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Iron deficiency anemia in pregnancy: evaluation and management

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Abstract:

Anemia is a condition in which the number of red blood cells (RBC) is insufficient to meet the body's physiological needs for oxygen transport. A limiting factor for the erythrocyte mass increase is iron deficiency, which can also have a negative impact on the pregnancy's prognosis. The most frequent pathogenic cause of anemia in pregnancy is iron deficiency anemia (IDA). Biochemical tests such as serum iron concentration, total iron binding capacity (TIBC), transferrin concentration, and ferritin concentration are decreased in iron deficiency anemia. In clinical practice, iron deficiency is defined as low serum ferritin or a decreased percentage of transferrin saturation by iron. Usually, the diagnosis begins with the determination of serum ferritin. Although iron supplementation for iron deficiency is advised as soon as the condition has been diagnosed, prophylactic iron delivery is still under discussion. In patients for whom oral iron is ineffective or contraindicated, intravenous iron can be used to restore lost iron.

Keywords: iron deficiency; iron deficiency anemia; iron supplementation; pregnancy.

Introduction

Anemia is a condition in which the number of red blood cells (RBC) is insufficient to meet the body's physiological needs for oxygen transport. Anemia, defined as hemoglobin levels no lower than 10 g/dL at term, affects nearly all pregnancies, and in most cases, rather than reflecting a deficient condition or underlying hematologic disorder, it is a result of physiologic processes (1). During pregnancy, plasma volume increases disproportionately to the red blood cell mass, reaching a maximum value around 24 weeks of gestation (1). Although

there is a 15 to 25% increase in RBC mass during pregnancy, this is not noticeable because of the dilution effect brought on by the rise in plasma volume (2). The the hematocrit (Hct), a hemoglobin (Hb) concentration, and circulating erythrocyte count rise while maternal plasma volume typically falls in the latter weeks of pregnancy (3). The mother's erythropoiesis returns to normal within approximately one month after delivery (4).

A limiting factor for the erythrocyte mass increase is iron deficiency, which can also have a negative impact on the pregnancy's prognosis. Significant anemia in pregnancy is defined as a Hb concentration <11 g/dL in the first trimester or <10 g/dL in the second and third trimesters (1). It occurs with a prevalence ranging between 2% and 26% (5,7). Anemia has a significant role in maternal and fetal morbidity and mortality, particularly in the developing countries (5,7–10). Severe maternal morbidity—including fatalities, blood transfusions, and hysterectomies—occurred more frequently in women with anemia present before delivery (11). It has been observed that iron deficiency can lead to placental hypertrophy, increase the risk of premature delivery, low birth weight and infant death (12–14). Additionally, early infancy cognitive development may be hampered by iron deficiency (15).

State of knowledge

Anemia occurs during pregnancy in 8.8% of women, and half of them have hemoglobin levels below 10 g / dL (16). The most frequent pathogenic cause of anemia in pregnancy is iron deficiency anemia (IDA) (17,18). In premenopausal women, iron deficiency is usually due to an imbalance between dietary iron intake and physiological blood loss through menstruation, especially menorrhagia, or due to iron loss from previous pregnancies. Reduced iron intake occurs in women on a vegetarian or vegan diet who do not take iron supplements or have iron malabsorption disorders (19,20). Only about 20–35% of European women of childbearing age have sufficient iron stores to complete a pregnancy without iron supplementation (21). It has been shown that 42% of non-anemic pregnant women in the first trimester were iron deficient (22).

The iron content in the human body is carefully regulated and is usually kept at around 40 mg / kg in women (1). The amounts of iron uptake by enterocytes in the duodenum and iron mobilization from liver parenchyma and macrophages regulate iron balance (1). Hepcidin regulates these processes (23,24). When hepcidin levels rise, iron is retained in enterocytes or macrophages and is not available for RBC production (24). When hepcidin levels are reduced, iron is mobilized (24). Iron is stored in the macrophages of the spleen, bone marrow or liver in the amount of 5–6 mg / kg in women (1). Circulating erythrocytes and erythroid precursors in the bone marrow are the body's main sources of iron (1). It is estimated that the absorbed iron requirement increases from 0.8 mg / day in early pregnancy to 7.5 mg / day in late pregnancy (25).

Data on iron supplementation in pregnancy by all women are inconclusive. When serum ferritin is greater than 70 µg / L, it is assumed that iron stores are sufficient to support pregnancy and supplementation is not used (1,26). Although there is limited data on the positive effects of iron supplementation on prognosis in mothers and infants, prophylactic iron supplementation has been found to reduce the rate of maternal anemia at delivery by 70% and iron deficiency at delivery by 57% (27–31). However, no evidence was found that iron supplementation during pregnancy improves neurological development in the offspring (28,29). Red blood cell mass increases more in pregnant women using iron supplements than in pregnant women not taking

iron supplements (1). However, many physicians routinely use iron supplementation for all pregnant women (1). There is no doubt, however, that anemia during pregnancy should be recognized and treated immediately to avoid difficulties for both the mother and the baby.

Each pregnant woman's peripheral blood counts are examined, and if the hemoglobin level is less than 11 g/dl, the source of anemia should be looked into. Biochemical tests such as serum iron concentration, total iron binding capacity (TIBC), transferrin concentration, and ferritin concentration are decreased in iron deficiency anemia. In clinical practice, iron deficiency is defined as low serum ferritin or a decreased percentage of transferrin saturation by iron. Usually, the diagnosis begins with the determination of serum ferritin. Numerous studies indicate that it is the most efficient single test for detecting iron deficiency in pregnant women (32,33). A serum ferritin concentration of ≤ 30 ng/ml allows the diagnosis of iron deficiency with a sensitivity of 92% and a specificity of 98% (22,34). However, it should be remembered that serum ferritin is an acute phase reagent that may be increased disproportionately to iron stores as a result of infection, inflammation, liver disease, cancer, or other conditions (1,35). A decreased transferrin saturation may indicate iron deficiency in patients with normal ferritin levels (36). Iron deficiency is linked to elevated serum soluble transferrin receptor (sTfR) levels, which do not vary during the inflammatory process (1,37). So, in conditions where it is uncertain, this indicator may be employed. It is also worth paying attention to the mean corpuscular volume (MCV). $MCV < 80$ fl is evidence of microcytic anemia which results from iron deficiency or hemoglobinopathy (38). Hemoglobin electrophoresis and testing for alpha-thalassemia can be performed to exclude hemoglobinopathy. Iron supplementation should begin as soon as iron deficiency anemia is recognized (38). 30 mg of elemental iron per day is the recommended amount for pregnant women (39,40). To ensure such a supply of iron, iron supplementation is often necessary. It is recommended to eat foods high in iron such as shrimp, oysters and clams, turkey, beans, lentils, liver (40). Iron absorption is impaired by dairy products, soybeans, spinach, coffee and tea (40). Patients with anemia should be advised to take oral iron supplementation in addition to nutritional modifications. The most commonly used orally administered iron preparations are: iron (II) fumarate, iron (II) gluconate, iron (II) sulphate, iron (III) proteinosuccinate (41). Among them, side effects are most common with iron (II) fumarate (41). On the other hand, iron (II) glycinate is best tolerated (41). The amount of elemental iron in the pill ranges from 18 to 106 mg, depending on the preparation. Typically, 10-15% of this is absorbed in the intestine (39). For this reason, the method of oral supplementation has its limitations. Both raising the dose of the iron tablet and giving it more frequently have no positive effects on the course of treatment (38,42,43). Constipation and nausea are the most frequent adverse reactions to oral iron preparations. By providing iron every two days, they can be avoided (27,42,44,45). In most cases, oral iron supplementation is effective and acceptable to the patient. However, intravenous iron therapy is secure and efficient if the patient does not respond to oral iron or is unable to consume iron orally (46). Intravenous administration of iron increases its reserves in the body faster. However, this route of iron administration is more expensive and carries with it risks (47). A meta-analysis found that women receiving iron intravenously were more likely to achieve their desired target hemoglobin levels more quickly and with fewer side effects (47). Failure to react to the administered iron should prompt the doctor to look for other causes of anemia.

Conclusion

Iron deficiency is the most common cause of anemia in pregnant women. Although iron supplementation for iron deficiency is advised as soon as the condition has been diagnosed, prophylactic iron delivery is still under discussion. In patients for whom oral iron is ineffective or contraindicated, intravenous iron can be used to restore lost iron. We should consider other possible diagnoses, such as β thalassemia trait and anemia from a chronic diseases, if there is no response to iron supplementation.

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