Nutritional Anemia in Adolescents in Oman

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ABSTRACT

Background: Nutritional anemia is one of the main public health problems in the Arab Gulf countries. Several dietary, social and cultural factors are associated with the high occurrence of this anemia in the region. Objectives: To assess the burden of nutritional anemia in adolescent girls and find out the important associates of anemia in girls with respect to their nutritional status and demographic profile. Methods: A community based observational cross-sectional study was done in Omani adolescent girls in Sohar. A structured, pretested questionnaire was used for data collection on socio-demographic variables. Body mass index was calculated with weight and height measurements. Hemoglobin was measured using Hemocontrol hemoglobin analyzer using cyanmethemoglobin reference method. Data was analyzed using SPSS. Anemia was defined by Hemoglobin cut off level of 12 g/dL. Results: Mean hemoglobin was 11.8g/dl ± 1.42 S.D and 54% of girls were anemic. Most of the girls had mild to moderate anemia. Most of the anemic girls belonged to grade 10 in the school (p<0.05) The proportion of anemic girls decreased as the level of the mothers’ education increased (p<0.05). Girls with undernourished nutritional status were more anemic (p<0.01). Conclusion: The proportion of anemic girls with mild and moderate anemia was significant and it calls for the need of dietary measures and health education campaigns in schools to curb the problem.

Keywords: Anemia, Adolescents, Nutritional, Hemoglobin

1. INTRODUCTION

Anemia is one of the most important global health problems, and more than two billion people worldwide are estimated to have anemia. Children and adolescents are particularly at risk of suffering from deficient nutritional status because of increased needs. Accelerated development, hormonal changes, malnutrition, and starting of menstrual periods in girls are the major causes of iron-deficiency anemia during adolescence, which may also lead to impaired perception and learning difficulties [1]. In the Eastern Mediterranean region, more than140 million individuals are considered to be anemic according to the World Health Organization (WHO) estimates, with the highest prevalence among women of reproductive age, infants, and children, especially those with low socioeconomic status [2]. It is one of the main public health problems in the Arab Gulf countries. Several dietary, social and cultural factors are associated with the high occurrence of this anemia in the region. Oman has undergone remarkable improvements in its health and nutrition indicators for women and children. Anemia remains a problem, although reportedly only in a mild form 42.7% in pregnant women and 34% in non-pregnant women are anemic [3].

2. LITERATURE REVIEW

The prevalence of anemia, especially iron deficiency anemia, is relatively high in the Gulf countries, particularly among preschool children, adolescent girls, and pregnant women. Additional support for this comes from dietary intake surveys in the Arab Gulf population, which tend to indicate inadequate intake of iron. This is particularly true in adolescent girls aged 11-18 years [4]. The intake of food rich in iron by preschoolers and adolescents in the Gulf countries is generally low, particularly among adolescent girls. In Kuwait, it was reported that the percent recommended dietary allowance for iron decreased as the age of school girls increased. The proportions were 78%, 38% and 32% of recommended dietary allowance for iron for girls aged 10-12, 13-15 and 16-17 years, respectively [5]. Anemia is more prevalent in rural than urban areas. In Bahrain, it was pointed out that the prevalence of iron deficiency anemia among secondary school girls in rural areas was 66.7%, while it was 31.7% in urban areas. A study in Qatar showed that severe anemia was prevalent in 13.3% of young women (15-24 years) compared to 3.5% of older women (more than 24 years). Similar findings were reported in UAE [6].

Early age at marriage may have an impact on the occurrence of iron deficiency anemia. Many women in the region get married before they are 16 years old. The risk of occurrence of iron deficiency anemia is higher among teenage pregnant girls than older girls. In Oman the prevalence of iron deficiency anemia among pregnant women ranged from 35.9% to 61%, depending on the regions. Although anemia levels in Oman have been decreasing; these levels of anemia particularly in non-pregnant women remain significantly high, and constitute a severe public health problem. Historically, the rate of anemia in school children in Oman has been very high [7]. Oman World Health Survey registered non-pregnant women as having a prevalence of anemia of 32.2%. However the rates seemed unaffected by place of residence (rates in urban population 29%, rural 24%), unimproved by increasing education level (rates among uneducated 32%, secondary 80%, university 32%), or economic quintile (rates in poorest quintile 27%, richest 32%) [8]. A study in university students in Oman showed that the prevalence of iron deficiency anemia among the students was 26% with a higher preponderance in females than males [9].

Nutrition education in schools can be mostly concentrated on giving some advice on modifying the dietary habits, such as changing meal composition to decrease the intake of inhibitors of iron absorption or to increase vitamin C rich foods in meals, or to increase intake of food rich in haem iron. To achieve the Vision for 2050 in health and nutrition, one of the goals is to reduce anemia and all micronutrient deficiencies through consumption of appropriate micronutrient rich foods [10].

Keeping this background of the burden of anemia in Oman, this study was done with the objective of assessment of the burden of nutritional anemia in adolescent girls and to associate it with their demographic profile and nutritional status.

3. METHODS

A community based observational cross-sectional study was done in Omani adolescent girls. The study was restricted to school going girls. Each school was visited to give a brief overview of the project to the girls in grade 9 and 10 and to distribute the parental consent forms. In all the 8 Omani high schools in Sohar, equal numbers of consent forms were distributed for girls in grade 9 and 10. The consent forms signed by the parents were collected by the school nurses after a week, following which the process of data collection begun. A pilot study was done, the results of which were used to modify the questionnaire and the train the project members for unanimity in the data collection tool and maintain quality of data. 359 such adolescent girls who got the consent were the part of the study in 2015.

Data collection tool was a predesigned, pretested, structured, self-administered questionnaire to collect data on sociodemographic variables. Data was collected from girls by the research team one by one during school premises. Height in meter and weight in kilogram was measured for calculation of Body mass index. Body mass index was calculated as weight in kilogram divided by height meter squared. Underweight was defined by taking the WHO defined cutoff point of body mass index less than 18.5 and overweight was defined by considering the cutoff point of body mass index more than or equal to 24.

Hemocontrol hemoglobin analyzer was used to measure total hemoglobin in the blood in gram per deciliter. Blood was collected under all aseptic conditions by the school nurses and hemoglobin levels were measured from the collected blood specimen. A drop of blood was taken from the fingertip and put in micro cuvette which was then inserted in the analyzer. This machine used azide methemoglobin
method. It was calibrated against cyan methemoglobin reference method. Anemia was defined by Hemoglobin cut off level of 12 g/dL according to WHO guidelines and was classified based on its severity in adolescents as: normal more than 12 g/dl, mild 10 to12 g/dl, moderate 7 to10 g/dl, and severe less than 7 g/dl. The girls who were found to be anemic were tested again to confirm the results. Also, they were given additional health education on how to improve their nutritional status. Referral slips were given to the anemic students by the school nurse to be followed-up at the local health center.

Data was analyzed with the Statistical Package for the Social Sciences Software. Unpaired student t test was used for comparing means and Pearson’s chi square test was used for estimating differences in proportions. A two tailed p-value of less than 0.05 was considered for statistical significance.

4. RESULTS

The participant girls were in the age group of 13 to 19 years. Mean age of the girls was 15.11 years ± 0.799 S.D. Majority of the girls’ mothers were educated (60.9%) while 39% were illiterate. The mean hemoglobin was 11.8g/dl ± 1.42 SD. The maximum hemoglobin level was 15.4g/dl and the minimum level was 7.3g/dl. Range of hemoglobin levels was 8.1g/dl. The mean hemoglobin level of anemic girls was 10.8g/dl ± 0.95, while that among the non-anemic was 13g/dl ± 0.76 and this difference was statistically significant (p<0.01). More than half of the girls, 194 girls (54%) were found to be anemic while 165 girls (46%) were not found to be anemic as depicted in Fig 1. Mild anemia was present in 157 (44%) girls while 37 (10%) had moderate grade of anemia. None of them were severely anemic.

![Fig 1: Status of anemia in adolescent girls](image)

A higher proportion of girls in grade 10 had anemia (67.6%) compared to girls with anemia in grade 9 (34.2%) and this result was statistically significant (p<0.05).

Out of the girls whose mothers were illiterate (140 girls), almost two-thirds (62.9%) were anemic, and this association was statistically significant. As the mother’s education increased to post graduate level, level of anemia decreased in girls (p<0.05). (Table 1)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Status of Anemia</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean hemoglobin levels (g/dL)</td>
<td>Mean ± S.D.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10.8 ± 0.95</td>
<td>13.0 ± 0.76</td>
</tr>
<tr>
<td>School grade of girls</td>
<td>No. &amp; (%)</td>
<td></td>
</tr>
<tr>
<td>Grade 9</td>
<td>50 (34.2)</td>
<td>96 (65.8)</td>
</tr>
<tr>
<td>Grade 10</td>
<td>144 (67.6)</td>
<td>69 (32.4)</td>
</tr>
<tr>
<td>Mother’s education level</td>
<td>No. &amp; (%)</td>
<td></td>
</tr>
<tr>
<td>Illiterate</td>
<td>88 (62.9)</td>
<td>52 (37.1)</td>
</tr>
<tr>
<td>High school</td>
<td>79 (50.3)</td>
<td>78 (49.7)</td>
</tr>
<tr>
<td>Graduate</td>
<td>11 (50)</td>
<td>11 (50)</td>
</tr>
<tr>
<td>Post graduate</td>
<td>16(40)</td>
<td>24 (60)</td>
</tr>
<tr>
<td>Nutritional status</td>
<td>No. &amp; (%)</td>
<td></td>
</tr>
<tr>
<td>Undernourished</td>
<td>55 (80.8%)</td>
<td>13 (19.2%)</td>
</tr>
<tr>
<td>Normal</td>
<td>95(50.3%)</td>
<td>94(49.7%)</td>
</tr>
<tr>
<td>Overweight</td>
<td>44(33.1%)</td>
<td>58 (66.9)</td>
</tr>
<tr>
<td>Status of menarche</td>
<td>No. &amp; (%)</td>
<td></td>
</tr>
<tr>
<td>Early menarche</td>
<td>74 (53.6)</td>
<td>64 (46.4)</td>
</tr>
<tr>
<td>Late menarche</td>
<td>120 (54.3)</td>
<td>101 (45.7)</td>
</tr>
</tbody>
</table>

The proportion of undernourished girls who were anemic (80.8%) was more than the proportion of undernourished girls who did not have anemia (19.2%). More girls who were overweight were not anemic (56.9%) while less girls with overweight were anemic; the difference was statistically significant (p<0.01).

When the anemia status was compared in relation to status of menarche, no significant association was noticed. Early menarche was considered as less than equal to 12 years and late menarche more than 12 years; keeping in mind the increasing secular trend of early menarche worldwide. Girls with late menarche having anemia were marginally more (54.3%) compared to those with early menarche (53.6%).

5. DISCUSSION

An alarming percentage of 54% girls were found to be anemic in this study. In several other studies similar prevalence was found; in Bangladesh 55.3% students were found anemic [11] and in Iranian university students 40.9% had anemia [12]. While another study in Saudi Arabia [13] reported a lower prevalence of 22.4%. Similar lower prevalence (29%) was also found in Emirati students [14]. Possible reasons might be poor dietary habit, menstrual blood loss, and lack of awareness of iron-deficiency and nutritional status. Age contributed significantly to anemia in this study. Premalatha et al (2012) reported similar findings [15]. While study done by Kaur et al (2006) and Rita Singh (2008) stated that age was not a correlated factor [16, 17].

Study by Premalatha et al (2012) in India showed significant association with mother’s literacy status (p<0.05). A statistically highly significant association of anemia was found with the mother’s and father’s educational status in another Indian study [18]. A significant association of the prevalence of anemia with educational status of mothers shows good awareness among literate mothers related to dietary concerns of their daughters.

Anemia had a significant association with body mass index in this study. When considering body mass index among the female anemic students, about half (50.5%) were found normal-weight students, 31.4% were underweight, and 18.1% were overweight and no obese female students were found either in anemic or non-anemic group by Shill et al (2014). The finding was similar to other published studies [19]. Results of study by Chaudhary et al (2008) shows that there is a relationship between anthropometry and anemia but contradicts with the findings of Rita Singh (2008). This relationship needs further research with greater population.

Similar to this study; age and attainment of menarche did not record any significant association in adolescent girls studies in Iran [20]. In contrary, few studies have depicted high prevalence of anemia in association with attainment of menarche [21].

6. CONCLUSION

Anemia was a significant problem in adolescent girls with commonest being mild to moderate anemia. It was associated significantly with mother’s education, grade in the school and nutritional status of girls. Status of menarche had no association with anemia. Anemia may affect the girls’ nutritional status and growth. Health education is recommended in schools emphasizing healthy lifestyle, consumption of balanced, nutritious diets especially iron-rich food and iron tablets if needed. The study findings may help in conducting further research among students of other schools, colleges and universities to estimate the prevalence nutritional anemia and take measures to curb the problem.

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REFERENCES
