ORIGINAL RESEARCH PAPER

Volume-7 | Issue-5 | May-2018 | PRINT ISSN No 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

AUTOMATED VERSUS MANUAL ESTIMATION OF PLATELET COUNT

Hematology

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ABSTRACT

Objective: To compare the results of platelet count done by peripheral smear method and by automated cell counter.

Material and Methods: This cross sectional study was conducted in the hematology laboratory of police Hospital Jammu, J & K for the period of two months (February to March 2018). 100 random samples were processed by the automated method (Rayto Haemarray 83) and the manual method (leishman's stained thin blood films) simultaneously.

Results: The mean platelet count estimated by the manual method was 208.2 ±100.9× 10^9/L, while that estimated by the automated method was 206.5 ± 106.0 × 10^9/L, with no significant statistical difference between both means (p>0.05). The Pearson correlation test showed significant positive correlation between both methods (r: 0.904), this correlation remained significant when the samples of normal count by the two methods were correlated (r: 0.890), but it was insignificant negative correlation when the samples of low or high counts by the two methods were correlated (r: -0.096 and r: -0.239) respectively.

Conclusion: Platelet estimate is an important step in assessment of platelet count and it should be done for every sample of platelet count, especially when the count is lower or higher than normal by any method.

KEYWORDS

platelet count, Manual method, Automated method.

INTRODUCTION

Platelet count estimation is an important element of the diagnostic and treatment process in many disorders. In patients with thrombocytopenia, especially when platelet transfusion is considered, the reliability of platelet estimation is essential to make clinical decisions[1]. Before the widespread use of automated counters, manual platelet count was done. The manual count is the oldest means of counting platelets and remarkably, is still used as the gold standard international Reference method[2]. Beside manual estimation of platelet count, blood film evaluation provides additional assessment of platelet size, shape, granulation and analysis of phenomena such as aggregation or platelet satellitism. Automation has afforded high precision and accuracy for platelet counting in normal individuals. Automated method is less useful in thrombocytopenic or other patients in whom other small particles could generate electrical or optical signals that are similar to platelets, eg. debris and red cell fragments[3,4,5]. Presence of large platelets beyond the upper threshold may leads to under estimation of platelet count. The present study aimed to compare the results of the automated with the manual method of platelet count.

MATERIALAND METHODS

This cross sectional study was conducted in the hematology laboratory of police Hospital Jammu, J & K for the period of two months (February to March 2018). The randomly selected specimens were 100 blood specimens in EDTA anticoagulant Vacutainer tubes of patients presenting to the hematology laboratory with any diagnosis during the study period. Age and gender of the patients were taken from the lab requests without meeting the patients .The study was dealing with blood samples from the lab. All the obtained data were handled confidentially, instead of reporting the name of patients, each sample was given a unique numeric identifier. Samples were processed by the automated counter using the Rayto haemarray 83 and manually by the thin blood film, stained with Leishman's stain. Data processing was performed by the Statistical Program (SPSS18). Data were tested by the student t-test for two means and the hypothesis test for two proportions. Simple regression analysis and coefficient of determination (r) for correlation analysis between the two methods was used .All tests were applied at a level of significance (α=0.05). P-values of ≤0.05 were considered as statistically significant.

RESULTS

The manual method for performing platelet count estimates on blood smears gives estimates that are not significantly different from the counts by the automated method on the Haemarray 83 automated counter for the whole samples (r=0.904, p<0.001) (Figure 1). About 26 samples from the studied 100 samples were found with low count by either method, by the manual method they were 25 samples while 1 sample with normal count showed low count by the automated counter. By the automated method, 22 samples showed low count, while 4 samples with normal count showed low count by the Manual method (Table 1). About 7 samples showed high platelet count by either method, 3 samples were missed by the automated method, and 2 samples were missed by the manual method (Table 1). Statistically, there is no significant difference between the number of samples estimated with low count, high count or with normal count by the two methods (p>0.05) (Table 1).

Table 1. Variation of platelet count estimated by automated versus manual method

Platelet count (×109/L)	Proved samples (n=100)	Manual method (n=100)*	Automated method (n=100)**	Statistical inference (Chi-square method)
Low count (<150)	26	25	22	p=0.73
Normal count (150-450)	67	67	67	–
High count (>450)	7	5	4	p=0.73

* 3 samples were missed and not detected by the method.
** 7 samples were missed and not detected by the method.

When the correlation test was applied for the 67 samples with normal count by both methods, there is positive correlation between the result of both methods (r=0.890, p<0.0001 (Figure 2).

When the correlation test was applied for the 26 samples with low count by either method, there is negative correlation between the result of both methods (r=-0.096, p=0.64) (Figure 3).

When the correlation test was applied for the 7 samples with high count by either method, there is negative correlation between the result of both methods (r=-0.239, p=0.60) (Figure 4).

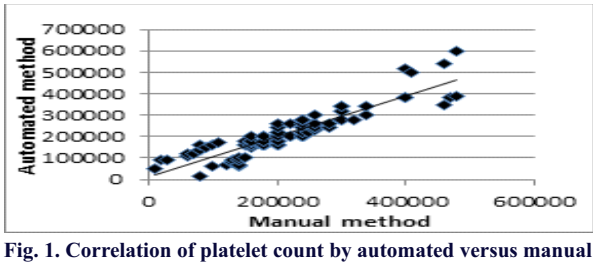

Fig. 1. Correlation of platelet count by automated versus manual method (n=100)

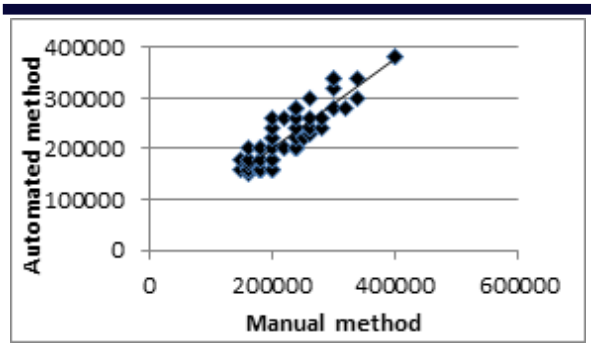

Fig. 2. Correlation of normal platelet count by automated versus manual method (n=67)

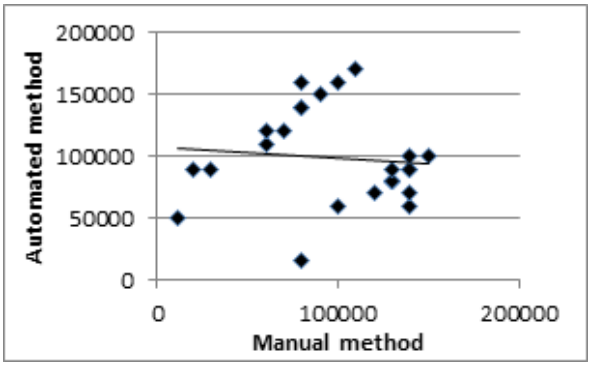

Fig. 3. Correlation of low platelet count by automated versus manual method (n=26)

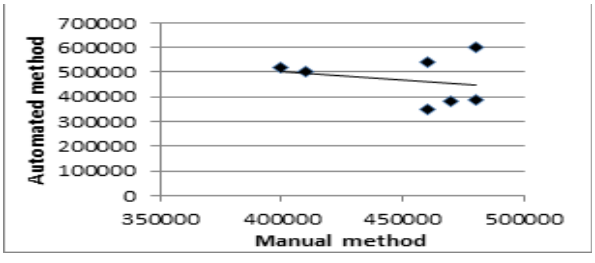

Fig. 4. Correlation of high platelet count by automated versus manual method (n=7)

DISCUSSION

The studied samples represented patients who are complaining of various diseases, which may or may not affect platelet count. The mean platelet count estimated by the manual method and the automated method for all the studied samples (n=100) did not show significant statistical difference (p=0.90). This means that both methods can be used to count platelets without producing a significant difference in results. When all the samples were analyzed by the Pearson correlation test, we observed significant positive correlation between the result of both methods (r=0. 904). But when we correlated between low count samples alone as well as high count samples alone, the Pearson correlation test showed negative correlations (r: -0.096, r: -0.239) respectively.

The presence of high number of samples with normal count (67 samples) dominates in the correlation of all sample and yields positive correlation. Samples of low count (26 samples) or those of high count (7 samples) may not be enough to show such positive correlation, and so we cannot rely on either method alone once there is suspicion of low or high count and the performance of platelet estimate is mandatory in such situations.

In their study Webb et al[6] reviewed 35 samples with normal, low, high platelet counts. They compared the smear assessment with the automated counter results. There was fair concordance in 27 specimens. In three specimens underestimation was found, overestimation in five. A cross-sectional study conducted in National centre for public Health Laboratories of Aden Yemen, Bakhubaira[7] found that the mean platelet count estimated by manual method was not significantly different from that estimated by the electronic method, which is similar to our study.

In another study by Oliveira et al[8] suggested, a platelet count below 30,000/ul obtained in automated counters, should be confirmed by reference manual method.

Manual platelet estimation using various methods in severe thrombocytopenia cases is more accurate compared to automated methods. To get an accurate platelet count by the use of an automated hematology analyzer may be complicated by the presence of particles of similar size and/or light scatter properties (microcytic red cells, white blood cell fragments) and by giant platelets and platelet clumps or aggregates[9]. The only "Gold Standard" in platelet counting available to assess any degree of accuracy of the automated count has been the manual phase-contrast microscopic method[2].

CONCLUSION

The mean platelets count estimated by the manual method was not significantly differing from that estimated by the electronic method. Platelet estimate is an important step in assessment of platelet count and it should be done for every sample of platelet count, especially when the count is lower or higher than normal by any method.

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