The frequency of iron deficiency anemia and beta thalassemia carriers in volunteers of marriage.

Bijan Keikhaei¹, Amin Shahvazi¹, Saeed Hesam²

¹Research Center for Thalassemia and Hemoglobinopathy, Health Institute of Ahvaz Jundishapur, University of Medical Sciences, Ahvaz, Iran
²Department of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran

Abstract

Introduction: Thalassemia is one of the most important diseases associated with mild microcytic anemia, beta-thalassemia minor. This anemia usually does not require treatment, but it is important to screen for this anemia, especially before marriage, to prevent the birth of a newborn with thalassemia major in parents with β-thalassemia minor. Therefore, the aim of this study was to evaluate the prevalence of thalassemia and iron deficiency anemia in married couples of Ahwaz.

Methods: This study is a cross-sectional and descriptive study. 5 cc of blood were prepared in two tubes containing EDTA and Hemoglobin, MCV, MCH, RDW were determined by the System KX21 solenoid and the amount of ferritin, iron, and TIBC was also found in the serum sample. Blood samples from the MCV, MCH low electrophoresis and HbA2 measurements are measured.

Results: In this study 16281 couples (32,562) marriage volunteers who were referred to health centers in east and west of Ahwaz were studied. The results showed that the mean of ferritin, MCV and MCH hemoglobin was higher in males than in females. Of the 32,562 people surveyed (5.86%), 1908 had thalassemia minor, of which 966 (5.93%) and 942 (5.79%) were female. In addition, (30.44%), 3041 (10.69%) were 1741 males and (99.7%) were 1,300 women with alpha thalassemia. Of the 32,562 patients (55.1%), 504 had an anemia. Of these, were 284 (74.1%) men and 220 (1.25%) women.

Conclusion: The results of this study showed that the prevalence of iron deficiency anemia, thalassemia minor and sickle cell anemia in β-thalassemia carriers were higher among those referring to Ahwaz health center than other cases. On the other hand, in the case of thalassemia continued beta-thalassemia screening of couples in this city can effectively prevent the birth of a newborn with thalassemia major and impose unwanted treatment costs.

Keywords: Sickle cell anemia, Minor thalassemia, Marriage, Sickle cell anemia, Ferritin.
deficiency anemia is one of the most important women problems at fertility ages which are able to peril mother and fetus health [11,12]. On the other hand, minor beta-thalassemia is one of the most important diseases which are along with mild microcytic anemia. This anemia usually does not need any treatment, but screening of this anemia especially before marriage is essential in order to prevention of birth of infants with major thalassemia in parents with minor-beta-thalassemia [13,14]. Since people carrying the defective gene are lack of clinical signs, recognition of thalassemia carriers before marriage especially in Khoozestan province in which has a rather high prevalence in Iran can prevent birth of children with major thalassemia-which leads to numerous social-economical injuries- via training and education. Therefore, the aim of the present study was to evaluate the incidence rate of thalassemia and iron deficiency anemia in marriage volunteers of Ahvaz city.

Material and Methods

Study design
This study was a cross-sectional descriptive one during which the marriage volunteers of Ahvaz city during 2016-2017 were studied, after filling out the consent form of participating in study, 5 mililiter blood was taken from each case in two tubes one containing EDTA and another one as blot. The hemoglobin, RDW, MCH, MCV of samples was measured using cell counter model Sysmex KX21 and ferritin, iron and TIBC rates of serum samples were also determined. Blood samples with low MCH and MCV were electrophorized and HbA2 rate was measured. With considering the amounts of HbA2, beta-thalassemia and iron deficiency anemia were specified. If iron deficiency is persistent after treatment for one month, HbA2 was repeated again.

Data analysis
In quantitative variables, average and standard deviations were used in order to data description, and in qualitative variables, frequency and percentage were used. In order to data analysis Chi-Square test was used and T-test, ANOVA test and regression methods such as logistic regression were used if needed. All analysis was performed using SPSS software version 20.

Results

Demographic characteristics
In the present study 16281 couples (32562 individuals) of marriage volunteers referring to health centers of east and west Ahvaz were studied, the average age of total patients was 25.92 ± 8.09 years, the mean age of studied women was 24.60 ± 16.66 years and the average age of men was 27.75 ± 4.23 years, there was no significant correlation for age between the two genders (P>0.05).

Iron deficiency anemia
From 32,562 evaluated individuals, 10513 patients (32.28%) had iron deficiency anemia, among them, 2962 cases (18.19%) were men and 7551 patients (46.38%) were women, therefore, the prevalence rate of iron deficiency anemia was significantly higher in women comparing to men in the evaluated population (Table 1).

Table 1. Prevalence of iron deficiency anemia between marriage volunteers separately for genders.

<table>
<thead>
<tr>
<th>Population</th>
<th>Without anemia</th>
<th>iron deficiency</th>
<th>With anemia</th>
<th>iron deficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women</td>
<td>8730 (53.62%)</td>
<td>1785 (11.38%)</td>
<td>7551 (48.38%)</td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>13319 (83.46%)</td>
<td>1495 (9.48%)</td>
<td>2962 (16.54%)</td>
<td></td>
</tr>
<tr>
<td>Whole population</td>
<td>22049 (67.72%)</td>
<td>3280 (10.50%)</td>
<td>10513 (32.28%)</td>
<td></td>
</tr>
</tbody>
</table>

Hematological indices in patients with iron deficiency anemia
From all patients with iron deficiency anemia, 1621 individuals (10.10%), accomplished iron deficiency follow up, the results of hematological examinations in iron deficiency anemia patients showed that the mean rates of ferritin, hemoglobin, MCV and MCH had been higher in men comparing to women (Table 2).

Table 2. Mean rates of ferritin, hemoglobin, MCV and MCH in evaluated patients for gender separately.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ferritin (ng/ml)</td>
<td>11.2 ± 3.21</td>
<td>19.4 ± 5.23</td>
</tr>
<tr>
<td>Hemoglobin (g/dl)</td>
<td>10.16 ± 1.38</td>
<td>10.95 ± 2.02</td>
</tr>
<tr>
<td>MCV (FL)</td>
<td>70.63 ± 6.81</td>
<td>74.22 ± 8.13</td>
</tr>
<tr>
<td>MCH (pg)</td>
<td>22.15 ± 7.24</td>
<td>24.67 ± 4.98</td>
</tr>
</tbody>
</table>

Thalassemia prevalence evaluation
From 32562 evaluated patients, 1908 cases (5.86%) had minor thalassemia, among whom 966 cases (5.93%) were men and 942 cases (5.79%) were women. Therefore, no significant difference was observed among the two genders for thalassemia prevalence in the evaluated population. Also, the mean rates of MCV and MCH were 61.08 ± 8.30 fl and 19.53 ± 2.54 Pg, respectively. Furthermore, 3041 individuals (9.34%) including 1741 men (10.69%) and 1300 women (7.99%) had alpha-thalassemia.

The prevalence of sickle cell anemia
From 32562 evaluated cases, 504 patients (1.55%) including 284 men (0.87%) and 220 women (0.68%) had sickle cell
anemia, on the other hand, 6 patients (0.02%) had trait and 498 cases (1.53%) showed non-trait sickle cell anemia (Table 3).

Table 3. Prevalence of sickle cell anemia according to gender and hemoglobin S percentage.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Non Trait</th>
<th>Trait</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Man 4(66.67%)</td>
<td>280(66.22%)</td>
</tr>
<tr>
<td></td>
<td>Woman 2(33.33%)</td>
<td>218(43.78%)</td>
</tr>
<tr>
<td>% lowest HG S</td>
<td>81.3%</td>
<td>28.5%</td>
</tr>
<tr>
<td>% highest HG S</td>
<td>69.6%</td>
<td>47.8%</td>
</tr>
<tr>
<td>Mean HG S</td>
<td>75.91%</td>
<td>41.4%</td>
</tr>
<tr>
<td>Major sickle cell</td>
<td>3 patients (2 men and 1 woman)</td>
<td></td>
</tr>
</tbody>
</table>

Discussion

In the present study, 16281 couples (32562 individuals) of married volunteers referring to health centers of East and west Ahvaz were evaluated; from 32562 evaluated persons, 10513 patients (32.28%) had iron deficiency anemia, among these 2962 cases were men (18.19%) and 7551 cases were women (46.38%), therefore, in the evaluated population, the incidence rate of iron deficiency anemia was significantly higher in women comparing to men (about three folds higher). Various studies in Iran have reported the total prevalence of iron deficiency and also its rate in both genders. Shaianmehr et al. [15] reported that the incidence rate of iron deficiency anemia in marriage volunteers of Urumia City is 4.52%. Also in their study the occurrence rate of iron deficiency anemia was observed 6 folds higher in women. Also, in study of Sadr et al. (1378) the incidence rate of iron deficiency anemia among the marriage volunteers of Kashan city was 10.97%, also, the incidence rate of this type of anemia was about three folds higher in women comparing to men (about three folds higher). Various studies in Iran have reported the total prevalence of iron deficiency and also its rate in both genders. Shaianmehr et al. [15] reported that the incidence rate of iron deficiency anemia in marriage volunteers of Urumia City is 4.52%. Also in their study the occurrence rate of iron deficiency anemia was observed 6 folds higher in women. Also, in study of Sadr et al. (1378) the incidence rate of iron deficiency anemia among the marriage volunteers of Kashan city was 10.97%, also, the incidence rate of this type of anemia was about three folds higher in women comparing to men. On the other hand, Keikhaei et al. [16] reported the incidence rate of iron deficiency anemia among children of Ahvaz city as 29.1%. Zendedel et al. [17] in their study in Lorestan indicated that the incidence rate of iron deficiency anemia in women 15 to 49 years old was about 69%. Similar to our study, this study reported high prevalence of iron deficiency anemia between women, and was parallel with our study. Shams et al. [18] evaluated the prevalence of iron deficiency anemia in girl students of Tehran with average age of 20 years. They study showed that around 41 percent of evaluated population had nearly 4% iron deficiency anemia. Veghari et al. [19] evaluated women in age range of 18 to 35 years in 20 villages of northern Iran; their study showed that the rate of iron deficiency in these women who are in fertility age is about 13.5%, although the total rate of iron deficiency and anemia were reported 35.6% and 26.8% respectively.

In the present study the mean hemoglobin of patients with iron deficiency anemia was 10.16 ± 1.38gram per dl in women and 10.95 ± 2.2 gr/dl in men, the mean rates of ferritin in women and men with iron deficiency were 11.2 ± 3.21 and 19.4 ± 5.23 ng/dl, respectively, and also MCV was 74.22 ± 8.13 in men and 70.63 ± 6.81 in women and MCH for men and women was 24.67 ± 4.98 and 22.15 ± 7.24 pg. Although there were no significant differences for these indices between the two genders, but all of them were lower than normal range. In study of Keikhaei et al. [16], the mean hemoglobin, MCV and MCH in individuals with anemia in age range of 10 to 55 years old in Ahvaz were 10.25 ± 1.30, 71.64 ± 8.56 and 22.16 ± 3.47, respectively which were consistent with our study. Shams et al. [18] reported the incidence rate of iron deficiency and also its rate in both genders. Also, various agents including sample size, geographical area, nutritional regime and habits, consuming iron supplementary and physiological status especially among women could be effective on occurrence of this type of anemia. Patra et al. [20] showed that iron deficiency anemia effects on pregnancy result and also mother's health and leads to birth of preterm infants (69.3%), post-parturition hemorrhage (26%), myocardial infarction (18%), pre-eclampsia (17%) and eclampsia (14%). Shaianmehr et al. [15] in a systematic review study with studies conducted in Iran imparted that the rate of iron deficiency anemia is 14.2% among Iranian pregnant women on average. They also stated that anemia is higher in rural women (20%) comparing to urban women (13.4%). According to the statistics of world health organization also, more than half of pregnant women and one third of non-pregnant women in fertility ages suffer from anemia. The prevalence of anemia in fertility ages is because of menstruation and more pregnancy and especially in developing countries has higher prevalence because of inaccurate nutrition and lack of supplementary iron consumption. Therefore, the awareness of couples of iron deficiency anemia status and its effect on mother and infant's health especially in women at fertility ages is very important.

From the 32562 evaluated individuals, 1908 cases had minor thalassemia (5.86%), among these, 966 cases (5.93%) were men and 942 cases (5.79%) were women. Therefore, there was no significant difference observed in the evaluated population about the rate of thalassemia prevalence in both genders. Also, the averages of MCV and MCH in these people were 61.08 ± 8.30 fl and 19.53 ± 2.54 pg respectively. Furthermore, 3041 cases (9.34%) including 1741 (10.69%) men and 1600 (9.83%) women had alpha-thalassemia. Keikhaei et al. [16] with studying of children, reported the occurrence of minor thalassemia as 3.4% in Ahvaz, which is lower than prevalence rate in our study, one of the reasons for this difference can be sample size of evaluated population, the sample size of present study was higher comparing to their study. However, in study of Shaianmehr et al. [15] in Urumia, the occurrence rate of minor thalassemia and alpha-thalassemia were reported 0.09%
The prevalence rates of iron deficiency and iron-deficiency anemia in infants and young children (0-3 years of age). Pediatrics 2010; 126:1040-1050.


**Conclusion**

The results of the present study showed that the incidence rate of iron deficiency anemia, minor thalassemia and sickle cell anemia? is patients referring to Ahvaz health center is higher than other regions. Given that iron deficiency can induce destructive effects on mother and fetus, therefore awareness of couples especially women from their body iron status and consumption of appropriate nutritional regimes and receiving iron supplementary can prevent these complications. On the other hand, in case of thalassemia, implementation and continuity of screening program of couple’s beta-thalassemia in this city can effectively prevent from birth of infants with beta-thalassemia and imposing of unwanted treatment costs. Finally, with regards to weather conditions which are predisposing of sickle cell anemia gene maintenance, screening of this gene can be effective in decreasing of this type of anemia incidence.

**Authors’ Contribution**

All the authors contributed the same.

**Financial Disclosure**

There is no conflict of interest.

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**References**


*Correspondence to
Bijan Keikhaei
Research Center for Thalassemia and Hemoglobinopathy
Health Institute of Ahvaz Jundishapur University of Medical Sciences
Ahvaz
Iran