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PHYSIOLOGICAL VARIATIONS IN BLOOD PARAMETERS AND FERRITIN ALONG THE COURSE OF THE PREGNANCY IN PREGNANT WOMEN IN RAMADI CITY

Waqar Abdul Rahim Obaid Al-Satouri &Muhammad Jassim Muhammad Al-Fahdawi.
Department of Chemistry, College of Science, Anbar University, IRAO.
Department of Biology, College of Science, Tikrit University, IRAO.
*Correspondent email: bil19s1012@uoanbar.edu.iq

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Abstract:

The study focused on pregnant women and their blood values as indicators of anaemia. Three groups comprised the women according to the three months of their pregnancy. Each team consisted of 20 pregnant women who underwent a blood smear and haemoglobin test, along with a patient and physical examination. The findings revealed that blood values such as Women with anemia exhibited decreases in Hb, Hct, MCV, MCH & MCHC during all three trimesters. However, in the second trimester, the values of these indicators in women with anaemia were higher than those during the first pregnancy. Additionally, The principles of blood indicators during the third pregnancy were lower as opposed to those during the second pregnancy. During pregnancy, the ferritin (SF) index tends to be lower than the average in the first trimester, while the iron index is usually lower in the second trimester than in the first. When comparing blood parameters such as Hb, Hct, MCV, MCH & MCHC between the first, second and third trimesters, the ferritin index values were lower than the second trimester in the third trimester. All parameters gradually decreased from the first to the third trimester. In contrast, white blood cells were higher in the third trimester than in the first and second trimesters, which were closer to average values. The third trimester is also known to have higher levels of ferritin deficiency and anaemia, which makes pregnant women more susceptible to urinary tract infections.

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Keywords: Physiological variations, Blood parameters, ferritin, pregnant women

INTRODUCTION

Globally, anaemia in the course of pregnancy is a significant issue of public health, negatively impacting the health of both mother and baby(1). During pregnancy, anaemia may arise, a condition where the concentration of haemoglobin (Hb) in the blood falls below 11g/dL at any point in the three trimesters. This is a crucial matter as hemoglobin is responsible for carrying oxygen to different parts of the body, including the growing fetus. The World Health Organization (WHO) has set this threshold for anemia in pregnancy to ensure that both the mother and the baby receive enough oxygen. It's essential to care for your health and regularly monitor your haemoglobin levels to prevent anaemia and ensure a healthy pregnancy(2). It's essential to keep an eye on your haemoglobin levels via pregnancy. The CDC (The Centers for Disease Control) observes that if your haemoglobin concentration wanes lower 11 g/dL in your initial trimester or less 10.5 g/dL in your second or third trimester, you may be experiencing anaemia. It's always best to consult with your healthcare provider if you have any concerns or questions about your pregnancy(3) In many countries where people don't have a lot of money. These more than half of women are expecting a baby have a condition called anaemia. In countries where people have more money, about one in ten pregnant women have this condition. Anaemia happens when someone doesn't have enough iron in their body(1). This is the main reason why around three-quarters of all pregnant women with anaemia don't have enough iron in their bodies (4). In developing countries, various challenges related to malnutrition and infections are often encountered, which can significantly impact their populations. Micronutrient insufficiencies, vitamin B12, vitamin A, and folic acid, among others, are among the prevalent causes of health issues. Additionally, parasitic diseases like hookworm and malaria, as well as prolonged illnesses such as TB disease and acquired immunodeficiency syndrome, are also major concerns. Addressing these complex issues requires a collaborative approach that involves education, healthcare access, and public policy interventions. By working together to find sustainable solutions, we can improve the health and well-being of individuals in these countries and promote long-term development(5-7). I can certainly help with that. It's important to note that during pregnancy, a decline in Hb concentration may occur due to physiological hemodilution if there is inadequate iron supplementation. MoreoverA sensitive measure of the body's iron reserves is ferritin. and is generally believed to be a trustworthy measure of a pregnant woman's iron status (8). When the pregnancy begins, it's common to observe a broader range of serum ferritin concentrations compared to corresponding Hb values, but don't worry; this is normal and nothing to be concerned about (9). The main protein in mammalian cells that stores iron, ferritin, is essential for maintaining cellular iron homeostasis. Because of its capacity to sequester iron, cells are shielded from increasing ferrous iron concentrations, which reduces oxidative cell damage. (10).

MATERIAL AND PROCEDURES

In this study conducted in Ramadi city, 120 pregnant women aged from 14 to 42 years old were chosen at random, and three groups were formed based on their trimesters of pregnancy. Each group had 20 pregnant women with weakness anaemia. Venous blood samples were collected from these women at different stages of pregnancy and ages. Samples were collected from various clinical facilities and hospitals located in the city of Ramadi, including Ramadi Teaching Hospital, Ramadi Women's and Children's Teaching Hospital, and a health centre in the Second sector of Ramadi, between January 1, 2023, and September

20, 2023. Hb levels were determined to identify pregnant patients with or without anaemia. Pregnant women's information was collected using a questionnaire, and each woman was assigned a glass tube containing an anti-clotting substance sized at 5 mL. Each woman's venous blood was drawn using disposable syringes, and the blood was divided into two parts. One component was put in a tube with an anticoagulant (EDTA). At the same time, in ntrast, the second portion was put in a tube without an anticoagulant, allowed to come to room temperature, and then centrifuged for ten minutes at a rate of three thousand cycles per minute. For biochemical experiments, the resultant serum was kept in Eppendorf tubes at a temperature of -20˚C.

Blood test measurement

1. 1. Hb (hemoglobin) concentration (g/dL).
2. Evaluate the red blood cells preparation (RBC) (106/mm3).
3. Determine the red blood cell that is packed volume percentage (PCV%) (Hct).
4. Find red blood cell volume (MCV) in fL.
5. Measure the haemoglobin weight (MCH) in grams.
6. Determine the average haemoglobin concentration (MCHC) in grams per deciliter.
7. Evaluate the difference in RDW (red blood cell size) (%) using calculation.
8. Determine the platelet count (103/mm3).
9. Compute the white blood cell count (109/L) in preparation.
10. During pregnancy, a general urine examination is conducted to monitor the health of the mother and fetus and establish their relationship.

B-Biochemical test measurement

Measurement of Ferritin serum (FS) level (ng/mL).

Statistical analysis

Statistic evaluation GraphPad Prism version 6 software was used to conduct the Fisher test; This served as a comparison sample in current study. Statistically significant P-values have been defined as those smaller than 0.05.

RESULTS AND DISCUSSION

During pregnancy, the physiology section divides the entire 40-week period into three phases, each of which is a trimester and lasts approximately 3 months. Beginning at 0–13 weeks, the first trimester, beginning on the initial day of the most recent menstrual cycle. During the course of a pregnancy, the second and third trimesters last, respectively, thirteen to twenty-six and forty weeks.

To identify patients with anaemia caused by iron deficiency and its stores, it is necessary first to select samples that exhibit low haemoglobin percentage and anaemia. By focusing on the ferritin percentage, clinicians can better understand the underlying causes of anaemia and devise appropriate treatment plans.

Studying RBC morphology during pregnancy can provide valuable insights into identifying anaemic women and the type of anaemia they have. This knowledge can help healthcare providers take necessary measures to improve the health of pregnant women and their babies. It is worth noting that microcytic and hypochromic anaemia are the most common types found during pregnancy.

The results of the present findings align with those reported with [11], wherein the concentration of haemoglobin (Hb) started to decline during the ten to twelve weeks of pregnancy due to an increase in blood plasma, resulting in anaemia. Furthermore, serum ferritin exhibited an apparent decrease between 12-24 weeks of pregnancy, indicating consumption of iron when the mass of the mother's red blood cells rises [12]. Additionally, saturation of transferrin showed an apparent decline in iron levels and RBC volume, indicating a decrease in iron status [13]. These results agree with [14] & [15] demonstrated that the first trimester's serum iron level (10.92 µmol/L) was lower than the second trimester's (68.2 µmol/L) in the African nation.

During the second trimester of pregnancy, the body undergoes physiological changes that can result in anaemia. This is because of the increased need for iron, which is required for the expansion of the blood plasma (estimated at around 50%) and the red blood cell mass (around 25%) [16]. As a result of the dilution of red blood cells, the haemoglobin levels may decline for up to 16 weeks but typically increase by 24 weeks, requiring more iron [17]. Expanding blood plasma also leads to a decrease in haemoglobin and Hct % levels [32]. When combined with low ferritin levels (below 15 ng/mL), this decline in Hb and Hct indicates iron deficiency anaemia during pregnancy [18].

In the third trimester of the course of pregnancy, the incidence of anaemia is due to a natural deficiency of iron in the body[19]. Anaemia can cause reduced oxygen transfer, leading to hypoxia[20]. The level of iron in the body can be depleted during this period despite taking iron supplements. By the third trimester's conclusion, blood volume increases by 40-45% above pregnancy levels[21]. Plasma volume and RBC increase, but there is a greater rise in volume of plasma (50%) [22].

Table 1: Comparative indicators of the blood & ferritin of anemia in pregnant women during the trimester

Parameters	*First Trimester of Pregnancy*	*Second trimester of Pregnancy*	*Third Trimester of Pregnancy*	***S.D.*[1]**
Hb (g/dL)	**10.5**	**9.8**	**9.5**	**0.40**
Hct (%)	**33**	**31.88**	**30.12**	**1.45**
MCV (fL)	**85,92**	**82.86**	**79.08**	**2.67**
MCH (pg)	**33.34**	**26.6**	**24.56**	**4.59**
MCHC (g/dL)	**28.76**	**30.05**	**28.77**	**0.74**
WBC ×109/L	**8.693**	**10.03**	**11.896**	**1.61**
SF(ng/mL)	**16.88**	**14.32**	**10.88**	**3.01**

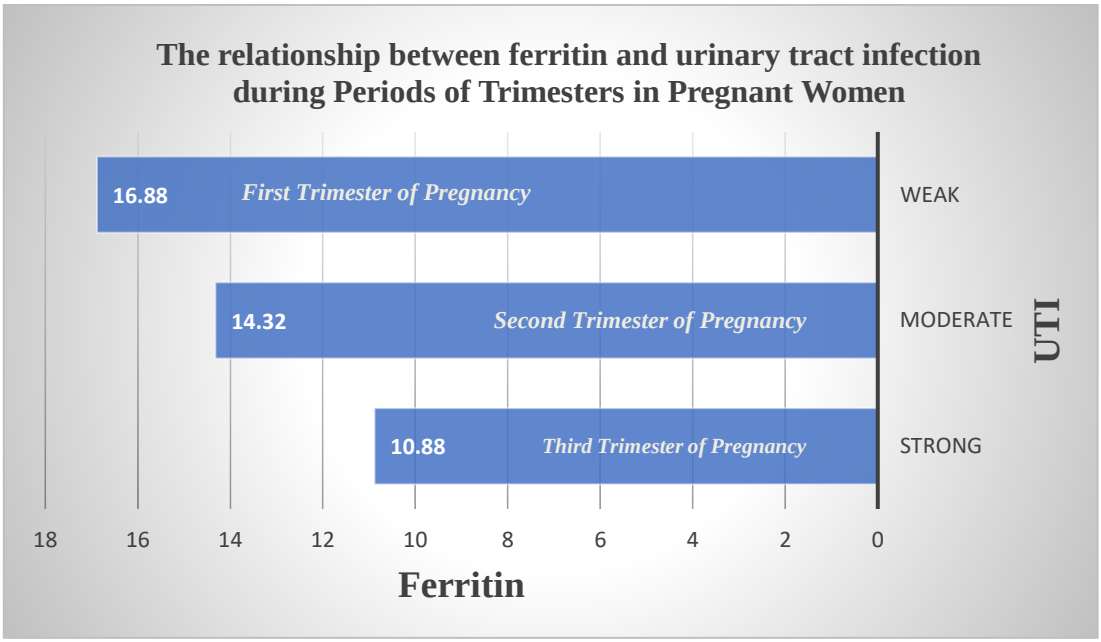
[1]Standard deviation.

The journey of pregnancy involves significant hormonal changes in a woman's body. During pregnancy, the levels of pregnancy hormones escalate, leading to changes in almost every body system. The endocrine system is not spared

from these changes, and the pituitary gland in expectant mothers increases by 135% compared to non pregnant ladies [23]. Furthermore, During pregnancy, increased protein binding affects most endocrine glands. Notably, hyperplasia of glandular tissue and increased vascularity cause the thyroid gland to enlarge, and the need for insulin increases. The placenta secretes the Female sex hormones: human gonadotropin, progesterone, and estrogen responsible for most physiological alterations during pregnancy[24].

During pregnancy, it is expected to experience an increase in white blood cells (leukocytosis) despite hemodilution. This is caused by the physical stress of pregnancy and an increase in inflammatory response, which results from the fetus's immunosuppression, immunomodulation, and selective immune tolerance [25]. Stress starts the process of hematopoietic cells and blood cell metabolism. [26]. Additionally, Pregnant women are known to have hemodilution, which can result in a drop in immunoglobulin levels. [27].

During the last trimester of pregnancy, urinary tract infections may cause anaemia due to a decrease in Ferritin, as shown in the chart below



The results showed agreement with [28], indicating that severe anaemia increases an infection's risk, especially during pregnancy especially in the urinary and reproductive systems. Anaemia due to a lack of iron is a significant issue in public health that leads to pregnancy-related morbidity and death. Urinary tract infections can be caused by anaemia, even in milder forms.

CONCLUSIONS

A comprehensive study is required to Examine the effects of folic acid and B12 vitamins on the body. On the process of erythropoiesis, which forms red blood cells during pregnancy. The study should focus on pregnant women at various phases of pregnancy and examine the key hormonal shifts connected to this time. Particular attention should be given to the different hormones, including Erythropoietin. The study should further aim to raise awareness among pregnant women about the risks associated with Iron- deficiency anaemia in pregnancy, including the increased risk of miscarriage. Adequate nutrition and family planning should also be promoted among expectant mothers. Additionally, the study should assess the levels of RBC Ferritin, protoporphyrin, and Pregnant women's transferrin receptors at various stages of pregnancy. Overall, this study will provide valuable insights into the physiological changes during pregnancy and support expecting mothers and their children's health and wellbeing.

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