The level of Nutrition Knowledge and Dietary Iron Intake of Bosnian Women

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Abstract

The iron deficiency anemia is particularly common in reproductive age women. Thus, it is important to explore facts of knowledge about importance of iron in nutrition in female population. The study included 176 respondents and collection of data was done using a questionnaire and statistically analyzed. Women from rural area, women in younger age groups and pregnant women showed a higher level of knowledge about importance of iron in nutrition. The most respondents were in the normal weight range, but the significant prevalence of inadequate iron intakes was determined (daily average intake for iron was 7.62 mg/day) and there was significant difference between groups. Also, respondents had no knowledge concerning factors affecting iron supply from their diet, while it seems justified to focus our attention on these problems within the framework of educational activities.

Keywords: Anemia; iron deficiency; nutrition knowledge
1. Introduction

Iron is an essential nutrient for humans, and as a cofactor for several enzymes its participates in many metabolic processes essential for sustaining life including oxygen transport, deoxyribonucleic acid (DNA) synthesis, and electron transport (Anderson et al., 2007). Despite iron's plenteousness on earth, iron deficiency is extremely common in humans, and is the most prevalent cause of anemia worldwide. According to the World Health Organization approximately half of the 1.62 billion cases of anemia worldwide are due to iron deficiency, one of the leading risk factors for disability and death worldwide. It can be caused by a low dietary intake of iron, poor iron absorption, or excessive blood loss (World Health Organization, 2008).

Dietary iron bioavailability is low in populations consuming monotonous plant-based diets. The high predominance of iron deficiency in the developing world has health and economic consequences, including poor pregnancy outcome, impaired school performance, and decreased productivity (Zimmermann and Hurrell, 2007). The iron requirement is significantly increased during pregnancy due to increased iron utilization by the developing fetus and placenta, as well as blood volume expansion (Bothwell, 2000). It was estimated that 51% of pregnant women suffer from anemia, almost twice as many as non-pregnant women (Santiso, 1997).

As a redox-active transitional metal iron can form free radicals and in excessive amounts, it can be potentially hazardous, cause oxidative stress and lead to tissue damage. Thus, its concentration in body tissues must be tightly regulated throughout various body compartments, such as developing red blood cells, circulating macrophages, liver cells that store iron, and other tissues (Bao et al., 2012; Abbaspour et al., 2014). Disruptions in iron homeostasis are associated with a broad spectrum of chronic conditions including cardiovascular, malignant, metabolic, and neurodegenerative disease. Epidemiological studies provide evidence that excessive iron has been proposed to be a potent risk factor for developing cardiovascular and metabolic abnormalities (Basuli et al., 2014).

Iron is present in foods in two forms, as nonheme iron, which is present in both plant foods and animal tissues, and heme iron, which comes from hemoglobin and myoglobin in animal source foods. Heme iron is highly absorbed and its bioavailability is relatively unaffected by dietary factors. Nonheme iron is the main form of dietary iron has a lower rate of absorption, depending on the balance between iron absorption inhibitors (phytates, tannins, calcium, and phosphate) and iron absorption enhancers (ascorbic and citric acids, cysteine-containing peptides and ethanol) present in the diet (Hurrell and Egli, 2010). Further, meat, fish, and seafood all increase the absorption of nonheme iron (Hultén et al., 1995).

There is a lack of study focused on assessing knowledge of adequate iron intake in women of the Una-Sana Canton, Bosnia and Herzegovina. This study aims to estimate iron daily intake of respondents and level of understanding dietary iron importance.

2. Methods

In this trial were involved 176 respondents from 8 municipality of the Una-Sana Canton located in the northwest of the Federation of Bosnia and Herzegovina. The subjects were divided according to the place of residence (large and small municipalities, urban and rural areas), age range, as well as pregnant women as special group.

In Table 1 are given general data and anthropological measurements of respondents.

| Number of Subjects (N = 176) | N = 117 | N = 59 | BMI* (kg/m²) | Average salary (Euro) | Employed (%) |
|-----------------------------|---------|-------|--------------|-----------------------|--------------|
| Age (years)                 | Range   | Range | Pregnant women | Non-pregnant women | Range       |
| (18-30)                     | (18-30) | (31-50)|              |                       | (102 - 229.5)| Yes = 27 | No = 73 |
| Arithmetic Mean ± Standard Deviation | 24.45 ± 3.47 | 42.87 ± 6.75 | 25.69 ± 1.72 | 22.88 ± 1.13 | 164.31 ± 35.02 |

*Body Mass Index: Underweight (BMI \leq 18.5), normal weight (BMI between 18.5-24.9), overweight (BMI between 25-29.9), obese (BMI \geq 30).

In regards of their level of education 9% of respondents completed elementary school, 65% finished secondary and only 25% higher education. The standard of living in the country was quite low, only 27% of women were
employed, but with low average salary equates to only about 164 euro per month. The body mass index (BMI) for pregnant women was (25.69 ± 1.72), and (22.88 ± 1.13) for the other respondents. The obtained BMI range between 21.82 to 25.70 was the indicators of good nutritional status (normal weight BMI) of the all respondents.

The 24-hour dietary recall method was used as method to measure iron dietary intake of respondents in the current survey (Mandić, 2003), and collection of data was done using a questionnaire designed for the needs of this survey. Respondents were asked to indicate iron rich food and then made list of 7 foodstuff according to content of iron from high to low. Also, they should circle which foods between 5 offered foods contain large amounts of iron. Further, participants should answer to questions which two diseases may occur when insufficient intake of iron is presented and which factors influencing absorption of iron.

The data obtained were statistically analyzed by SPSS 13.0 software package which included analysis of variance (ANOVA, Duncan's post-hoc test). A p value of less than 0.05 was considered statistically significant. The results are presented as mean values ± S.D.

3. Results and Discussion

Several factors influence the body’s iron requirement, including iron intake, stores, and loss. The Recommended Dietary Allowance (RDA) for iron for all age groups of men and post-menopausal women is 8 mg/day, and the RDA for iron for pre-menopausal women is 18 mg/day. The difference in values between the two groups is primarily related to the need to replace iron losses due to menstruation. Pregnant women require even more iron, 27 mg/day (WHO/FAO/UNU, 2001).

In table 2 are shown daily intake of iron of respondents obtained on the basis of the 24-hour dietary recall method.

| Participants                  | Daily intake of iron (mg) |
|-------------------------------|---------------------------|
| Municipality of Bihać         | 7.38 ± 0.01a              |
| The other Municipality        | 6.90 ± 0.01b              |
| Urban populating              | 7.32 ± 0.01b              |
| Rural population              | 7.70 ± 0.01b              |
| Age (18-30)                   | 7.96 ± 0.01a              |
| Age (31-50)                   | 7.52 ± 0.01b              |
| Pregnant women                | 8.61 ± 0.01a              |
| Non-pregnant women            | 7.57 ± 0.01b              |

In our study the estimated average intake for iron was 7.62 mg/day and there was significant difference (p < 0.05) between all examined groups. The higher dietary iron intake were observed in women from municipality of Bihać (the bigest municipality of the Canton) (7.38 ± 0.01) mg/day, women from rural area (7.70 ± 0.01) mg/day, younger population (7.96 ± 0.01) mg/day and pregnant women (8.61 ± 0.01) mg/day. Considering that participants mainly belong to group of pre-menopausal women, all obtained results of daily iron intake were low. The estimated average dietary intake of 8.61 mg/day of iron for pregnant women was considerably below the RDA (27 mg/day). The mean daily dietary iron intakes in the UK were 13.5 mg for men and 9.8 mg for women (Dainty et al., 2014). Study of dietary intake and iron status of Australian vegetarian women showed there was no significant difference between mean (± S.D.) daily iron intakes of vegetarians and omnivores (10.7 ± 4.4 and 9.9 ± 2.9 mg, respectively) (Ball and Bartlett, 1999).
All subjects completed a questionnaire requesting details about their knowledge about the resources and importance of iron. The data processing system was developed scoring for each examination. For the first examination, scores ranged from 0.55 to 148.89, and for the second range was 2.02-4.01. For the third and fourth questions correct answers was worth 2 points (Table 3).

Table 3. The level of women’s knowledge about the resources and importance of iron

| Participants             | Order list of 7 foods according to content of iron from high to low | Which foods contain large amounts of iron? | Which two diseases may occur when insufficient intake of iron is presented? | Which factors influencing absorption of iron? |
|--------------------------|---------------------------------------------------------------------|------------------------------------------|--------------------------------------------------------------------------------|---------------------------------------------|
| Municipality of Bihac    | 31.34 ± 0.01b                                                      | 2.93 ± 0.01a                             | 1.41 ± 0.01a                                                                  | 0.27 ± 0.01a                                |
| The other municipality   | 43.38 ± 0.02a                                                      | 3.82 ± 0.02a                             | 1.90 ± 0.01a                                                                  | 0.50 ± 0.01a                                |
| Urban population         | 29.22 ± 0.01b                                                      | 3.08 ± 0.01a                             | 1.45 ± 0.01a                                                                  | 0.26 ± 0.01a                                |
| Rural population         | 41.23 ± 0.01a                                                      | 4.01 ± 0.06a                             | 1.72 ± 0.01a                                                                  | 0.48 ± 0.01a                                |
| Age (18-30)              | 27.86 ± 0.01a                                                      | 2.86 ± 0.01a                             | 1.50 ± 0.01a                                                                  | 0.25 ± 0.01a                                |
| Age (31-50)              | 27.38 ± 0.01b                                                      | 2.74 ± 0.01b                             | 1.32 ± 0.01a                                                                  | 0.15 ± 0.01a                                |
| Pregnant women           | 23.58 ± 0.01a                                                      | 2.29 ± 0.01a                             | 1.32 ± 0.01a                                                                  | 0.02 ± 0.01a                                |
| Non-pregnant women       | 22.04 ± 0.01b                                                      | 2.02 ± 0.01b                             | 1.33 ± 0.01a                                                                  | 0.12 ± 0.01a                                |

The same letter in the same raw indicates no significant differences (Duncan’s test, p < 0.05)

The obtained data showed that there were significant differences (p < 0.05) in participant’s knowledge between the answer in all performed examinations. Residents of Bihac municipality showed lower level of knowledge in the first examination (31.34 ± 0.01) comparing to the residents of the other municipality (43.38 ± 0.02). Actually, the residents of the other municipality gave better answers in all the other examinations. When respondents were asked to indicate and then order list of 7 iron-rich foods in the first place they put beans, although beans was in third place of foods highest in iron behind the liver and soybeans. Moreover, on the second place of iron-rich foods respondents put offal (including liver), and that is foods with the highest amount of iron. On the third place respondents listed spinach, but spinach is on ninth place in iron content.

Residents of rural area demonstrated better results in answering the questionnaire regarding to residents of urban area. For example in first examination they reached (41.23 ± 0.01) points while residents of urban area reached only (29.22 ± 0.01) points. Younger women, (ages 18 to 30) demonstrated slightly better level of knowledge about investigated topic comparing to women ages 31 to 50. Also, pregnant women knew more facts about dietary iron comparing to the other women who were in reproductive period but non-pregnant.

According to the number of points scored all the respondents were divided into three groups (poor, medium and good level of knowledge about dietary iron). Most of women (58%) had medium level of knowledge. Only one respondent gave complete answers.

4. Conclusion

In the presented study respondents were female population of the Una-Sana Canton (B&H). According to the level of education, the most prevalent group was women with secondary education (65%), and 9% of respondents only finished elementary school. The standard of living in the country was quite low and only 27% of respondents were employed. Probably these socioeconomic factors influenced on obtained results.

The most women were in the normal weight range, but the significant prevalence of low iron intakes was determined, (the average daily dietary iron intakes was 7.62 mg/day). The main part of the respondents 82% didn’t know which factors influencing absorption of iron. Only 18% knew that vitamin C promotes absorption of soluble iron.
nonhem iron, mainly due to personal experience with anemia. Women from rural area, women in younger age groups and pregnant women showed a higher level of knowledge about resources and importance of iron in nutrition.

It can be concluded that the respondents didn't enough informed about the importance of iron in the diet, they know which food is iron rich, but they do not know enough about the approximate amount of iron in the food. Low daily iron intake and insufficient level of knowledge about the resources and importance of iron indicate the need for better education of women about the importance of iron in the diet. In future, consuming a variety of iron-rich foods can help prevent iron deficiency of women in reproductive ages.

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