Prevalence of anemia and its etiology: a study in a semi urban area

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Abstract

Introduction: Anemia is recognized as a public health problem throughout the world affecting both developed and developing countries and is associated with nutritional deficiencies especially due to iron deficiency, which is the main factor for microcytic anemia, while folate or Vitamin B12 deficiencies are known to be responsible for macrocytic anemia. This study was conducted to estimate the prevalence of anemia in our area and its association with the lack of nutrients. Materials and Methods: General demographic details such as age, gender, weight, economic status of the parents, etc were taken for 392 children between the ages of 6 months to 5 years. Blood samples were taken for all the patients for hemoglobin levels and estimation of iron, folic acid and Vitamin B12. Results: 179 (45.7%) patients were found to be anemic. Of them, 91 (50.8%) were with mild anemia, 76 (44.1%) were with moderate anemia. Severe anemia accounted for only 9 (5.0%) of the cases. Out of patients, the most prevalent age group with anemia was found to be 12-<24 months, followed by 6-<12 months. Of the micronutrient tests, iron deficiency either pure or mixed with other nutrients was the most predominant with folic acid deficiency being the lowest. Conclusion: Proper food, rich in nutrients, iron supplements are some of the essential requirements with regular check ups for the children below 5 years. Education regarding the importance of nutrition and harmful effects of iron deficiency on the child must be given.

Keywords: Anemia, Children, Prevalence, Etiology, Iron deficiency, Malnutrition

Introduction

Anemia is recognized as a public health problem throughout the world affecting both developed and developing countries. It is estimated that about 30% of the world’s population is anemic and about 36% of the children between 6-12 years are said to have anemia [1,2]. Among the developing countries, the estimate of prevalence is 77% [3,4]. Anemia among the 5-14 year olds have been found to be around 66.7 – 77% in some studies [3,5]. The prevalence in the sub-Saharan Africa was reported to be 43% - 74% [6,7].

In the developed world, the rate of anemia among the Americans was very high among the children with 50% of them being affected in Mexico and between 45-70% in Ecuador [8,9,10]. The prevalence is 30-60% in Brazil, with 45% of children below 5 years being affected [11]. Most anemia cases are associated with nutritional deficiencies especially due to iron deficiency, which is the main factor for microcytic anemia, while folate or Vitamin B12 deficiencies are known to be responsible for macrocytic anemia [12,13]. Many parasitic infections like malaria are also known to be associated with anemia [6,7,13]. Normally anemia occurs in childhood due to bad eating habits and this is further accentuated by the weaning period [14]. This could be because the mother’s milk is replaced by other food which is not as nutritious and lacks in nutrients such as iron, folic acid and Vitamin B12 [15,16].

This study was conducted to estimate the prevalence of anemia in our area and the lack nutrients that leads to it.

Materials and Methods

This study was conducted by the department of pediatrics at Mallareddy Institute of Medical Sciences. 392 children between the ages of 6 months to 5 years who came to our department were included in the study. This study was performed after attaining the clearance by the institutional ethical committee.
General demographic details such as age, gender, weight, economic status of the parents, etc were taken for all the patients. Blood samples were taken for all the patients to check the hemoglobin levels of them and to estimate the levels of iron, folic acid and Vitamin B12. Detailed history and thorough physical and clinical examination was done. The WHO criterion (hemoglobin < 11 g/dL) was used to diagnose anemia [8].

Anemia in the patients was categorized as mild if the hemoglobin level was 10.0-10.9 g/dl, moderate 7.0-9.9 g/dl, and severe if Hb levels were below 7 g/dl. Weight for age (WAZ), height for age (HAZ) and weight for height (WHZ) z-scores were calculated using the WHO Child Growth Standards for nutritional status. Z-score < -3 was classified as very underweight, ≥-3 and < -2 as underweight, ≥-2 and < +2 as adequate weight and z-score of ≥ +2 was classified as overweight for age[17]. Means (± SD) Pearson’s chi square test and regression analysis were done for statistical analysis.

Results

Out of the 392 children recruited into the study, there were 233 (59.4%) were males and 169 (43.1%) were females. 179 (45.7%) patients out of the 392 children were found to be anemic. Of them, 91 (50.8%) were with mild anemia, 76 (44.1%) were with moderate anemia. Severe anemia accounted for only 9 (5.0%) of the cases. (Fig: 1).

![Fig 1: Type of anemia](image)

Out of patients, the most prevalent age group with anemia was found to be 12-<24 months, followed by 6-<12 months (fig 2).

![Fig 2: Age wise distribution of anemic patients](image)

The nutritional status of the anemic patients was analysed. It was observed that 48% of the anemic children were malnourished. Most of them belonged to the weaning phase. Most of the mothers or other care takers of these children
were uneducated or were educated only up to the primary level. 52.5% of the children were from poverty ridden area with very low income of the parents (Table: 1).

Table 1: General characteristics of the anemic patients

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Number (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutritional status</td>
<td></td>
</tr>
<tr>
<td>Malnourished</td>
<td>86 (48.0%)*</td>
</tr>
<tr>
<td>Well nourished</td>
<td>61 (34.1%)</td>
</tr>
<tr>
<td>Overweight/Obese</td>
<td>32 (17.9%)</td>
</tr>
<tr>
<td>Caretaker education</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>53 (29.6%)</td>
</tr>
<tr>
<td>Primary</td>
<td>77 (43.0%)</td>
</tr>
<tr>
<td>Secondary</td>
<td>31 (17.3%)</td>
</tr>
<tr>
<td>College</td>
<td>18 (10.1%)</td>
</tr>
<tr>
<td>Financial status</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>94 (52.5%)*</td>
</tr>
<tr>
<td>Middle</td>
<td>34 (19.0%)</td>
</tr>
<tr>
<td>High</td>
<td>51 (28.5%)</td>
</tr>
<tr>
<td>Weight / age index</td>
<td></td>
</tr>
<tr>
<td>&lt; -2 z score</td>
<td>4 (2.2%)</td>
</tr>
<tr>
<td>≥ -2 z score</td>
<td>175 (97.8%)</td>
</tr>
<tr>
<td>Height / age index</td>
<td></td>
</tr>
<tr>
<td>&lt; -2 z score</td>
<td>7 (3.9%)</td>
</tr>
<tr>
<td>≥ -2 z score</td>
<td>172 (96.1%)</td>
</tr>
</tbody>
</table>

* p=<0.001

Of the micronutrients tested, iron deficiency either pure or mixed with other nutrients were the most predominant with folic acid deficiency being the lowest (Fig 3)

![Fig 3: Nutrients deficiency in anemic patients](image-url)
46.4% of the children had some form of gastrointestinal disorder like diarrhea, abdominal pain etc, 39.7% with respiratory tract infections including asthma (Table: 2).

**Table 2: Diseases associated with anemia.**

<table>
<thead>
<tr>
<th>Diseases associated</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastrointestinal diseases</td>
<td>83 (46.4%)*</td>
</tr>
<tr>
<td>Respiratory tract infections</td>
<td>71 (39.7%) *</td>
</tr>
<tr>
<td>Asthma</td>
<td>17 (9.5%)</td>
</tr>
<tr>
<td>Other diseases</td>
<td>8 (4.5%)</td>
</tr>
</tbody>
</table>

* p<0.001

**Discussion**

Anemia is a major health problem though out the world. In our study a very high prevalence of anemia of 45.7% among the children who approached our department was observed. This was in concordance to various other studies. 43% of the children below 5 years of age who were brought to the emergency ward in Zaire were anemic [18]. A slightly lower prevalence of 32.8% was observed in the state of Pernambuco [19] and 45.1% in Vietnam [20], while a very high prevalence of 70-79% was observed by researchers from Tanzania, Kenya and South Africa [21-23]. In sub-Saharan African countries, prevalence of 82% in Benin and 83% in Mali were found [24].

The highest rate of prevalence of anemia occurred in the 12-24 months age group. This could be because of the fact that most mothers, who were from the rural background continued to breast feed the children till more than a year and slowly wean off the child before 2 years of age. This age group was followed by < 12 months (29.6%). Also there is a rapid growth of the child during this phase as a result a greater requirement of iron [25, 26].

We have not found any significant association of the gender on the prevalence of anemia. While many studies corroborate our study [27, 28], few other researchers have found an association between the two, with boys being more affected than girls [16,29].

In our study, we found 48% of the children to be malnourished. Several population studies have also found and increasing trend of anemia in malnourished and obese children [19,30]. Although anemia is seen predominantly among the underweight children, it was also found in overweight children. This could be due to the lack of intake of minerals and vitamins in adequate quantities. However, no association was found in another study in Brazil [31].

Iron deficiency was found to be the most common etiology for the presence of anemia in children, followed by Vitamin B12 deficiency and folic acid deficiency. The same was reported by Gomber et al in a similar study [32]. Mixed micronutrient deficiency was also found in many of the children. This could be due to the inadequate food intake of the children.

Low intake of iron rich food and diminished nutrient absorption caused by changes in the gastrointestinal system has also contributed to the low iron status of the child [33].

We have found a significant association between the low income level of the family to be one of the contributors for anemia. This could be due to the low purchasing capacity of the family. Similar association have been reported in other studies from other countries [34,35].

**Conclusion**

In conclusion, we present an alarming burden of anemia among the children especially those in the 12-24 months age group.

Anemia is a global problem and requires proper understanding of its associated factors, so that effective measures can be taken to combat this disorder. Proper food, rich in nutrients, iron supplements are some of the essential requirements. Regular check ups for the children below 5 years must be conducted to that the effective actions can be taken as early as possible. Proper education on the importance of iron and its harmful effects in the child’s mental and physical growth must be emphasized in the population.

**Source of Support:** Nil, **Conflict of Interest:** None

**Permission of IRB:** Yes
References


