Iron-Deficiency Anemia in Multiparity Pregnancies

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ABSTRACT

The incidence of iron deficiency anemia increases due to hemodilution during pregnancy. In pregnant women with iron deficiency anemia, the frequency of many diseases increased. In our study, we aimed to compare iron, ferritin, hemoglobin, and hematocrit levels in multiparous pregnant women in first, second, and third trimesters. The women included in the study were 26 ± 3 years old. The women were divided into four groups of 40 persons per group, namely, the control group, the first-trimester group, the second-trimester group, and third-trimester group. Iron, ferritin, hemoglobin (Hb) and hematocrit (Htc) levels were then evaluated. Hb, Htc, and Ferritin levels were significantly lower in the first trimester compared to the control group (p=0.001; p=0.003; p=0.000, respectively). All parameters were significantly lower in the second and third trimesters compared to the control group (p=0.000 for all groups and parameters). Compared to the first trimester, there was a significant decrease in Hb, Htc, and iron values in the second and third trimesters (p=0.000 for all groups). Compared to the first trimester of ferritin, there was a significant decrease only in the second-trimester values (p=0.034). Gestation period should be carefully evaluated in terms of iron deficiency anemia, and pregnant women should be informed. Considering the negative situations that iron deficiency anemia may cause during pregnancy, it is concluded that this situation should be evaluated as a public health problem, and precautions should be taken.

Key words: Multiparipregnancy, iron-deficiencyanemia, iron, ferritin, hemoglobin.

INTRODUCTION

The physiological changes that occur during pregnancy affect both mother and the fetus. Dilutional anemia may develop as the increase in the number of erythrocytes in pregnancy is lower than the increase in blood volume (Koller, 1982). Although this condition develops physiologically, the most common anemia type is iron-deficiencyanemia (Anon, 2008; Güleç et al., 2014). According to the World Health Organization (WHO), this condition, defined as gestational anemia, is that hemoglobin (Hb) levels are below 11 g / dl during pregnancy (Anon, 2001). It is involved in many metabolic processes such as iron reduction-oxidation reactions, DNA synthesis, development of the immune system, and the structure of hemoglobin (Poena-Rosas et al, 2015; Khoushabiet al., 2016). Iron requirements during pregnancy increase, especially in the third trimester (Wang et al., 2016). In pregnant women with iron deficiency and iron-deficiencyanemia, the fetus is negatively affected. A positive correlation was found between iron deficiency in the mother and decreased iron in the fetus (Shao et al., 2012). Iron deficiency results in myelination disorder in the nerves, brain development disruption, hypoxiaoccurs in the brain due to hemoglobin deficiency, which leads to increase in angiogenesis (Bastian et al., 2015). It has been shown that iron-deficiencyanemia can lead to low birth weight and prematurity in the fetus, and also, it can cause diseases such as hemorrhage, heart failure, preeclampsia in the mother (Bothwell,2000;Sanhaviet al., 2010;Kozuki et al., 2012; Wang et al., 2016).

Serum ferritin levels are a non-invasive, safe indicator of iron stores in the body (Byg et al., 2000, JW, 2005). There are 4000-45000 iron atoms in a ferritin molecule(WF, 1991).
Ferritin level below 12 μg / l supports the diagnosis of iron deficiency anemia. However, since ferritin is an acute phase reactant, it can increase, especially in the presence of inflammation and infection (Güleç et al., 2014). In the case of iron deficiency, ferritin levels are much more important as there is a decrease before the parameters such as serum iron, transferrin saturation, hemoglobin (Romslo et al., 1983). Iron and ferritin levels are essential not only in women of reproductive age but also in women in their post menopausal period. In a study by Cikim et al. (2016) iron and ferritin levels were investigated in patients with and without iron deficiency anemia and were found to be significantly higher in the non-anemic group (Cikim et al., 2020).

In our study, multiparous pregnant women who did not use any iron preparations, did not smoke, and have no risk factors, during the 1st, 2nd, and third trimester periods, we aimed to measure the levels of iron, ferritin, hemoglobin, hematocrit. In evaluating these parameters, it was another goal to determine the change in iron deficiency anemia among the groups, if any, by comparing them with values in healthy non-pregnant women.

MATERIALS AND METHODS

Study design

This study was performed after approval by local ethics committee authorities (approval number: KSU-03.07.2019/02). The study included women aged 26 ± 3 years without any known disease, non-smoker, and no use of iron drugs. The women included in the study had a count of pregnancy, count of birth, and count of children were 2. The women in study were divided into four groups of 40 people per group, namely, the control group, the first-trimester group, the second-trimester group, and third-trimester group.

Venous blood samples were taken from the individuals following a 12-hour fasting period. Hemoglobin (Hb), hematocrit (Htc), iron (Fe), and ferritin levels were measured. Hb level below 11 g / dl was accepted as anemia (Anon, 2001).

Biochemical analyzes

Hemoglobin and Hematocrit measurement: Hemoglobin (gr/dl) levels were evaluated by Sysmex XN-1000 (Sysmex Corporation, Chuo-ku, Kobe, Japan) and Photometric - SLS Cyanide Free fluorescence flowcytometry was used, while hematocrit (%) levels were evaluated by Cumulative Pulse Height Detection.

Iron measurement: Iron levels were estimated by photometric measurements using the auto analyzer (Cobas e 601 module, RocheDiagnostics, F.Hoffmann-La Roche Ltd., Kaiseraugst, Switzerland).

Ferritin measurement: Measurements were performed using the electro chemiluminescence immuno assay method in the auto analyzer (Cobas e 601 module, RocheDiagnostics, F.Hoffmann-La Roche Ltd., Kaiseraugst, Switzerland).

Statistical analysis: For statistical data comparisons, a standard software package (SPSS 20 for Windows; SPSS Inc., Chicago, IL, USA) was used. The differences between groups were analyzed by one-way ANOVA, followed by the least significant differences (LSD) tests. All values were given as mean ± S.E.M. P values<0.05 were considered significant.

Results

Hb, Htc, and Ferritin levels were significantly lower in the first trimester compared to the control group (p=0.001; p=0.003; p=0.000, respectively). All parameters were significantly lower in the second and third trimesters compared to the control group (p=0.000 for all groups and parameters; figure 1A, B, C, D). Compared to the first trimester, there was a significant decrease in Hb, Htc, and iron values in the second and third trimesters (p=0.000 for all groups; figure 1A, B, C). Compared to the first trimester of ferritin, there was a significant decrease only in the second-trimester values (p=0.034; Figure 1D).

The measured Hb values were below 11 g/dl in 7.5% of 1st-trimester pregnancies, 32.5% of 2nd-trimester pregnancies, and 35% of 3rd-trimester pregnancies. The rate of anemia in all pregnant women included in the study was calculated as 25% (30 of 120 pregnant women).

DISCUSSION

The anemia that we encounter during pregnancy is considered physiological, and the most common reason for this is iron deficiency anemia (Anon, 2008). According to the World Health Organization (WHO), individuals with a Hb value below 11 g / dl during pregnancy were accepted as anemic, and the rate of anemia in all pregnant was determined as 24.2% (Anon, 2001). In our study, Hb value was found below 11 g / dl in 30 of 120 pregnant women. The ratio of anemic pregnant women to all pregnant women was calculated as 25%, which is similar to the data of WHO. In another study, the frequency of anemia was increased during pregnancy (Scholl, 2005). In our study, an increase in the frequency of anemia was found during pregnancy, similar to the data in this study. While the rate of anemia was 7.5% (3/40) in the first trimester, this rate was 32.5% (13/40) in the second trimester and 35%
Figure 1: Levels of Hemoglobin (A), Hematocrit (B), Iron (C) and Ferritin (D) in non-pregnants, pregnant in the first, the second and the third trimesters. The results are shown as mean ± standard error mean (SEM) (n=40 / group).


(14/40) in the third trimester. Also, the decrease in Hb and Htc values tended to decrease statistically significantly compared to the control group (statistical values are shown in Figures 1A and 1B for each group and trimester).

Although it is considered normal to see anemia during pregnancy, it is a condition that needs to be treated. Studies have shown that anemia affects the health of both the fetus and the mother. According to this, in the anemic mothers have increased the severity of post natal bleeding and sepsis development frequency (Khan et al., 2006, Acosta et al., 2012), and it has been shown that preterm delivery, preeclampsia, premature membrane rupture, and fetal deaths are more common than normal pregnant (Klebanoff et al., 1991, Paiva Ade et al., 2007, Bad far et al., 2019). Also, it has been stated that iron deficiency during pregnancy may cause neurochemical and neurobiological changes in the fetus, and neural development may be impaired as a result (Chouthai et al., 2003). Many factors can cause this condition, and iron deficiency also contributes. Because iron, it acts as a cofactor in the structure of many enzymes involved in the destruction of free oxygen radicals such as catalase. In the case of iron deficiency, the catalase enzyme cannot work, and hydrogen peroxide cannot be destroyed. Hydrogen peroxide can form hydroxyl radicals (OH), which is considered as one of the strongest free radicals known by taking electrons from elements such as iron and copper (Cikim et al., 2016). In the light of these results, we think that hydroxyl radical can cause damage to the fetoplacental endothelium and lead to impaired oxygenation of the fetus and structure-dysfunction in organs and tissues. In addition, as the electron transport chain will be disrupted duetocytoschremdy function in iron deficiency, it can be expected that free radical formation increases and causes feto-maternal side effects.

Iron deficiency also depends on socioeconomic reasons in society. When evaluated from all over the world, the rate of iron deficiency in pregnant women was 42%, the highest rate was in the Gambia (75%) in the African continent and the lowest rate in North America (6%) (Anon, 2008). While the rate of anemia in pregnant women is below 20% in developed countries, it is stated that it is around 50% - 75% in developing countries (Anon, 1992). When the iron levels of the women participating in our study were evaluated,
there was no statistically significant change in the iron levels of women in the first-trimester pregnancy compared to the non-pregnant control group. Furthermore, after the first trimester, iron levels tended to decrease gradually, and these changes were statistically significant for both the 2nd trimester (p = 0.000) and the 3rd trimester (p = 0.018) (Figure 1C). It is thought that among the causes of iron deficiency anemia in our country income distribution and educational level differences, the high number of foreign immigrants, high consumption of tea and coffee duet odietary habits, high and frequent fertility has been included. Also, when patients are not adequately informed about side effects during the use of iron preparations for treatment, patient compliance problems may occur. This situation can lead to a decrease in the use of drugs and an increase in the frequency of anemia.

Serum ferritin levels are a non-invasive, safe indicator of iron stores in the body (Byg et al., 2000, JW, 2005). Ferritin is present in all cells in the body, especially the liver, bone marrow, and spleen. There are 4000-4500 iron atoms in one ferritin molecule (WF, 1991). Ferritin level below 12 μg / l supports the diagnosis of iron deficiency anemia (Güleç et al., 2014). The ferritin values that we measured in our study were found to be decreased in all periods of pregnancy compared to the control group. Compared with the values in the first trimester of pregnancy, a statistically significant decrease was observed in the second trimester (p = 0.034), although a decrease was observed in the third trimester, this decline was not statistically significant (p = 0.149) (Figure 1D).

CONCLUSION

The pregnancy period should be carefully evaluated in terms of iron deficiency anemia, and pregnant women should be informed. Considering the negative situations that iron deficiency anemia may cause during pregnancy, it is believed that this situation should be evaluated as a public health problem, and measures should be taken with both nutritional supplements and iron preparations.

REFERENCES


