ORIGINAL ARTICLE

RISK FACTORS FOR IRON DEFICIENCY ANEMIA AMONG SCHOOL GOING CHILDREN IN URBAN SOUTH BANGALORE, INDIA

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Abstract

Objective: Iron deficiency anemia (IDA) is a common problem in children of the school going age. In spite of government efforts, many reports suggest a high prevalence of anemia. Our study aims at identifying the prevalence of IDA and its associated risk factors. Methodology: We studied 372 children from an urban school in South Bangalore, India with age ranges between 5 to 15 years old. Complete Blood Count was done by using Mindray BC 5200 5 part Hematology cell counter and serum ferritin was estimated by using Chemiluminescence. Anemia was classified as per the WHO grading. Results: The prevalence of IDA was found to be 13.9% of which 9.1% was mild anemia. There was no significant correlation between age, gender, socioeconomic status and anemia. However, a significant correlation was found between lower body mass index (BMI), vegetarianism and anemia (p-value = 0.03 and 0.04 respectively). Conclusion: Anemia is still a public health problem in our country. Major risk factors for development of IDA were found to be low socioeconomic status, vegetarian diet and pubertal period. However, interestingly gender did not play any role in the development of IDA.

Keywords: Iron Deficiency Anemia, Serum Ferritin, School Children

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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 [1]. Anemia is a significant global health problem affecting nearly 305 million school aged children with an estimated prevalence of 70 to 80 percent as per the National Family Health Survey (NFHS-3) [2]. School aged children between 12 to 14 years are known to be at an increased risk of nutritional anemia due to
incremental demands of iron due to rapid growth during this phase [3].

Anemia in children can result in impaired cognitive performance, delay in behavioral and motor development, abnormalities in coordination and language, decreased scholastic performance and increased morbidity from infectious diseases [4].

Our study aims at estimating the prevalence of iron deficiency anemia in school going children and to study its associated risk factors.

**Study Methodology**

**Study type**

Cross sectional study

**Study subjects**

372 school going children aged 5 to 15 years from an urban school of South Bangalore were enrolled in the study after taking consent. After enrolment, relevant history pertaining to anemia like easy fatigability, loss of appetite, decreased physical activity and their diet habits were taken. Subsequently, they were examined to look for signs of iron deficiency anemia. Socioeconomic status was analysed by Modified Kuppuswamy Classification of Socio Economic Status (SES).

**Study methods**

Relevant history was obtained and clinical examination performed. 2 ml each of blood samples were collected in EDTA and Gel vacutainers for complete blood count and serum ferritin analysis respectively. Hematological analysis was performed by Mindray BC 5200 hematology cell counter. Serum ferritin estimation was done by Chemilumiscence method. Children were classified as per WHO grades of anemia by hemoglobin estimation as mild (between 10 to 12 g/dl), moderate (between 7 to 10 g/dl) and severe (below 7 g/dl) [5]. Serum ferritin levels were considered to be low when below 15 ng/mL [6]. Children were classified as 'iron deficiency anemia' when both hemoglobin and serum ferritin were low and as 'iron deficient state' when serum ferritin was low and hemoglobin was normal. Children suffering from any acute or chronic illness or on any medications were excluded from the study. Any children with history of repeated blood transfusions or those having signs of hemolytic anemia clinically were also excluded from the study.

**Results**

There were 372 children involves in this study where 52.2% of them were males. There were 58.1% of children between the age of 10 to 15 years old and 41.9% were between 5 to 10 years old. The overall prevalence of anemia was found to be 13.9% of which 9.1% were mild anemia and 4.8% were moderate anemia as per WHO classification.

In children with mild anemia, average mean corpuscular volume (MCV) was found to be 71.4 fL. The average mean corpuscular haemoglobin (MCH) was found to be 24.8 pg and mean corpuscular haemoglobin concentration (MCHC) was found to be 29.7 g/dL. In those with moderate anemia, mean MCV was 60.8 fL, mean MCH was 20.6 pg and mean MCHC was 26.8 g/dL.

Serum ferritin was found to be low (<15 μg/L) in 114 (30.6%) of the 372 children. Hence, 13.9% were found to be of iron deficiency anemia and 16.7% of iron deficient state. In the remaining 258 (69.4%)
children, serum ferritin levels and hemoglobin were found to be normal.

**Socioeconomic status**

As per the Modified Kuppuswamy classification, 53.2% belonged to Class IV (Upper lower) and 41.4% to Class III (Lower middle). Of the children with anemia, the most common group was Class III and Class IV, with no significant difference ($p=0.704$) in the prevalence of anemia between the different socio economic groups studied.

**Age and Gender**

Of the children who had anemia, the most common age was between 10 to 15 years old. There was an equal distribution of both males and females with no significant difference in the prevalence of anemia between them.

**Diet**

There were 55.9% children practiced vegetarians in their dietary preference and had not consumed meat at any point in time. There was a significant difference in the prevalence of anemia between vegetarians and those who consumed meat ($p=0.04$), with 73.07% of anemic children being vegetarians.

We found that 77.4% children had regular breakfast consumption with 22.6% skipping breakfast in the morning and were irregular in their consumption. Of those who missed their breakfast, the most common reason (66.7%) cited was the lack of time early in the morning. There was however no significant difference ($p=0.53$) in the prevalence of anemia in those who consumed regular breakfast and those who did not.

**Body Mass Index (BMI)**

Our study revealed that 61.3% children had a BMI less than 15. There was a significant difference in the prevalence of anemia between those with low BMI and normal BMI ($p=0.03$). Of the children with anemia, 61.53% (32) had a low BMI of less than 15.

**Table 1. Prevalence of anemia in various studies**

<table>
<thead>
<tr>
<th>Studies</th>
<th>WHO Worldwide study</th>
<th>Djokic D</th>
<th>N Saluja</th>
<th>Mutthayya S</th>
<th>Present Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevalence of anemia</td>
<td>25.4%</td>
<td>18%</td>
<td>37.7%</td>
<td>13.6%</td>
<td>13.7%</td>
</tr>
</tbody>
</table>

**Table 2. Prevalence of anemia among vegetarians in various studies**

<table>
<thead>
<tr>
<th>Studies</th>
<th>Djokic D</th>
<th>N Saluja</th>
<th>Present Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetarians</td>
<td>93.6%</td>
<td>59.7%</td>
<td>73.07%</td>
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</table>
Table 3. Prevalence of anemia with reference to BMI

<table>
<thead>
<tr>
<th>Studies</th>
<th>Djokic D</th>
<th>Present Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low BMI</td>
<td>72%</td>
<td>61.54%</td>
</tr>
<tr>
<td>Normal BMI</td>
<td>18%</td>
<td>38.46%</td>
</tr>
<tr>
<td>Overweight</td>
<td>10%</td>
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Discussion

This study was done to evaluate the prevalence and risk factors associated with iron deficiency anemia in school going children. We found a prevalence of 13.9% which was comparable to other studies (Table 1), such as those conducted by Djokic et al. [3] and S Mutthayya et al. [7] who reported a prevalence of 18% and 13.6% respectively. The WHO worldwide study reports a prevalence of 25.4% which is much higher than our study. This could be attributed to the smaller number of subjects in our study owing to our limitation with obtaining consent from parents for blood sampling. Also, the study was conducted in a Government aided school in urban South Bangalore, where children were given iron and folic acid supplementation as per the Ministry of Health and Family Welfare guidelines. Biannual deworming was done and all children were provided with a mid-day meal. This could also contribute to the lower prevalence noted in our study in comparison to the WHO study [7].

The higher incidence of anemia in vegetarians (Table 2) can be explained by the increased availability of heme iron in meat which was better absorbed than non-heme iron in a vegetarian diet. The missing of breakfast reflects on the general nutritional status of children in our country with a large number still missing breakfast. This however, did not directly contribute to the prevalence of anemia in the children. However, it was noted that low BMI and anemia were significantly related (Table 3). Thus, preventing malnutrition would definitely contribute to reducing the prevalence of anemia in the country.

Conclusion

This study inferred that the risk factors for development of iron deficiency anemia in the school going children of urban south Bangalore were low socioeconomic status, vegetarian diet, pubertal period and those with low BMI. However, no significant association was found between development of anemia and gender. Our study thus adds value to show the prevalence of iron deficiency anemia in children in an urban school going population. Our study shows that in spite of different strategies to lower the prevalence in our country; it is still a significant problem in our country. Further, strengthening the government schemes to enhance nutrition in children would be a
way toward decreasing the prevalence of iron deficiency anemia in children [8].

References


