

Analysis of Hematological and Biochemical Parameters Alterations in Pregnant Subjects

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ABSTRACT

Background: Pregnancy triggers a series of physiological alterations that influence hematologic parameters, both directly and indirectly. Bleeding complications in pregnant individuals may arise from either inherited or acquired coagulopathies. Hence; the present study was conducted for analysis of hematological and biochemical parameters alterations in pregnant subjects.

Materials & Methods: Demographic information and drug history were obtained directly from the participants involved in the study. A blood sample of 5 mL was collected from each participant with minimal stasis from the antecubital vein, utilizing a dry, sterile disposable syringe and needle. The collected blood was transferred into tubes containing the anticoagulant ethylenediaminetetraacetic acid (EDTA). Each specimen was labeled with the participant's age and identification number. The EDTA samples were stored at room temperature until they were processed, which took place within four hours of collection. A complete blood count was subsequently conducted.

Results: A total of 200 subjects were evaluated. Among them, 55.5 percent were of second trimester while 27 percent were of third trimester. Mean Hb levels among subjects of first, second and third trimester was 12.1 g/dL, 10.9 g/dL and 10.1 g/dL respectively. Mean WBC count (x10⁹) among subjects of first, second and third trimester was 7.2, 7.6 and 8.5 respectively. Mean MCV levels among subjects of first, second and third trimester were found to be 80.33fL, 78.1fL and 72.6 fL

respectively. A statistically significant correlation was identified between packed cell volume and white blood cell count as gestational age increased. Conversely, no statistically significant relationship was observed between platelet count and advancing gestational age. Anemia was seen in 36 percent of the patients while thrombocytopenia was seen in 15 percent of the patients.

Conclusion: Pregnancy triggers various physiological alterations that influence hematologic parameters, both directly and indirectly. The identification and management of hematologic disorders arising during pregnancy present challenges due to the limited evidence available to inform healthcare professionals.

Key words: Hematological, Biochemical, Pregnant.

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INTRODUCTION

Pregnancy triggers a series of physiological alterations that influence hematologic parameters, both directly and indirectly. The identification and management of hematologic disorders arising during pregnancy pose significant challenges due to the limited evidence available to inform healthcare providers. Iron deficiency anemia is the most prevalent hematologic issue encountered and can be effectively managed with oral iron supplements; however, it is crucial to consider other potential causes of anemia, such as sickle cell disease.^{1,2}

Thrombocytopenia frequently prompts referrals to hematologists, necessitating a clear differentiation between gestational thrombocytopenia and conditions such as immune thrombocytopenia (ITP), preeclampsia, HELLP syndrome, or

thrombotic thrombocytopenic purpura (TTP), as treatment approaches vary considerably. In some cases, prompt identification of neonatal alloimmune thrombocytopenia (NAIT) is critical, as this condition can lead to severe, life-threatening hemorrhage in newborns.³

Bleeding complications in pregnant individuals may arise from either inherited or acquired coagulopathies. Acquired bleeding disorders typically manifest acutely during significant postpartum hemorrhage when interventions such as uterotonics or sutures are ineffective. Additionally, within 1 to 4 months post-delivery, acquired hemophilia may emerge due to the development of antibodies against specific coagulation factors. Women may also present with symptoms of previously undiagnosed bleeding

disorders during pregnancy and childbirth. The platelet (PLT) count tends to be somewhat reduced in pregnant women compared to their non-pregnant counterparts. Most research indicates that PLT levels at term are approximately 10% lower than those observed prior to pregnancy.^{1, 2}

While the majority of pregnant women maintain PLT levels within the normal range, those with borderline pre-pregnancy levels or significant reductions may experience counts that fall below this range. The underlying mechanisms are believed to involve dilution effects and the enhanced destruction of platelets as they traverse the often compromised trophoblast surface of the placenta. Additionally, PLT counts may be lower in women carrying twins compared to those with singleton pregnancies, potentially due to increased thrombin generation.³⁻⁵

Therefore, it is essential for consulting hematologists to consider this possibility when assessing women experiencing bleeding complications during pregnancy or in the postpartum period.⁶ Hence; the present study was conducted for analysis of hematological and biochemical parameters alterations in pregnant subjects.

MATERIALS & METHODS

A total of 200 pregnant subjects were evaluated. Pregnant women who gave informed consent and satisfied the study inclusion criterion (normotensive blood pressure < 140/90 mmHg) were recruited into the study. Demographic information and drug history were obtained directly from the participants involved in the study.

A blood sample of 5 mL was collected from each participant with minimal stasis from the antecubital vein, utilizing a dry, sterile disposable syringe and needle. The collected blood was transferred into tubes containing the anticoagulant ethylenediaminetetraacetic acid (EDTA). Each specimen was labeled with the participant's age and identification number. The EDTA samples were stored at room temperature until they were processed, which took place within four hours of collection. A complete blood count was subsequently conducted. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software.

RESULTS

A total of 200 subjects were evaluated. Among them, 55.5 percent were of second trimester while 27 percent were of third trimester. Mean Hb levels among subjects of first, second and third trimester were 12.1 g/dL, 10.9 g/dL and 10.1 g/dL respectively. Mean WBC count ($\times 10^9$) among subjects of first, second and third trimester was 7.2, 7.6 and 8.5 respectively. Mean MCV levels among subjects of first, second and third trimester were found to be 80.33fL, 78.1fL and 72.6 fL respectively. A statistically significant correlation was identified between packed cell volume and white blood cell count as gestational age increased. Conversely, no statistically significant relationship was observed between platelet count and advancing gestational age. Anemia was seen in 36 percent of patients while thrombocytopenia was seen in 15 percent of the patients.

Table 1: Distribution of patients according to trimester

Trimester	Number	Percentage
First	35	17.5
Second	111	55.5
Third	54	27
Total	200	100

Table 2: Hematological profile

Hematological profile	First trimester	Second trimester	Third trimester	Overall
Hb (g/dL)	12.1	10.9	10.1	10.8
WBC Count ($\times 10^9$)	7.2	7.6	8.5	7.9
Platelet count ($\times 10^9$)	232.3	221.8	201.9	2284
MCV (fL)	80.3	78.1	72.6	77.8
MCHC (g/dL)	36.9	34.2	30.9	35.8

DISCUSSION

The haematological profile of an individual serves as a significant indicator of their overall health status, as evidenced by numerous studies that have highlighted the haematological characteristics of pregnant women as critical factors influencing both pregnancy and its outcomes. Among the various haematological indices, haemoglobin concentration is frequently emphasized, with low haemoglobin levels, indicative of anaemia, being the most prevalent haematological disorder identified. This condition is linked to negative pregnancy outcomes. Anaemia in women is typically defined in two primary ways: either as a haemoglobin

concentration below 11.0 g/dl or as a value falling below the 5th percentile of the haemoglobin distribution or haematocrit levels in a healthy reference population, taking into account factors such as age, sex, and, specifically for pregnant women, the stage of pregnancy. The World Health Organization has recognized anaemia as a widespread and significant issue during pregnancy, underscoring the necessity for intervention.⁷⁻⁹

A total of 200 subjects were evaluated. Among them, 55.5 percent were of second trimester while 27 percent were of third trimester. Mean Hb levels among subjects of first, second and third trimester were 12.1 g/dL, 10.9 g/dL and 10.1 g/dL respectively. Mean WBC

count ($\times 10^9$) among subjects of first, second and third trimester was 7.2, 7.6 and 8.5 respectively. Mean MCV levels among subjects of first, second and third trimester were found to be 80.33fL, 78.1fL and 72.6 fL respectively. A statistically significant correlation was identified between packed cell volume and white blood cell count as gestational age increased. Conversely, no statistically significant relationship was observed between platelet count and advancing gestational age. James TR et al assessed 157 healthy primigravid women ages 15 to 25 and without anaemia, and who were recruited. The haemoglobin concentration, packed cell volume, mean cell volume, mean cell haemoglobin, mean cell haemoglobin concentration, white blood cell count, red blood cell count and platelet count were measured on samples of blood obtained from each consenting participant during each of the three trimesters. The results showed changes by trimester in all measured variables. For most of the indices the changes achieved levels of significance across trimesters. These changes were however in keeping with the expected physiological response in pregnancy and the values were similar to the published international norms. The findings suggested that the international norms for haematological indices in pregnancy are applicable across populations and to the pregnant Jamaican primigravid woman.¹⁰

Anemia was seen in 36 percent of patients while thrombocytopenia was seen in 15 percent of the patients. Shitie D et al determined level of anemia and other hematological profiles in pregnant women attending antenatal care clinic. Prevalence of anemia was 2.8% and that of thrombocytopenia was 10.2%. Out of the anemic pregnant mothers, 5 (62.5%) were mildly anemic and 2 (25%) were severely anemic. The factor age < 20 years of mothers was significantly associated with anemia ($P < 0.05$). In addition, the occurrence of anemia in mothers who visited antenatal clinic two times is two times higher than those mothers who visited the antenatal clinic three times. Moreover, the prevalence of anemia is two times more likely to occur in pregnant mothers who did not take iron supplements as compared to their counter parts. According to pregnancy periods; the mean white blood cells count was $(8.48 \pm 3.09, 8.83 \pm 2.73, 8.86 \pm 2.67) \times 10^9/L$ for the first, second and third trimesters, respectively. Red blood cells and platelet counts in the first trimester were significantly higher than their corresponding values in third trimester ($P < 0.01$), whereas mean hemoglobin and hematocrit values were not statistically significant within trimesters ($P > 0.05$).¹¹

CONCLUSION

Pregnancy triggers various physiological alterations that influence hematologic parameters, both directly and indirectly. The identification and management of hematologic disorders arising during pregnancy present challenges due to the limited evidence available to inform healthcare professionals.

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