Comparison between manual procedure and automated for determinant of WBCs and PCV in maternity and labor hospital in Karbala city

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Introduction

Automated method for the estimation of complete blood count (white blood cells, hematocrit and hemoglobin etc.) is commonly used in routine practice laboratory but many other labs still work on manual procedure for the abnormal automated results as well as health care workers in the laboratory can be optimized by doing test on manual microscopic procedure as validation technique for automated method. In the recent past, huge progress in automated analysis for hematologic examination has occurred. No automated cell counter can equal the performance of manual differentiation for the presence of old results for leukocyte. White blood cells (WBCs), also called leukocytes or leucocytes, are the cells of the immune system that are involved in protecting the body against both infectious disease and foreign invaders. Automated systems for white blood cell recognition are currently available in the market. The importance of traceability in the medical diagnostics market is increasing. A technique that can make a determination from a microscope slide (or from a set of images) has the advantage that the data from which a diagnosis is made can be kept on file for future quality assurance needs.

Hematocrit is a test that measures the percentage of blood that is comprised of red blood cell. This is often referred to as packed cell volume (PCV) or erythrocyte volume fraction. It is considered as an integral part of a person’s complete blood count, along with hemoglobin concentration, white blood cell count and platelet counts. In Ethiopia, hematocrit is one of the most common parameters from complete blood count used as a routine examination by physicians in any parts of the country where automated method are unavailable, microhematocrit procedure is used to evaluate HCT value of patients.

Materials and Methods

A comparative cross sectional study was conducted from 28 December 2015 to 28 January 2016 to assess the analytical performance between manual procedure and automated methods for hematocrit and white blood cells determination for EDTA blood sample by Sysmex XP-300™ Automated Hematology Analyzer for a clinic sample laboratory or research testing. It provides 17 reportable parameters and three part differential, which include an absolute neutrophil count (ANC), the results in histograms for WBC, RBC, and Platelet (PLT). Venous blood was obtained from the patients admitted to maternity and labor hospital in Karbala city during study period. The study sample size was 52. About 2–3 ml of blood from the vein of selected patients was collected in a tube containing EDTA anticoagulant. The percentage of packed cell volume was measured manually by filling a capillary tube (plain) and sealing with modeling clay and centrifuging at 3000 g for 5 minutes, then the result was read using hematocrit reader. Also WBC counting was done manually using chamber counter after adding blood (20 µl) to tube containing glacial acetic acid (0.4 ml), and then calculated WBC by equation summation of two parts of chamber and multiplied by 100. The result was obtained from Sysmex XP-300™ analyzer. The WBC and PCV values for both method registered were analysed by SPSS version 23 as a Pearson correlation co-efficient. Precision was determined using coefficient of variation and the significance of value was decided based on the P-value [0.05] at 95% confidence.

Results

The results in Figure 1 show a strong correlation between WBC value in automated Sysmex XP-300™ and manual results. At the same time, the relationship between the two methods is extrusive, the value of correlation is +0.95.

In the scatter plot chart in Figure 2 shows the correlation of result Packed cell volume in both methods manual and automated procedure. This value is +0.95.

A comparison of automated and manual method to determine the hematocrit for 52 patients is shown by mean ± SD in Table 1.
obtained, as the mean difference between both methods is significant \( (P < 0.001) \), as observed in other studies. A study undertaken in Nigeria, using Sysmex KX-21N, revealed statistically significant difference \( (P < 0.0001) \) when the mean and SE values of the two methods (automation and manual) were compared. In another study conducted on canine and feline, there were significant differences between manual and automated HCT \( (P < 0.05) \). The results of these studies also indicated that the HCT values from the automated method could not be used to substitute for those of the manual method, though the values of the two methods were accurate and precise. Unlike to this study which reported higher value of HCT in manual method, another study reported a higher PCV value from Coulter automated analyzer, even though there was no significant association observed. Also there was a correlation coefficient in result of hematocrit with both methods Fig. 2.

In Table 2, a comparison of automated and manual method to determine the white blood cells for 52 patients is shown by mean ± SD. The correlation coefficients for relationships between the manual and automated (Sysmex XP-300™) was calculated using Pearsons correlation coefficient formula, which was \( R = 0.95 \). The correlation coefficient \( (R = 0.95) \) indicated the strong positive correlation between manual and automated methods to determine the hematocrit and White Blood Cell. The mean ± SD of HCT result by the manual method is 41.6 ± 5.1, whereas the automated method is 34.5 ± 4.9. The mean ± SD of WBC result by manual method is 9.0 ± 3.4, whereas in automated method is 9.9 ± 3.5. This implicated that the manual and automated for both tests WBC and PCV were significantly different \( (P < 0.001) \) which is less than 0.05 at 95% of confidence interval.

**Discussion**

Automated peripheral blood, leukocyte counts are widely accepted in routine practice. However, many laboratories still reflexively perform manual CBC solely based on abnormal automated results or instruments “flags”, before any manual triage step, to established manual procedure for quality control. This study indicated that manual HCT is higher than the automated HCT. It shows that the hematocrit values determined by the autohematological analyzer (Sysmex XP-300™) cannot replace the manual (microhematocrit) results.
References

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