HORMONAL INFLUENCES ON IRON METABOLISM IN WOMEN OF REPRODUCTIVE AGE

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Abstract. Iron metabolism in women of reproductive age is significantly influenced by hormonal factors. Estrogens, progesterone, and other hormones regulate iron homeostasis by affecting hepcidin expression, erythropoiesis, and intestinal iron absorption. Hormonal fluctuations during the menstrual cycle, pregnancy, and use of hormonal contraceptives contribute to variations in iron status and may predispose women to iron deficiency anemia. This review analyzes the current understanding of hormonal regulation of iron metabolism and its clinical implications. Special attention is given to the interaction between sex hormones and inflammatory pathways, which play a key role in anemia development. Understanding these mechanisms is essential for improving diagnostic accuracy and optimizing treatment strategies.

Keywords: iron metabolism; hormones; women of reproductive age; estrogen; progesterone; hepcidin; anemia

Introduction. Iron metabolism is a tightly regulated physiological process essential for oxygen transport, cellular respiration, and DNA synthesis. In

women of reproductive age, iron balance is particularly vulnerable due to physiological and hormonal factors [1].

Hormonal regulation plays a crucial role in maintaining iron homeostasis. Fluctuations in estrogen and progesterone levels during the menstrual cycle, as well as hormonal changes during pregnancy, significantly affect iron absorption, utilization, and storage [2]. These changes increase the risk of iron deficiency and anemia in this population.

Role of estrogen in iron metabolism. Estrogen is one of the key regulators of iron metabolism. It influences iron homeostasis by modulating the expression of hepcidin, a central hormone controlling systemic iron balance.

Studies have shown that estrogen suppresses hepcidin synthesis, thereby enhancing intestinal iron absorption and mobilization of iron from stores [3]. This mechanism is particularly important during periods of increased iron demand, such as pregnancy.

Additionally, estrogen has antioxidant properties that protect cells from oxidative stress induced by iron overload [4].

Progesterone and iron regulation. Progesterone also plays a role in iron metabolism, although its effects are less pronounced compared to estrogen. It is involved in regulating erythropoiesis and may indirectly influence iron utilization. During the luteal phase of the menstrual cycle, increased progesterone levels are associated with changes in iron metabolism and erythropoietic activity [5].

Menstrual cycle and iron balance. The menstrual cycle is a major determinant of iron status in women. Regular blood loss during menstruation leads to a continuous depletion of iron stores. Hormonal fluctuations throughout the cycle

influence both iron loss and absorption. Women with heavy menstrual bleeding are at particularly high risk of developing iron deficiency anemia [6].

Pregnancy and hormonal adaptations. Pregnancy is associated with profound hormonal changes that significantly impact iron metabolism. Increased levels of estrogen and progesterone, along with placental hormones, alter iron requirements and distribution.

Iron demand during pregnancy increases substantially due to: expansion of maternal blood volume, fetal growth and development, placental needs.

Hepcidin levels are typically suppressed during pregnancy to facilitate increased iron absorption [7,10].

Hormonal Contraceptives and Iron Status. Hormonal contraceptives influence iron metabolism by reducing menstrual blood loss and stabilizing hormonal fluctuations. Women using oral contraceptives often have higher hemoglobin and ferritin levels compared to non-users, which may reduce the risk of anemia [8,9].

Interaction between hormones and inflammation. Inflammation plays an important role in iron metabolism through the regulation of hepcidin. Pro-inflammatory cytokines increase hepcidin levels, leading to reduced iron availability. Hormones interact with inflammatory pathways, influencing the development of anemia, particularly anemia of chronic disease [11,12].

Clinical implications

Understanding hormonal influences on iron metabolism is essential for: accurate diagnosis of anemia, identification of high-risk groups, development of individualized treatment strategies, hormonal factors should be considered when evaluating iron status in women of reproductive age.

Discussion. Iron metabolism in women is a complex process influenced by multiple hormonal and physiological factors. Estrogen, progesterone, and other hormones regulate iron absorption, utilization, and storage. Hormonal fluctuations during the reproductive period create unique challenges in maintaining iron balance. This highlights the need for targeted prevention and treatment strategies.

Conclusion.Hormonal factors play a critical role in regulating iron metabolism in women of reproductive age. Their influence on hepcidin, erythropoiesis, and iron absorption contributes to the high prevalence of anemia in this population.

A better understanding of these mechanisms can improve diagnostic approaches and enhance treatment effectiveness.

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