MODIFYING MICRONUTRIENT DEFICIENCIES USING FOOD-BASED INTERVENTIONS

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ABSTRACT
The micronutrient deficiencies are an important public health problem. The primary underlying cause of micronutrient deficiencies is insufficient intake. Aim of this paper was to describe the micronutrient intake status in women. In this cross-sectional study, 3-day food records 125 volunteer women were assessed using the Nutritionist III software in Ardabil city. Finally, the Dietary Reference Intake standards were used to evaluate the intake of nutrients. Based on the results, the proportion of the population with intakes below the dietary reference intake was 63.3% for iron, 60.5% for zinc, 82.9% for vitamin A and 97.5% for folate. On the other hand, the proportion of women with insufficient intakes of four micronutrients was 60.97%. The studied women were at increased risk for insufficient micronutrient intakes due to poor diet quality. Based on results, it seems that we need to long-term intervention strategies for multimicronutrient deficiencies in Iran.

Keywords: Micronutrients; Intake; Dietary Reference Intakes; Women

INTRODUCTION
Micronutrient malnutrition (MNM) or hidden hunger is widespread in the world (Muthayya et al., 2013). Globally, an estimated two billion people suffer from a chronic deficiency of micronutrients (World Health Organization, 2008). From a public health viewpoint, MNM is a concern not just because such large numbers of people are affected, but also it can contribute to high rates of morbidity and even mortality for many diseases. On the other hand, even mild to moderate deficiencies of micronutrients lead to impaired work capacity which impacts the nation’s development (Muthayya et al., 2013).

It can affect all age groups, but women of reproductive age are most vulnerable to micronutrient deficiency due to their relative high requirements for reproduction (World Health Organization, 2002). The World Health Organization contends that the micronutrients iron, zinc, folic acid, and vitamin A are among the most critical for women health (Nguyen et al., 2014).

The etiology of micronutrient deficiencies is multifactorial. In developing countries, poor dietary quality is often a major determinant of inadequate micronutrient intakes (Thurlow et al., 2006). The aim of this study was to describe the micronutrient status and compare to the dietary reference intakes (DRI) recommendations in the participants.
MATERIALS & METHODS

In this cross-sectional study; 125 volunteer women were recruited in Ardabil city, in the northwest of Iran. The participants were apparently healthy, non-pregnant, non-lactating and non-menopausal women, aged 18-50 years from urban areas. They had no participation in weight loss programs including formal or self-imposed diet.

Participants’ weight and height were measured in light clothing and without shoes using a balanced scale (SECA model 224, SECA Corp., Hamburg, Germany). The body mass index (BMI) was calculated as weight (kg) divided by squared height (m$^2$) of each participant.

Dietary intake was assessed using 3-day food records (2 non-consecutive weekdays and 1 weekend day). Subjects had to document time, amount (in gram) and situation, in which a food or beverage was consumed. They were instructed to (1) document all consumed foods and beverages in as much detail as possible, (2) to weigh foods (or to estimate doses, if weighing was not possible in some situations), (3) not to change usual eating habits. Food records were analyzed by computer using the Nutritionist III software and the daily intakes of total energy, carbohydrate, protein, fat, and micronutrients were calculated.

In this study, the Dietary Reference Intake (DRI) standards were used to evaluate the prevalence of inadequate intakes of micronutrients. This reference for the daily supply of vitamins and mineral nutrients apply to healthy, normal weight individuals (Institute of Medicine, Food and Nutrition Board, 2011). The 4 essential micronutrients used in this study were: iron, zinc, vitamin A, and folate.

All statistical analysis was conducted using SPSS 23. Data were checked for normality by using the Komogorov–Smirnov test. Descriptive statistics were computed for all parameters. Descriptive statistics included means± SD. The comparison of dietary micronutrients’ intake with the recommended intake was done using one-sample T-Test. Statistical significance was set at p < 0.05.

RESULTS AND DISCUSSION

The baseline characteristics are shown in Table 1. The mean age and body mass index of study participants were 35.58±10.06 years and 32.00±3.64 kg/m$^2$, respectively. Subjects’ characteristics were shown in Table 1. In this study, 57.7% of subjects had at least grade II obesity (BMI: 30-34.9 kg/m$^2$), about 17.3% obesity grade III (BMI: 35- 40 kg/m$^2$).

In this study, mean total energy intake, carbohydrate, protein, and fat were 2195.77 kcal/d, 338.01 gr/d, 76.02 gr/d and 60.57 gr/d, respectively. The daily dietary intakes of micronutrients are presented in Table 2.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean ±SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age(year)</td>
<td>35.58±10.06</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>80.27±13.33</td>
</tr>
<tr>
<td>Body mass index(kg/m$^2$)</td>
<td>32.00±3.64</td>
</tr>
</tbody>
</table>
The overall mean intakes for zinc, vitamin A, and folate intake in women was significantly lower compared to the DRI (p=0.04, p<0.001 and p<0.001, respectively). The level of insufficient intake ranged from 63.3–97.5% for selected micronutrients. Lowest micronutrient intakes compared to DRI were observed for vitamin A and folate (>75% of the study population below DRI). The proportion of women with insufficient intakes of four micronutrients was 60.97%.

<table>
<thead>
<tr>
<th>Micronutrient</th>
<th>Mean ±SD</th>
<th>DRI</th>
<th>P value</th>
<th>subjects [%] below DRI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron (mg/d)</td>
<td>17.15±6.38</td>
<td>18</td>
<td>0.15</td>
<td>63.3%</td>
</tr>
<tr>
<td>Zinc (mg/d)</td>
<td>7.37±3.29</td>
<td>8</td>
<td>0.04</td>
<td>60.5%</td>
</tr>
<tr>
<td>Vitamin A (µg/d)</td>
<td>573.18±90.11</td>
<td>700</td>
<td>&lt;0.001</td>
<td>82.9%</td>
</tr>
<tr>
<td>Folate (µg/d)</td>
<td>188.38±124.18</td>
<td>400</td>
<td>&lt;0.001</td>
<td>97.5%</td>
</tr>
</tbody>
</table>

a: Mean intake compared to DRI

This paper was described micronutrient intakes among Iranian women, based on dietary intake assessment at the individual level. Our findings suggest that selected micronutrient intakes are sub-optimal. This is consistent with results from other studies (Nguyen et al., 2014; Laillou et al., 2012). This insufficient nutrient intake raises concerns for women’s health both in terms of increased risk of adverse maternal and birth outcomes as well as of long-term consequences related to overall health and wellbeing (Ramakrishnan et al., 2012).

Micronutrient deficiencies have multiple causes, and therefore, there is no single strategy to eliminate micronutrient deficiencies suitable for all situations (Black et al., 2013). However, three strategies have been envisaged for prevention and control of hidden hunger, which can be deployed individually or in combination: short-term supplementation, medium-term food fortification, and a long-term focus on dietary diversification (Nair et al., 2016). These approaches should be regarded as complementary, with their relative importance depending on local conditions and the specific mix of local needs.

This study provides valuable information that can be used to design better policies and intervention programs to help improve dietary intakes in Iran. This new understanding of micronutrient intake will allow us to tailor our recommendations for nutrition.

CONCLUSIONS

The results of our cross-sectional study demonstrate that:
1. Most of the studied women were at risk of two or more coexisting micronutrient deficiencies.
2. Iranian women need combinations of multimicronutrients. Such combinations are especially important, because deficiency of one micronutrient may affect the absorption or metabolism of another micronutrient.
3. Clearly, there is an urgent need for coordinated programs to alleviate coexisting micronutrient deficiencies using food-based methods.
4. The efficacy and effectiveness of such interventions, however, must be investigated in future trials.

REFERENCES


