%) |
|---|---|
| **Age** | |
| <3 years | 114 (71.25) |
| >3 years | 46 (28.75) |
| **Sex** | |
| Male | 96 (60) |
| Female | 64 (40) |
| **SE status (class)9** | |
| 5 | 4 (2.50) |
| 4 | 123 (78.12) |
| 3 | 25 (15.62) (p value<0.001) |
| 2 | 8 (5) |
| 1 | 0 (0) |
| **Nutritional status** | |
| SAM | 20 (12) |
| MAM | 97 (61) (p value<0.001) |
| Normal nutrition | 43 (27) |

**Table 2: Clinical presentations in severe anemia**

| Clinical presentation | Cases (n=160) (%) |
|---|---|
| Severe anemia | 22 (13.75) |
| Diarrhoea | 22 (13.75) |
| Pneumonia | 21 (13.12) |
| Fever | 19 (11.87) |
| Hepatitis | 17 (10.62) |
| LRTI | 10 (6.25) |
| URTI | 10 (6.25) |
| Dysentry | 7 (4.37) |
| Enteric fever | 4 (2.5) |
| Asthma | 5 (3.12) |
| Other | 23 (14.37) |

**Table 3: Haematology in severe anemia**

| Haematology | Cases (n=160) (%) |
|---|---|
| **Haematology profile** | |
| **Hb** | |
| 1-3 | 7(4.3) |
| 3-5 | 41(25.62) |
| 5-7 | 112(70) |
| **MCV -** Mean Corpuscular Volume | |
| <76 | 139(86.8) |
| 76-90 | 13 (8.1) |
| >90 | 8 (5) |
| **MCH** - Mean Corpuscular Haemoglobin | |
| <25 | 139 (86.8) |
| 25-31 | 21 (13.2) |
| >31 | 0 |
| **MCHC**– Mean Corpuscular Haemoglobin Concentration | |
| <32% | 67 (41.87) |
| 32-36% | 93 (58.12) |
| >36% | 0 |
| **Morphology in peripheral smear** | |
| Microcytic hypochromic | 132 (82.5) |
| Microcytic normochromic | 7 (4.35) |
| Normocytic hypochromic | 3 (1.87) |
| Normocytic normochromic | 10 (6.25) |
| Macrocytic normochromic | 4 (2.5) |
| Macrocytic hypochromic | 4 (2.5) |
| **Serum iron <22 (low)** | 143(89.37) |
| **Serum B12 <283 (low)** | 22 (13.75) |

**Table 4: Classification of severe anemia**

| Type | Male (n=96) | Female (n=64) | Total (n=160) |
|---|---|---|---|
| Iron deficiency anaemia | 86 | 50 | 136 (85) |
| Megaloblstic anaemia | 2 | 8 | 10 (6.25) |
| Dimorphic anaemia | 8 | 6 | 14 (8.75) |

Figure in the bracket indicate percentage.

**Table 5: Hospital stay and final outcome**

| Duration of Hospital stay | Cases (n=160) (%) |
|---|---|
| <1 day | 6 (3.75) |
| 2-3 day | 94 (58.75) |
| 4-7 day | 45 (28.12) |
| >7 days | 15 (9.37) |

## DISCUSSION

According to WHO grading of anemia,[1,2] severe anemia is haemoglobin level less than or equal to 7g/dl. Anemia is not a specific entity but it results from many underlying pathologic processes. Anemia is associated with socioeconomic, biological, environmental and nutritional factors. [3,4]Under 5-year-old children have greater susceptibility to anemia because of their increased iron requirements due to rapid body growth and expansion of red blood cells. Pallor is the most prominent and characteristic sign of anemia. It is best appreciated in skin, nail beds, mucous membranes and conjunctiva. Symptoms of anemia varies from simple easy fatiguability , anorexia to prolong complications like impaired cognitive function, growth and psychomotor development. [10] In addition to this some children will experience acute life-threatening clinical events, including tachycardia, tachypnea, hypotension, respiratory distress, and congestive heart failure.

Present study was done to study severe anemia in children 1-5 years of age. We have observed that toddlers were more commonly affected group of children. (71.25%).Similar observations noted by salanzo[11]. The more severity of the problem in toddlers is likely to be due to increased iron Requirements, rapid growth, early weaning, and low availability of foods rich in iron and mismanaged feeding. We have observed more incidences in boys than girls. Similar was observed by other authors[9,11-13] An association with boys may be due to the faster growth and more demand of pre-school boys compared to girls. However, further studies are necessary to better understand this factor.

We have observed that lower socioeconomic status and malnutrition were significantly associated with severe anemia . Similar observation was done by viswesara rao et al[12].Osorio et al[14]. Also found higher prevalence of malnourished children aged between 6-59 months in Pernambuco. Unfavourable socioeconomic conditions make children more vulnerable to malnutrition causing nutritional deficiency anemia.

We have observed that only 22% children presented with anemia disease per se and all others were presented with some other diseases and severe anemia was incidental finding. Diarrhoea, respiratory infections were more common presentations. Diarrhoea, respiratory infections and intestinal parasites, may markedly compromise intake, absorption and biological utilization of iron leading to anemia. Also the associated diseases occur may be due to impaired resistance and decreased immunity due to severe anemia. Similar study was done in Brazil by Rosemary Ferreira et al[17] and they observed same. Lima et al.[18]observed high prevalence of anemia in infants having infectious diarrhoea.

We have used different laboratory markers to diagnose nutritional cause of anemia including haematological profile, RBC morphology, and serum levels. In our study 136(85%) children had iron deficiency anemia and 10 (6%) had megaloblastic and 14 (8%) had mixed deficiency anemia. Thus iron deficiency anemia was a major cause of nutritional anemia. Brotanek et al[19] used transferrin saturation, free erythrocyte protoporphyrin, and serum ferritin levels as their main determinants of IDA. Similarly, Domellöf et al[20] used standard markers for IDA, such as haemoglobin, MCV, and ferritin. No matter how it is diagnosed, IDA continues to be a significant problem in young children. The prevalence of IDA may even rise, given the upward trends. Iron deficiency, and the anemia that results from it, is a major health problem affecting more than 3.5 billion people in developing countries, reducing vitality for the young and impairing the cognition.[22] Iron deficiency is usually the result of inadequate bioavailable dietary iron, increased iron requirement during rapid growth, and increased blood loss for any reason. There are no current estimates of the total ID cases, but based on anemia as an indicator, it is estimated that most preschool children in developing counties are iron deficit. we have successfully discharged almost all patients but duration of hospital stay was longer for most of the patients as they all had one or other comorbid conditions

## CONCLUSION

Thus we have observed that severe anemia due to nutritional deficiency is common in 1-3 years of babies (71.25%), lower socioeconomic class and malnutrition were interrelated and major contributing factors leading to it. Only 13.75% presented with clinical features of anemia per se in all other it

was incidental finding. Iron deficiency (85%) was the major nutrient deficiency contributing to anemia. Thus this study tells the importance of evaluating nutritional and anemia status in young children due to their high susceptibility. Different measures for prevention and control of anemia including supplementation and fortification programme should be reinforced.

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