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Assessment of Some Hematological parameters Hemoglobin, White Blood Cells, and Platelets among Pregnant Women at Al-jemail Hospital, Western Libya

Elayadi Daw Mabrouk Elabed [1 *], Siddig Bushra Mohamed [2],
Salih Abdelgadir Elmahdi Ahmed [3], Saeid Khalifa Sassi [4], Hussein Ali Khudheir Abood [5]
[1] Department of Health Nutrition, Faculty of Public Health-Al-jemail, Sabratha University, Libya
[2] Nursing Department, Faculty of Nursing Sciences, Zawia University, Libya
[3] Department of Medical Laboratories and Analysis, Faculty of Public Health-Al-jemail, Sabratha University, Libya
[4] General Department, Faculty of Public Health-Al-jemail, Sabratha University, Libya
[5] Department of Health Inspection and Control, Faculty of Public Health-Al-jemail, Sabratha University, Libya

تقييم بعض المعايير الدموية (الهيموجلوبين وخلايا الدم البيضاء والصفائح الدموية) لدى النساء الحوامل في مستشفى الجميل، غرب ليبيا

العيادي ضو المبروك العابد [1*]، صديق بشرى محمد [2]، صالح عبد القادر المهدي أحمد [3]،
سعيد خليفة ساسي [4]، حسين علي خضير عبود [5]
[1] قسم التغذية الصحية، كلية الصحة العامة - الجميل، جامعة صبراتة، ليبيا
[2] قسم التمريض العام، كلية التمريض، جامعة الزاوية، ليبيا
[3] قسم المختبرات والتحاليل الطبية، كلية الصحة العامة - الجميل، جامعة صبراتة، ليبيا
[4] القسم العام، كلية الصحة العامة - الجميل، جامعة صبراتة، ليبيا
[5] قسم التفتيش والرقابة الصحية، كلية الصحة العامة - الجميل، جامعة صبراتة، ليبيا

[*]Corresponding author: elayadi.alabed@sabu.edu.ly

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Abstract:
Background: Pregnancy causes physiological changes that aid in the fetus's growth and get the mother ready for delivery. These adjustments are required to enhance the mother's and fetus's health.
Objectives: The current study aims to evaluate the alterations in the level of hemoglobin, white blood cells, and platelets counts in pregnant women at Al-jemail Hospital. Libya.
Methodology: A questionnaire was used to collect data from 73 pregnant women between the ages of 18 and 41 who were involved in a descriptive-analytical study at Al-Jemail General Hospital. The Sysmex blood analyzer was used to determine the Complete Blood Count (CBC) assay.
Results: The study's findings demonstrated that pregnancy impacted blood components. Pregnant women's hemoglobin levels was insignificantly decreased p-vale (>0.050) at the means rate (10.19±1.37, 10.59±1.34, and 10.36±1.54) in 1st, 2nd, and 3rd trimesters of pregnancy, respectively. This resulted in reduction in hemoglobin levels that disseminated anemia and a higher rate of miscarriages among anemic women. To boost the immune system and get the body ready for delivery, the data also indicated that the rate of white blood cell count increased gradually across the trimesters of pregnancy and it is a significant difference p –value (0.000) at third trimester. To aid in the clotting process and prevent bleeding during delivery, also platelets progressively increased over time and also it is significant difference at second and third trimester p –vale (0.022, 0.001) respectively.

Conclusion: It can be concluded that anemia during pregnancy may cause complications for the fetus, such as miscarriage or childbirth. Early pregnancy and the high rate of white blood cell counts increase gradually as the months of pregnancy increased (stages of pregnancy). The platelets were gradually increasing, reaching the highest count in the third stage of pregnancy. Moreover, our study emphasizes the need to increase attention to the health awareness of pregnant women during this sensitive period for the health of the mother and the fetus about the various physiological effects on blood components that our study found.

Keywords: Pregnant women, Hemoglobin level, White Blood Cells Counts, Libya.

الملخص

الخلفية: يُسبب الحمل تغيرات فسيولوجية تُساعد في نمو الجنين وتجهيز الأم للولادة. هذه التعديلات مطلوبة لتعزيز صحة الأم والجنين.
الاهداف: تهدف الدراسة الحالية إلى تقييم التغيرات في مستوى الهيموغلوبين وخلايا الدم البيضاء والصفائح الدموية لدى النساء الحوامل في مستشفى الجميل، ليبيا.
المنهجية: استُخدم استبيان لجمع البيانات من 73 امرأة حامل تتراوح أعمارهن بين 18 و41 سنة، وقد شاركن في هذه الدراسة الوصفية التحليلية بمستشفى الجميل العام. استخدم جهاز تحليل الدم Sysmex لتحديد فحص تعداد الدم الكامل (CBC).
النتائج: أظهرت نتائج الدراسة أن الحمل له تأثير على مكونات الدم فقد انخفضت مستويات نسبة الهيموغلوبين لدى النساء الحوامل بشكل طفيف (0.050>) بمعدل متوسط (1.37 + 10.19 و 1.34 + 10.59 و 1.54 + 10.36) في الثلث الأول والثاني والثالث من الحمل على التوالي. وقد أدى ذلك إلى انخفاض مستويات الهيموغلوبين التي أدت لانتشار فقر الدم وارتفاع معدل الإجهاض بين النساء المصابات بفقر الدم. ولتعزيز جهاز المناعة وتجهيز الجسم للولادة، أشارت البيانات أيضًا إلى أن معدل عدد خلايا الدم البيضاء زاد تدريجيًا عبر الثلث الثالث من الحمل وأثبت فرق كبير في القيمة الاحتمالية (0.000>) في الثلث الثالث. وللمساعدة في عملية التخثر ومنع النزيف أثناء الولادة، كما زادت الصفائح الدموية تدريجيًا بمرور الوقت وهو أيضًا أثبت فرق كبير في القيمة الاحتمالية في الثلث الثاني والثالث من الحمل (0.022> ,0.001>) على التوالي.
الاستنتاج: ما تم استنتاجه من الدراسة، أن فقر الدم أثناء الحمل قد يسبب مضاعفات للجنين، مثل الإجهاض أو فى حالات الولادة. كما إن حالات الحمل المبكر وارتفاع معدل خلايا الدم البيضاء يزدادان تدريجيًا مع زيادة أشهر الحمل (مراحل الحمل). كانت الصفائح الدموية تتزايد تدريجيًا، لتصل إلى أعلى عدد لها في المرحلة الثالثة من الحمل. علاوة على ذلك، تؤكد دراستنا على ضرورة زيادة الاهتمام بالوعي الصحي للنساء الحوامل خلال هذه الفترة الحساسة لصحة الأم والجنين حول التأثيرات الفسيولوجية المختلفة على مكونات الدم التي أوجدتها الدراسة.

الكلمات المفتاحية: النساء الحوامل، مستوى الهيموغلوبين، عدد خلايا الدم البيضاء، ليبيا.

Introduction:

The term pregnancy refers to a state in which an ovum fertilized by a spermatozoon implants itself to the maternal uterus with subsequent development and growth into a fetus (WHO, 1992)[1]. Pregnancy is considered to last approximately 40 weeks (280 days) from the last menstrual period (LMP) or 38 weeks (266 days) from the date of conception. It starts with conception, the process of fertilization to form a zygote, and ends in childbirth, miscarriage or abortion. However a pregnancy is considered to have reached term between 38 and 42 weeks (Duvecot and Peters, 1994)[2].

A woman's pregnancy is a special time in her life that is marked by intricate hormonal and physiological changes. Pregnancy is both a normal and the most frequent physiological change that people experience. Following pregnancy, all bodily systems experience physiological changes that help the woman adjust to the pregnancy and support the development of the fetus (Ashish *et al.,* 2018). [3]

The hematological profile during pregnancy has an impact on pregnant ladies and the outcome of the pregnancy. The most common hematological indices are the indicators of hemoglobin concentration.[4] The occurrence of anemia is. low hemoglobin level concentration in the blood is characterized as a hematologic abnormality.[5] An anemic women tend to have severe pregnancy outcome. Anemia during pregnancy is the concentration of hemoglobin < 11.0 g/dL.[6] The alternation of miscarriages and low birth weight babies increases two- fold with low hemoglobin level in mother during pregnancy. It is also regarded as reason for lowered immunity of baby and mother which increases chances of infection among both.[7]

In pregnancy, The hemoglobin concentration falls by 1–2 g/dl owing to relatively less increase in mass of red blood cells as compared to plasma volume.[8,9] White blood cell (WBC) count raises significantly in pregnancy due to pregnancy induced physiological stress and to prevent infection. Neutrophils as granule leukocytes donate most to the overall higher white blood count. On the other hand, the platelet count falls drastically owing to hemo dilution, increased platelet activation and consumption, especially in the third trimester of pregnancy.[9,10]

Thrombocytopenia (low platelets) is another common hematologic abnormality after anemia during pregnancy affecting approximately 8–10% of pregnant ladies, None pregnant woman had complications related thrombocytopenia and none of their babies had been affected [11]. Preeclampsia, hemolysis, enhanced liver

enzymes, and idiopathic thrombocytopenic purpura (ITP) are quite common in pregnancy secondary to thrombocytopenia. There is great risk of maternal, neonatal and fetal mortality.[12,13,14] Considering this, we conducted the present descriptive analytical study to evaluate hematological profile (Hemoglobin, White Blood Cells and Platelet cells count) of pregnant women.

A drop in hemoglobin levels in the blood is known as anemia, and the threshold number varies depending on age, gender, and physiological state. One of the most important public health issues facing the world today is anemia. Iron deficiency, vitamin deficiencies, iron siphoning, viral and parasitic disorders are the most frequent causes of anemia. The inability of the bone marrow to produce enough red blood cells because of a lack of iron required to form hemoglobin results in iron deficiency anemia, which is characterized by the formation of small red blood cells with a small amount of hemoglobin and a decrease in the volume of blood that nourishes the cells (Azab *et al.* 2020) [15].

White blood cells are a component of blood and are released from the bone marrow. As members of the immune system, they boost the body's defenses against illness and infection and help keep the body healthy. It's usual to see an increase in white blood cells in a pregnant woman because blood cells also go through some alterations. Pregnancy-related stress and exhaustion might be the cause, but not necessarily (Kadas. AS, *et al*, 2020) [16].

After blood vessel damage, platelets are crucial for halting normal bleeding and minimizing blood loss. They increase more and more crucial during pregnancy in order to stop excessive bleeding during and just after childbirth. In order to accommodate the unique needs of pregnancy and promote the clotting condition, platelets go through a number of modifications. Even while platelets are more efficient in halting bleeding, changes in platelet function may potentially be linked to dangerous medical disorders. These disorders might be minor (like gestational thrombocytopenia) to severe like preeclampsia and idiopathic thrombocytopenic purpura, (Boothman, 2016)[17].

Materials and Methods:

In this descriptive analytical study was conducted at Al-jemail Hospital, western Libya, from march to July, 2024. A sum of seventy-three (73) pregnant women in age ranged 18 – 41 years were selected for this study, Demographic data which included (Gender, Age, etc.,) were collected by using structured questionnaire. And EDTA as anticoagulants was used to collect blood sample for determination of Complete Blood Count (CBC), Hemoglobin, White Blood Count, and Platelets count by using Clinical Hematology Analyzer.

Preliminary data:

The researchers relied on the descriptive analytical approach to suit the nature and objectives of the research. The necessary data were collected from the research community regarding the evaluation in question, and relied on this evaluation as a tool to collect data related to the research topic , and then codified and analyzed it using the Statistical Package for Social Sciences (SPSS) version 25 with the aim of reaching indicators and evidence that support the research project.

Secondary data:

It is represented in the data contained in previous scientific books, bulletins, periodicals and research studies related to the research topic under study, with the aim of benefiting and enriching the research topic scientifically. The medical analyses necessary to complete the research requirements included: Hemoglobin, White Blood Cell count, and Platelets Count determination.

Methodological Procedures:

In this chapter, we will discuss the identification of the approach that was taken in this project including the identification of the research community and the sample selected from it, the scientific methods that were followed during the data collection process, and the statistical methods that were used in the process of analyzing the collected data.

Statistical Analysis:

Data was analyzed by using Microsoft office excel and statistical package of social science (SPSS) version 25, The level of the p-value ≤ 0.05 was considered statistically significant.

Ethical consideration:

The ethical consideration approval was taken from the faculty of public health Al-jemail, Sabratha University, and verbal informed consent was taken from all participants before collection the sample and also information were used anonymously.

Results:

Table (1): The frequencies and percentages of sample numbers by age groups.

Age Group	Frequency	Percentage %
18-23	17	23.3 %
24-29	35	47.9 %
30-35	13	17.8 %
36-41	08	11.0 %
Total	73	100.0 %

Table (1) shows that the highest percentage according the age at pregnant women in the study sample was for women within the age group (24-29) at a rate of (47.9%).

Table (2): Comparison of means level of Hb between two groups of pregnant women (with mischarge and non-mischarge) by using student t' test:

Variables	No	Mean±SD	p-vale
Hb level with mischarge	54	10.16±1.38	0.878
Hb level with non-mischarge	19	10.93±1.28	
Total	73		

Table (2) shows that there is no significant difference of Hb level among mischarge and non mischarge.

Table (3) : Comparison of mean of Hb in different pregnant stages (1^{st}, 2^{nd}. 3^{rd} trimester) by using ANOVA analysis:

Variables	No	Mean ± SD	P-value
Hb concentration in phase- 1	15	10.36 ± 1.54	0.565
Hb concentration in phase- 2	25	10.59 ± 1.34	
Hb concentration in phase -3	33	10.19 ± 1.37	
Total	73		

Table (3): Shows that, it was found that the (P-value=0.565), which is more than (0.05), which means that there is no statistically significant differences between the mean of Hb concentration in different phases of pregnancy
Normal value of Hemoglobin in women = 11 – 14 g/dl

Table(4): shows a mean counts of White blood cells (WBC) during the different stages of pregnancy by sing ANOVA analysis.

	Variables	No	Mean ± SD cell /L	P-value
WBC	Phase -1	33	(7.32±211) x10^{9}	0.565
	Phase -2	25	(8.94±203) x 10^{9}	0.958
	Phase -3	15	(9.48±212) x10^{9}	0.000
Total		73		

Normal value of WBC = (4 – 10) x 10^{9}

Table (4) shows that the rate of white blood cell (WBC) counts was increase as the months of the 3 pregnancy stages increased and gives indication of highly significant (p-value 0.000)

Table (5): shows the comparison of mean counts of platelets (PLT) during the different stages of pregnancy by using ANOVA analysis.

	Variables	No	Mean±SD	p-value
PLT	Phase -1	33	241.820±64.420$^{x}10^{9}$	0.022
	Phase -2	25	249.600±51.940$^{x}10^{9}$	0.977
	Phase -3	15	254.440±70.110$^{x}10^{9}$	0.001
Total		73		

***Normal value of PLT= 150– 400 ^{x} 10^{9}/ L**

Table (5): shows that there is a significant difference in platelet counts (PLT) continues to increase at the second and third stage of pregnancy to reach (254.440, 249.600 with p-vale (0.001, 0.022), respectively, to help prepare the body for clotting and protect against bleeding during childbirth.

Discussion:

This was a descriptive analytical study, aimed to evaluate the Alterations of the Level of Hemoglobin, the count of White Blood Cells, and Platelets in Pregnant Women at Al-jemail Hospital, Western Libya, during the period from march to July 2024.

The research sample consisted of pregnant women of different ages and pregnancy periods, and their number was (73) women. It is clear from table (1) that the highest percentage of age group of pregnant women included in the study sample was for women within the age group (24-29) years scoring (47.9%), followed by women who are within the age group (18-23) years with a percentage of (23.3%).

Our findings revealed that there is no significant differences in hemoglobin rates in the two different groups (**with mischarge and non-mischarge**).

(p- value 0.878). The low Hemoglobin will increase risk of pregnant women that will affect on the fetus leading to abortion or premature birth.

In the three stages of pregnancy the hemoglobin was found low, although it was also lower than the lower limit of hemoglobin reference value. The rate of Hemoglobin level (HGB) is expected to fluctuate with the increase in the months of pregnancy (pregnancy stages) because hemoglobin represents the protein found in red blood cells and is responsible for transporting oxygen to all parts of the body as well as providing the necessary oxygen to the fetus, whose oxygen needs increase demands as the pregnancy stages developed (pregnancy months), which may cause a decrease in its levels to anemia in pregnant women, which may have serious health to the pregnant woman and the fetus, so we conclude from the previous table 2.

The average Hemoglobin (HGB) levels in the first pregnancy stage (the first three months) decreased than that of the lower normal range (11 – 14 g/dl). The low levels lead to anemia in pregnant women, which in turn leads to the body not getting enough oxygen, which affects the health of the mother and the fetus, and may cause early miscarriage. Previous study had reported, the reduction in hemoglobin concentrations are common findings during pregnancy and results from elevation in plasma volume

combined poor iron intake (Bashiri, *et al*. 2003)(18), (Ruchi *et al.* 2013)[19], (Mahmoud, *et al,* 2013)[11]. furthermore slight increase in the rate of Hemoglobin (HGB) levels in the second stage of pregnancy (second trimester) (10.59 g/dl) with a standard deviation (1.34 g/dl). This may be attributed to the increase in the volume of blood in the body for the purpose of providing the fetus with the necessary oxygen.

A slight decrease from the first stage of pregnancy in the rate of Hemoglobin (HGB) levels relative to the normal rate in the third stage of pregnancy (the last three months) that reached (10.36 g/dl) with a standard deviation (1.54 g/dl). This is due to the increase in the volume of blood plasma by a greater percentage than the increase in red blood cells, which may cause anemia in the pregnant woman and thus the body does not get enough oxygen, which affects the health of the mother and the fetus, which may cause premature birth. This result is consistent with a study of (Gebreweld A, *et al*, 2018) [20] and (Ekhegbesela .A *et al*, 2024) [21].

Our study found that , the rate of white blood cell (WBC) counts was increased in the three stages with the increase months of pregnancy (stages of pregnancy) due to the interaction of the immune system of the pregnant woman and to protect the fetus from any infection. On this basis the white blood cell (WBC) counts increased with significant difference (p-value 0.000) in the pregnancy (Third trimester) when compared with that of first trimester ($9.48^{x}10^{9}$, $7.32^{x}10^{9}$), respectively, with a standard deviation ($2.12^{x}10^{9}$, $2.11^{x}10^{9}$), respectively. in order to further enhance the immune response of the pregnant woman and it might attributed the level of WBC to increase the protection of the fetus from infection. In order to further enhance the immune response of the pregnant woman and the body's readiness for childbirth. This result is consistent with study (Yugo Ding *et al*, 2024) [22].

The study also found that platelet (PLT) count play an important role in pregnant women by being responsible for the process of clotting and the prevention of bleeding if we know that in pregnancy and during childbirth, the likelihood of bleeding increases, so it is important that platelet levels are within the normal range to ensure the prevention of excessive bleeding. Disorders of platelet levels may affect the fetus and cause the risk of fetal bleeding or internal fetal bleeding that may increase if platelet levels are excessively low. Accordingly, platelets are expected to increase during the various stages of (first, second and third trimester) of pregnancy. Increase the rate of platelet levels (PLT) in the second and third stage of pregnancy (the second and third trimester) was significantly difference p-value (0.002, 0.001) respectively, to reach ($249.600\ ^{x}10^{9}$) with a standard deviation (51.94) and ($254.44\ x10^{9}$) with standard deviation (70.11) from what it was in the first stage of pregnancy (the first trimester), which was ($241.820\ ^{x}\ 10^{9}$) and standard deviation (64.420) due to the association of this increase with hormonal changes and the increased needs of the fetus and uterus. The rate of platelet levels (PLT) continues to increase at the third stage of pregnancy to help prepare the body for clotting and protect against bleeding during childbirth. This result is consistent with study (Azab *et al,* 2020)[15] (Eledo, B.O *et al,* 2015) [23].

Conclusion:

It can be concluded that anemia during pregnancy may cause complications for the fetus, such as miscarriage or childbirth. Early pregnancy and the high rate of white blood cell counts increase gradually as the months of pregnancy increased (stages of pregnancy). The platelets were gradually increasing, reaching the highest count in the third stage of pregnancy. Moreover, our study emphasizes the need to increase attention to the health awareness of pregnant women during this sensitive period for the health of the mother and the fetus about the various physiological effects on blood components that our study found.

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