

## COMPARATIVE EVALUATION OF THROMBOCYTE COUNT BY PERIPHERAL SMEAR AND AUTOMATED CELL COUNTER IN PREGNANT WOMEN

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### ABSTRACT

**Background:** Platelet count plays a crucial role in the diagnostic evaluation of pregnant women. The determination of platelet count is conventionally performed using automated methods. However, the availability of automated cell counters in all healthcare facilities, particularly in rural areas, is limited. Alternatively, platelet count estimation can be achieved through the examination of peripheral smears, which can be readily performed in any healthcare setting. The primary objective of this study was to compare platelet estimation using the peripheral smear method with the automated method.

**Material and Methods:** Platelet estimation was conducted in a group of 100 normal pregnant women using both stained peripheral smears and the automated method. Platelet counts were reported as Mean  $\pm$  SD, and statistical analysis was performed using the student's t-test.

**Results:** The platelet counts obtained through the peripheral smear and automated method was  $2.73 \pm 0.68$  lacs /mm<sup>3</sup> and  $2.62 \pm 0.71$  lacs /mm<sup>3</sup>, respectively, with a p-value of 0.4.

**Conclusion:** The findings of this study demonstrate that there was no significant difference between the two methods of platelet estimation. Therefore, it can be concluded that the peripheral smear method is comparable to the automated method in determining platelet counts.

**Key words:** Pregnancy, Platelet Count, Peripheral Smear, Automated method.

### INTRODUCTION

Platelet count is routinely recommended for pregnant women as a standard practice. Over the past two decades, the prevalence of thrombocytopenia, a condition characterized by a low platelet count, has increased in pregnant women due to the inclusion of platelet counts in automated blood cell counters [1]. Various factors can contribute to thrombocytopenia during pregnancy, with gestational thrombocytopenia and pregnancy-induced hypertension (PIH) being the most common causes. The severity of the disease correlates with the degree of thrombocytopenia [2]. Maternal and fetal morbidity and mortality rates tend to be higher with lower platelet counts [3].

Platelet count can be determined either through manual methods or automated analyzers. Manual methods encompass traditional techniques such as heamo cytometry and stained peripheral smear method. An

alternative method involves calculating the average number of platelets per oil immersion field (OIF), multiplying it by the patient's hemoglobin concentration in g/dl, and then further multiplying it by 1000 to estimate the platelet count per microliter [4]. Despite the accuracy and sophistication of automated cell counters, their availability in hospitals, particularly in rural areas, remains limited. This constraint poses challenges to conducting routine platelet counts as part of regular antenatal checkups in rural settings. However, one viable manual method that can be performed with minimal equipment is the stained peripheral smear method. Thus, the aim of this study was to compare the results of platelet counts obtained through these two methods to determine if any differences exist.

**MATERIAL & METHODS**

For this study, a total of 100 pregnant women in their second trimester, who did not have a history of hypertension or any other systemic disorders known to affect platelet count, were selected as participants. Prior to inclusion, the subjects underwent a thorough clinical examination. Capillary blood samples were collected with utmost aseptic precautions, and smears were immediately prepared and stained using Leishman's stain according to standard protocols. The counting of platelets was conducted by observing 10 oil immersion fields [5-7]. The obtained average number of platelets was then multiplied by 20,000, and the resulting value was expressed as platelet count in lacs/mm<sup>3</sup>.

The collected data were presented as mean ± SD. To compare the results obtained from the two methods (stained peripheral smear and automated method), a Student's t-test was employed. Statistical significance was defined as a p-value less than 0.05

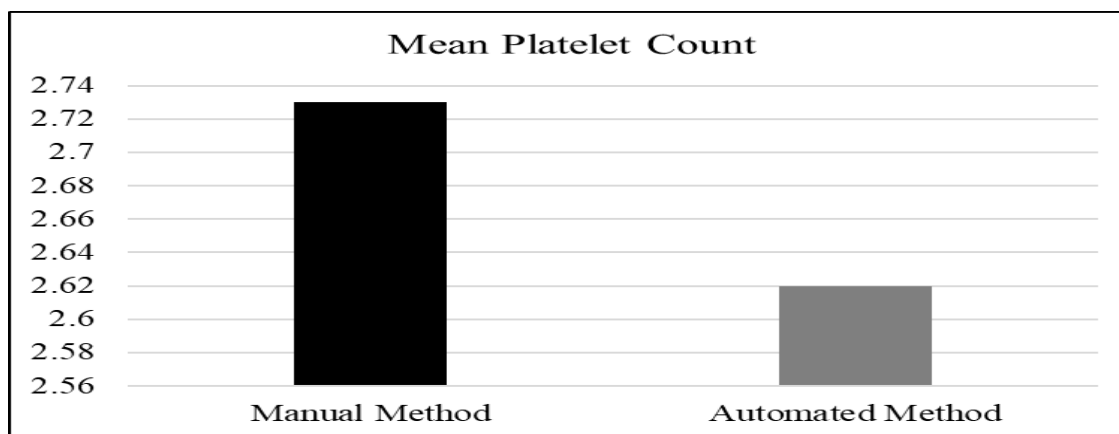
**RESULTS**

Platelet count by peripheral smear method was 2.73 ± 0.68 lacs/mm<sup>3</sup> and by automated method was 2.62 ± 0.71 lacs/mm<sup>3</sup> with p value of 0.45 (Table 1 and figure 1). There was no statistically significant difference between two methods.

**Table 1: Comparison of Platelet Count by the Two Methods**

Parameter	Manual Method	Automated Method	P-value
Platelet Estimation	2.73 ± 0.68	2.62 ± 0.71	0.45

**Figure 1: Comparison of Mean Platelet Count by the Two Methods**



## DISCUSSION

This study aimed to compare platelet estimation using the peripheral smear method and the automated method. The findings indicated that there was no statistically significant difference between the two methods. Therefore, the results suggest that platelet estimation through the peripheral smear method is a simple, reliable, rapid, and cost-effective approach that can be performed even in rural healthcare settings lacking well-equipped laboratories. This method can assist in assessing disease severity and early diagnosis of thrombocytopenia, enabling timely referral of patients to higher-level healthcare facilities for management.

Gestational thrombocytopenia, a common benign disorder, is the most frequently observed numeric platelet deficiency in obstetrics. The second most frequent thrombocytopenia type is associated with HELLP syndrome, a severe form of pre-eclampsia [8]. Hypertensive disorders account for 21% of thrombocytopenia cases. Thrombocytopenia occurs more commonly in patients with eclampsia (30%) compared to those with mild and severe forms of pre-eclampsia (15%-18%). Among patients with severe pre-eclampsia, 4% to 12% will meet the criteria for HELLP syndrome, characterized by hemolysis, elevated liver enzymes, and low platelet counts [9]. Thrombocytopenia is also linked to a higher incidence of preterm delivery and intrauterine growth retardation. It has been concluded that thrombocytopenia is an independent and significant risk factor for maternal and perinatal complications in pregnancy-induced hypertension [10].

A study on platelet function variation in pregnancy-induced hypertension and gestational diabetes mellitus revealed enhanced platelet activity in these conditions, indicating a potential role in their pathogenesis and development [11].

Thrombocytopenia is an important diagnostic criterion for pre-eclampsia. A platelet count below  $100 \times 10^3/\text{mm}^3$  is an indication for delivery in cases of pre-eclampsia [12]. Therefore, platelet count becomes a crucial diagnostic tool for assessing maternal and fetal well-being.

While automated hematology analyzers are accurate, obtaining an accurate platelet count may be challenging due to factors such as similar-sized particles, light scatter properties, giant platelets, platelet clumps, and other factors [16, 17]. Thus, even the most advanced analyzers do not replace human judgment, and microscopic evaluation of peripheral blood films remains essential [18].

Although platelet count is a routine laboratory test, the validation of estimation techniques has not been extensively explored. Manual platelet enumeration using a counting chamber is considered the reference method but is time-consuming and requires a phase-contrast microscope, which is not always available in routine laboratories. Furthermore, there is a significant risk of error, estimated at 10-20% by some researchers [20]. Studies have proposed alternative methods, such as estimating platelet count based on the red cell: platelet ratio, which showed good precision and faster results [19]. Another study compared two manual platelet count estimation methodologies using peripheral blood smears, and found that the traditional estimation method showed better agreement with automated counts compared to the alternate estimation method [21, 22].

The estimation of platelet count using the peripheral smear method, which can be performed with minimal tools such as a microscope, glass slides, and Leishman's stain, proves to be valuable for early screening of pregnant women. This can help prevent complications by enabling early management or referral to tertiary care centers, thus reducing maternal and fetal morbidity and mortality. It can be a useful test in preventing complications associated with pregnancy-induced hypertension, such as HELLP syndrome and disseminated intravascular coagulation (DIC) [13-15].

## CONCLUSION

The results of this study indicate that platelet estimation using the peripheral smear method is a reliable, rapid, easy, and cost-effective approach. It can be performed even in rural healthcare settings and serves as an effective means for early diagnosis of thrombocytopenia during pregnancy. Importantly, the findings demonstrate that the peripheral smear method is equivalent to the automated method in terms of accuracy and reliability. Therefore, the peripheral smear method can be considered as a suitable alternative for platelet estimation, offering valuable diagnostic capabilities for identifying thrombocytopenia in a timely manner during pregnancy.

**Conflicts of interest:** none

**Source of funding:** none

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