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The Role of Hematological Parameters in Different Trimesters of Pregnancy

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Abstract

Background:

During pregnancy, blood changes occur in order to meet the requirements of fetal and placental development, with significant changes in blood volume. The abnormal bloody appearance affects pregnancy and its outcome. This study aimed to assess the blood parameters of pregnant women in Thi- Qar Governorate .

Methods:

The samples was collected in Al-Furat Specialized Laboratory in Thi- Qar Governorate, Iraq, during the period from December 17, 2021 to the end of February 2022. The study included (90) pregnant women of different ages in the first, second and third trimesters of pregnancy. Pregnancy. Oral consent was obtained from each participant prior to participating in the study. They were given questionnaires for information such as age, address, duration of pregnancy and Folic A supplement. Samples of 5 ml of venous blood were collected by sterile disinfection technique and 2.5 ml of blood was placed in EDTATube.

Results:

There are a significant differences were shown in hematological parameters of 1st and 2nd trimesters, these variations were seen in Hb, WBCs, granulocyte and PCT levels under (p value $\leq$ 0.05). significant and highly significant differences in the WBCs and their components between pregnant of 1st and 3rd trimesters under (p value ≤ 0.05). WBCs and its related parameters showed high significant correlation between them and different trimesters, also the present study revealed significant and high significant correlation.

Conclusion:

In brief, hematological parameters are differ during different trimesters of pregnancy with low levels of hemoglobin and high WBCs and their components which differ significantly through different stages of pregnancy.

Introduction

CBC limits can vary depending on many prior analytical and physiological factors such as age, gender, level, ethnicity, nutritional status, lifestyle, biorhythm, medication or still pregnancy [1]. This latter variable is related to physical, physiological, biochemical and endocrine changes that affect various organs and frameworks. These advances are essential in helping a woman adapt to pregnancy and aid in the development and bearing of the fetus. The hematopoietic structure must be modified in various ways, such as the arrangement of nutrients and minerals for fetal hematopoiesis (iron, vitamin B12, folate erosion), which can nourish maternal impairment and drainage grounds during transport and require improved hemostasis capacity [2].

One of the main hematological changes for pregnant lady is physiologic sickness because of free and lopsided varieties of plasmatic volume (+ 40%) and corpuscular volume (+15%) [3]. The peculiarity of hemodilution further adds to a decrease in the pace of hematocrit (HCT) and hemoglobin (HGB), bringing about a misleading weakness. For pregnant lady, such a change is physiological and demonstrates the reception of an alternate edge for the meaning of the pregnancy iron deficiency. Concerning the hemoglobin and as per the Centers for Disease Control and avoidance (CDC) in the United States, the HGB should be lower than 11.0g/dL in first and third trimesters and lower than 10.5 g/dL in the second one [4]. For the WHO, the limit of frailty in pregnancy is a state where the complete circling HGB fixation is under 11g/dl; or HCT under 33% whenever of the pregnancy. [5] Likewise in (WBC) pregnancy is related with leukocytosis, basically connected with expanded dissemination of neutrophils. The neutrophil include starts to increment in the second month of pregnancy and levels in the second or third trimester, when the complete WBC counts range from 9,000 to 15,000 cells/miniature liter [6]. Gestational thrombocytopenia is experienced in 7-8% of all pregnancies. Platelet counts are marginally lower during pregnancy because of sped up obliteration prompting more youthful, bigger platelets. Most thrombocytopenia in pregnancy is expected to expanded destruction[7].

Material and Methods

The study was conducted in Al-Furat Specialized Laboratory in Dhi Qar Governorate, Iraq, during the period from December 17, 2021 to the end of February 2022. The study included ninety pregnant women of different ages in the first, second and third trimesters of pregnancy. Pregnancy. Oral consent was obtained from each participant prior to participating in the study. They were given questionnaires for information such as age, address, duration of pregnancy and Folic A supplement..

Serum sample preparation

Samples of 5 ml of venous blood were collected by sterile disinfection technique and 2.5 ml of blood was placed in EDTA Tube.

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Compete blood count (CBC)

This test was conducted by auto mated hematological analyzer (Mindray – China).

Statistical Analysis:

Statistical analysis was performed using computer software Statistical Package for the Social Sciences (SPSS)(25). analysis of variance was used to compare between pregnant women at all trimesters. The P value> 0.05 was considered statistically significant.

Results

There are a significant differences were shown in hematological parameters of 1st and 2nd trimesters, these variations were seen in Hb the mean value 1_{st} (11.1867±1.05102), 2_{nd} (10.4400±1.49380). WBCs 1_{st} (6.9233±2.12809), 2_{nd} (8.5433±2.55244), granulocyte 1^{st}(4.6400± 2.06040), 2_{nd} (6.1000±1.89099). levels under (p value ≤ 0.05).

Table (1) Comparison of the hematological parameters of the study in early trimesters

Blood components	Trimester	Mean ± SD	Sig. (p value ≤ 0.05)
Hb	1_{st} T	11.1867 ±1.05102	.029
	2_{nd} T	10.4400 ±1.49380	
MCV	1_{st} T	81.9867 ±9.41520	.906
	2_{nd} T	81.7233 ±7.64815	
MCH	1_{st} T	26.5700 ±3.55704	.935
	2_{nd} T	26.6400 ±3.02582	
MCHC	1_{st} T	324.3667 ±9.38996	.661
	2_{nd} T	325.5000 ±10.4839	
WBCs	1_{st} T	6.9233 ± 2.12809	.010
	2_{nd} T	8.5433 ±2.55244	
Lymphocyte	1_{st} T	1.7900 ±.53714	.376
	2_{nd} T	1.9367 ±.72325	
Granulocyte	1_{st} T	4.6400 ±2.06040	.006
	2_{nd} T	6.1000 ±1.89099	
mid	1_{st} T	.4033 ±.28465	.410
	2^{nd} T	.4667 ±.30551	
plat	1_{st} T	268.2333 ±76.3235	.675
	2_{nd} T	260.5000 ±65.4700	
MPV	1_{st} T	9.6000 ±1.07767	.520
	2_{nd} T	9.4333 ±.91060	
PDW	1_{st} T	16.0067 ±.38590	.547
	2_{nd} T	16.0633 ±.33783	
PCT	1_{st} T	2.5237 ±.68312	.460
	2_{nd} T	2.4020 ±.58040	

The results revealed a significant and highly significant differences in the WBCs 1_{st} (6.9233±2.12809), 3_{rd} (8.9467±2.01849). and their components between pregnant of 1st and 3rd trimesters under (p value ≤ 0.05) as shown in table (2).

Table (2) Comparison of the 1_{st} and 3_{rd} based on hematologic parameters

Parameters	Trimester	Mean ± S.D	Sig. (p value ≤ 0.05)
Hb	1_{st}	11.1867 ±1.05102	.134
	3_{rd}	10.7200 ±1.31527	
MCV	1_{st}	81.9867 ±9.41520	.317
	3_{rd}	79.7067 ±8.02818	
MCH	1_{st}	26.5700 ±3.55704	.391
	3_{rd}	32.9867 ±40.52916	
MCHC	1_{st}	324.3667 ±9.38996	.419
	3_{rd}	322.3333 ±9.94236	
WBCs	1_{st}	6.9233 ±2.12809	.0001
	3_{rd}	8.9467 ±2.01849	
Lymphocyte	1_{st}	1.7900 ± .53714	.018
	3_{rd}	2.2033 ±.76315	
Granulocyte	1_{st}	4.6400 ±2.06040	.0001
	3_{rd}	6.9767 ±1.78513	
Mid	1_{st}	.4033 ±.28465	.010
	3_{rd}	.5533 ±.11666	
Plat	1_{st}	268.2333 ±76.32358	.739
	3_{rd}	262.2333 ±61.91189	
MPV	1_{st}	9.6000 ±1.07767	.209
	3_{rd}	9.2733 ±.90704	
PDW	1_{st}	16.0067 ±.38590	.296
	3_{rd}	16.1167 ±.42189	
PCT	1_{st}	2.5237 ±.68312	.172
	3_{rd}	2.3173 ±.44723	

The results of table(3)showed a variation in the concentration of some hematological parameters in the mean differences in the pregnant women at the 1st and 3rd trimesters. Although, no differences under p ≤ 0.05 among levels of parameters.

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Table (3) Comparison of the 2_{st} and 3_{rd} trimesters based on blood count parameters

Parameters	Trimester	Mean ± S. D	Sig. (p value ≤ 0.05)
Hb	2.00	10.4400 ±1.49380	.444
	3.00	10.7200 ±1.31527	
MCV	2.00	81.7233 ± 7.64815	.323
	3.00	79.7067 ±8.02818	
MCH	2.00	26.6400 ±3.02582	.396
	3.00	32.9867 ±40.52916	
MCHC	2.00	325.500 ±10.48398	.235
	3.00	322.3333 ±9.94236	
WBCs	2.00	8.5433 ±2.55244	.500
	3.00	8.9467 ±2.01849	
Lymphocyte	2.00	1.9367 ±.72325	.170
	3.00	2.2033 ±.76315	
Granulocyte	2.00	6.1000 ±1.89099	.070
	3.00	6.9767 ±1.78513	
Mid	2.00	.4667 ± .30551	.152
	3.00	.5533 ±.11666	
Plat	2.00	260.5000 ±65.47005	.916
	3.00	262.2333 ±61.91189	
MPV	2.00	9.4333 ±.91060	.498
	3.00	9.2733 ±.90704	
PDW	2.00	16.0633 ±.33783	.591
	3.00	16.1167 ±.42189	
PCT	2.00	2.4020 ±.58040	.529
	3.00	2.3173 ±.44723	

WBCs and its related parameters showed high significant correlation between them and different trimesters under P value (0.05 and 0.01), also the present study revealed significant and high significant correlation between them as illustrated.

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Table (4) correlation regression of hematological parameters according to trimesters

		Trimester	Hb	MCV	MCH	MCHC	WBCs	Lymph	Granul	mid	plat	MPV	PDW
Hb	r	-.145-	1										
	p	.173											
MCV	r	-.112-	.539**	1									
	p	.294	.0001										
MCH	r	.112	-.025-	.081	1								
	p	.293	.815	.447									
MCHC	r	-.084-	.599**	.563**	.052	1							
	p	.431	.0001	.0001	.625								
WBCs	r	.348**	-.068-	.009	.211*	.132	1						
	p	.001	.522	.933	.046	.214							
ymphi	r	.244*	.027	-.146-	.142	.064	.477**	1					
	p	.020	.804	.169	.181	.548	.000						
ranul	r	.451**	-.042-	-.009-	.165	.145	.861**	.210*	1				
	p	.000	.697	.937	.120	.172	.000	.047					
mid	r	.241*	-.129-	-.189-	.026	-.087-	.530**	.309**	.492**	1			
	p	.022	.226	.075	.808	.414	.000	.003	.000				
plat	r	-.036-	-.066-	.339-**	.188	-.182-	.233*	.515**	.075	.249*	1		
	p	.733	.535	.001	.076	.086	.027	.000	.481	.018			
MPV	r	-.139-	.233*	.080	-.115-	.079	.096	-.114-	.133	.072-	.277-**		
	p	.192	.027	.454	.282	.459	.366	.285	.212	.501	.008		
PDW	r	.118	.254*	.386**	.004	.141	.028	-.309-**	.116	-.110	.510-**	.534**	1
	p	.267	.016	.000	.967	.185	.794	.003	.277	.300	.000	.000	
PCT	r	-.147-	-.051	.360-**	.134	-.220-*	.269*	.464**	.107	.217*	.895**	.043	-.402-**
	p	.168	.631	.000	.206	.037	.010	.000	.314	.040	.000	.690	.000
	N	90	90	90	90	90	90	90	90	90	90	90	90

Discussion

The results of the current study showed statistical differences in the first and second trimesters, and there are differences in the levels of hemoglobin, white blood cells and granulocytes. The difference in the level of hemoglobin in pregnant women is due to the decreasing in the blood concentration, and the additional need that the fetus requirement[8] In addition to, differences in the food habits and decrease in the food consuming due to the signs and symptoms of pregnancy. Also, decreases in the number of globules The red blood expressed by the value of (PCV) (%) is due to a discrepancy in the increase in blood fluids compared to the cellular components, but this disparity and difference does not cause a significant decrease unless accompanied by a real deficiency in the basic requirements for building red blood cells which leads then anemia occurs [9].

Anemia in pregnant women may cause osteoporosis in the future, due to anemia caused by iron deficiency in the body. Iron is the main component in hemoglobin.[10] An important factor that causes iron deficiency anemia is a lack of iron in the diet, which is necessary for the synthesis of hemoglobin [11].

In this study, it was noted that there is a difference in the levels of white blood cells and granulocytes, and the reason is due to the physiological stress caused by pregnancy.[12]

While granulocytes also showed significant differences under ($P < 0.05$), although there was a significant difference in white blood cell (WBC) count, so the observation of a significant difference in total WBC count is consistent with the studies of Osonuga et al.[13]

The results of the study showed that there were significant and high differences in white blood cells that are responsible for defending of the body during pregnancy, and the number of lymphocytes and granulocytes was high, and there were significant differences, and this is consistent with previous work done by Luppi [14]., which confirmed that the total lymphocyte count elevated in early pregnancy would remain elevated throughout pregnancy. This may be a result of the body building up fetal immunity and this is achieved through a state of selective immune in where the pregnant women was more exposure to different types of clinical disorders and infections with a variety of microbes due to weak immune response especially cell-mediated immune response during pregnancy.

Conclusion

In brief, hematological parameters are differ during different trimesters of pregnancy with low levels of hemoglobin and high WBCs and their components which differ significantly through different stages of pregnancy.

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