

6-Parts Haematology Parameters Evaluation Using Abbott Alinity H

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Abstract

Nowadays, there are varieties of automated haematology analysers available in the market. However, the new product of diagnostic equipment should be evaluated and validated to ensure their capability. Thorough process of testing on all new haematology analysers must be performed to certify that reliable result will be released and for patient safety. This study was carried out to evaluate automated haematology analysers; Abbott Alinity H, in the Hospital Universiti Sains Malaysia setting. Blood samples send for complete blood count were selected randomly (n = 50) from healthy subjects and those who have different blood disorders. Blood specimens and quality control materials were analysed on the Abbott Alinity H to evaluate the precision. For correlation, the Sysmex XN-1000 was used as the comparative method. The study showed very good correlation between Abbott Alinity H and Sysmex, XN-1000 in the parameters such as white blood cell (WBC), red blood cell (RBC), hemoglobin (HGB), mean cell volume (MCV), platelet (PLT), neutrophil (NEU), lymphocyte (LYM), monocyte (MONO), eosinophil (EOS), and basophil (BASO). For the precision, all the parameters are performed well within allowable limits of performance for Abbott Alinity H. In conclusion, the Abbott Alinity H demonstrated an acceptable performance in term of precision and the analyser was equivalent with the Sysmex XN-1000.

Keywords

Abbott Alinity H; Sysmex XN-1000; Automated Haematology

Introduction

The automation in haematology has been routinely recognised and substituting the manual methods. It is because of the benefits by automated analyser in term of precision, accuracy and reduction in sample turnover time are much better as compared to manual methods. Therefore, the number of automated haematology analyzers is keep rising in the market today ^[1-4].

However, false or spurious results of hematological parameters from complete blood count can be observed. Spuriously low WBC counts can occur because of agglutination due to ethylenediamine tetraacetic acid (EDTA) anticoagulant. Abnormal haemoglobin or RBC count, can be detected due to certain

interference by lipids, agglutinins, cryoglobulins and elevated WBC counts [1, 2, 5]. Hence, the reliability of the result produce by every new automated haematology analyzers need to be assessed and validated is to minimize false-negative results [1-5].

Most of the automated haematology analyzer are using methods, such as impedance, flow cytometry, and fluorescence techniques to enhanced cell sorting [6,7]. Thus, the choice of an automated haematology analyzer must has the best impression on the accuracy of patient results and laboratory efficiency [1,2].

The aim of this study was to evaluate the automated haematology analyzers Abbott Alinity H in term of precision and its correlation with Sysmex XN-1000 in term of inter-instrument comparison of hematological parameter.

Materials and Methods

Samples

Blood samples in EDTA bottle send for complete blood count to Haematology laboratory Hospital Universiti Sains Malaysia were selected randomly (n = 50) from healthy subjects and those who have different blood disorders. The samples were analysed for complete blood count using Abbott Alinity H (USA) and Sysmex, XN-1000 (Kobe, Japan) within four hours of blood collection according to the manufacturer's operational guidelines.

The precision testing was performed as per the Abbott Operational Qualification guideline; 1 blood sample were tested 10 times in each incubation block for all the parameters; WBC, RBC, HGB, PLT, NEU, LYM, MONO, EOS, BASO and MCV. Quality Control using Abbott Tri-level was tested daily after calibration.

Results

The study showed very good correlation between Abbott Alinity H and Sysmex, XN-1000 in the parameters as shown in Table 1 and Figure 1. For the precision, all the parameters are performed well within allowable limits of performance for Abbott Alinity H (Table 2). All the quality control result was within the claimable linearity.

Table 1: Correlation between Abbott Alinity H and Sysmex, XN-1000 in hematological parameters.

Parameter	Units	n	Correlation Coefficient ²
WBC	10 ⁹ /L	50	0.999
RBC	10 ⁹ /L	50	0.993
HGB	g/dL	50	0.999
MCV	fL	50	0.968
PLT	10 ⁹ /L	50	0.981
NEU	10 ⁹ /L	22	0.999
LYM	10 ⁹ /L	22	0.999
MON	10 ⁹ /L	22	0.999
EOS	10 ⁹ /L	22	0.985
BAS	10 ⁹ /L	22	0.734

Discussion

A foremost anticipation of all the clinical laboratory from an automated haematology analyser is to lessen the evaluation rates and produce satisfactory result. Therefore, the performance, advantages and limitations of the analyzers need to be assessed properly [7, 8]. For advantages, automated analyzers can process a large number of samples in a relatively short time, significantly increasing the throughput of a laboratory. Faster processing times lead to quicker delivery of results, enabling healthcare providers to make timely decisions for patient care. This is especially critical in emergency situations. Automation reduces the likelihood of human errors associated with manual counting and staining methods. Automated

analyzers can perform a wide range of hematological tests, including complete blood count (CBC) and differential white blood cell (WBC) counts, providing comprehensive information about the patient's blood profile.

An example of limitation such as flagging of a FBC result that will require further manual examination of a blood smear, require well trained personnel, error-prone if not properly used and require frequent calibration for a precise and accurate results, therefore it is necessary to have periodic calibration checks by experienced laboratories technicians. Furthermore, the instruments should use as per standard recommendations from the companies, as well as maintaining the regular checks and quality control for obtaining reliable results from the instruments [1,4,6].

Several analyzers from different company and using different method are available in the market today. The XN 1000 used the laser flow cytometry for the blood cells counting. Based on the cellular characteristics, different intensities of the signals are collected, and scattergrams of respective measuring channels are populated [6,9]. Meanwhile, Abbott Alinity H using optical scatter and fluorescence method [10]. This study showed a very good correlation for hematological parameters between Abbott Alinity H and Sysmex, XN-1000 (Table 1) and all the parameters are within allowable limits of performance of Abbott Alinity H precision limit (%) (Table 2).

For future recommendation, can evaluate and assess the differences of flagging efficiency between the Abbott Alinity H and and Sysmex, XN-1000. Although this comparative evaluation will be quite expensive and time consuming, a thorough comparative evaluation can provide a valuable insight that may ultimately benefit the end-users, such as healthcare professionals and patients.

Table 2: Abbott Alinity H precision results

Parameter	Target CV (%)	Actual Left Block CV (%)	Actual Right Block CV (%)
WBC	≤ 2.5	1.57	1.77
RBC	≤ 1.5	0.521	0.443
HGB	≤ 1.0	0.414	0.211
MCV	≤ 1.0	0.160	0.493
PLT	≤ 4.0	1.05	0.695

Conclusion

As a conclusion, the study showed that the abbot alinity h automated haematology analyser result is precise and correlate well with the sysmex, xn-1000. Therefore, the potential clinical implications of this study's findings, is that the automated hematology analyzer that can enhance on the laboratory efficiency and also significance for patient care.

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Conflict of interest

No conflict of interest.

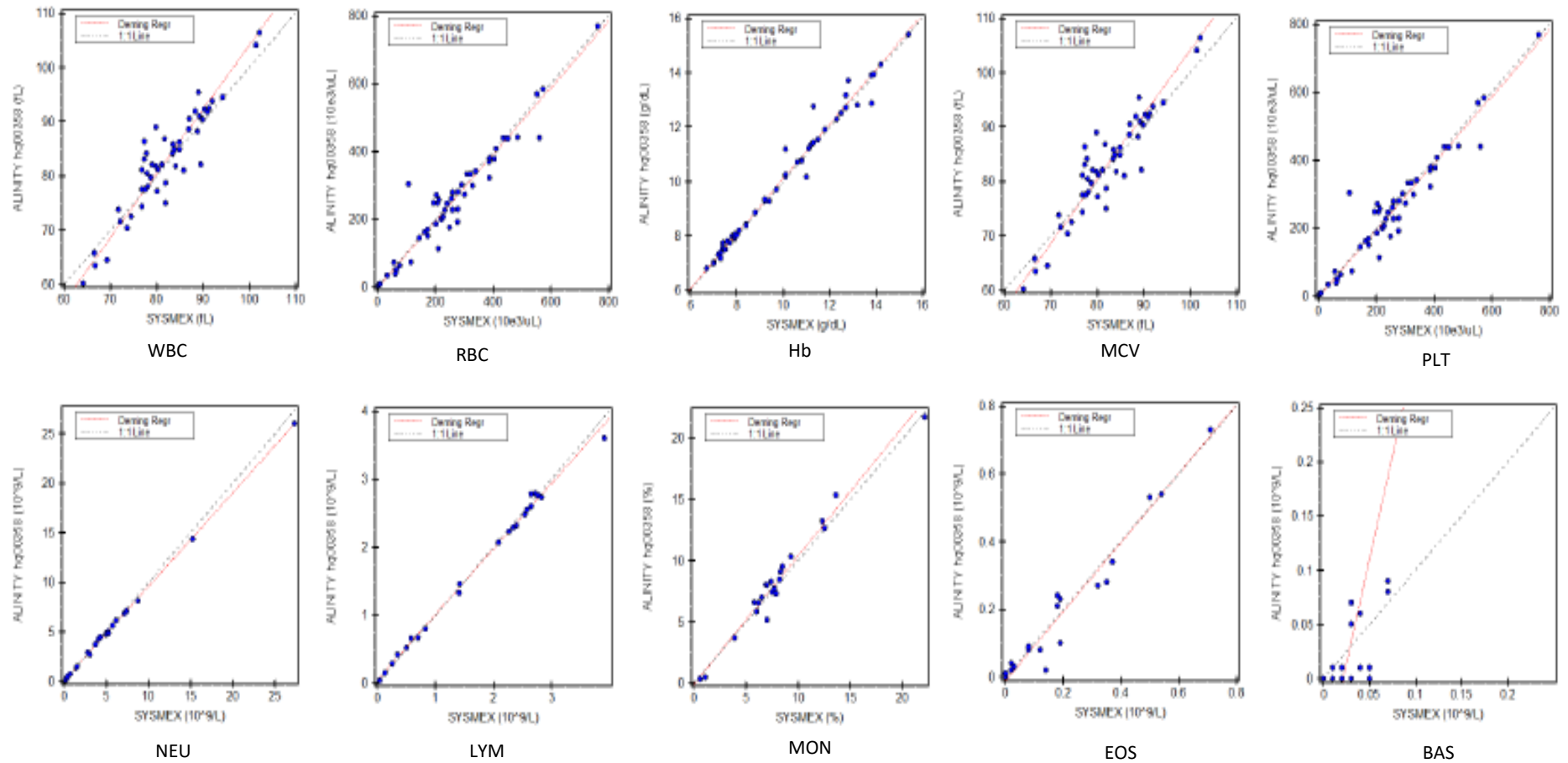


Figure 1: Correlation between Abbott Alinity H and Sysmex, XN-1000 in hematological parameters.

References

1. Dave D, Pandya AN. Comparative Study of Four Hematology Analyzers. *Journal of evolution of medical and dental sciences*. 2014;3(12):3107-3113. doi:<https://doi.org/10.14260/jemds/2014/2251>.
2. Kang SH, Kim HK, Ham CK, Lee DS, Cho HI. Comparison of four hematology analyzers, CELL-DYN Sapphire, ADVIA 120, Coulter LH 750, and Sysmex XE-2100, in terms of clinical usefulness. *International Journal of Laboratory Hematology*. 2008;30(6):480-486. Accessed December 14, 2023. <https://pubmed.ncbi.nlm.nih.gov/19062362/>.
3. Ike SO, Nubila T, Ukaejiofo EO, Nubila IN, Shu EN, Ezema I. Comparison of haematological parameters determined by the Sysmex KX - 2IN automated haematology analyzer and the manual counts. *BMC Clinical Pathology*. 2010;10(1). doi:<https://doi.org/10.1186/1472-6890-10-3>.
4. Davis, MPH MT(ASCP) G, Renner, MT(ASCP) SH N, Harris, MT(ASCP) RJ, Lantis, MT(ASCP) SH KL, Finn, MD WG. Elimination of Instrument-Driven Reflex Manual Differential Leukocyte Counts: Optimization of Manual Blood Smear Review Criteria in a High-Volume Automated Hematology Laboratory. *American Journal of Clinical Pathology*. 2003;119(5):656-662. doi:<https://doi.org/10.1309/vh1k-mv8w-b7gb-7r14>.
5. Zandecki M, Genevieve F, Gerard J, Godon A. Spurious counts and spurious results on haematology analysers: a review. Part I: platelets. *Clinical and Laboratory Haematology*. 2007;29(1):4-20. doi:<https://doi.org/10.1111/j.1365-2257.2006.00870.x>
6. Bruegel M, Nagel D, Funk M, Fuhrmann P, Zander J, Teupser D. Comparison of five automated hematology analyzers in a university hospital setting: Abbott Cell-Dyn Sapphire, Beckman Coulter DxH 800, Siemens Advia 2120i, Sysmex XE-5000, and Sysmex XN-2000. *Clinical Chemistry and Laboratory Medicine (CCLM)*. 2015;53(7). doi:<https://doi.org/10.1515/cclm-2014-0945>.
7. Tan BT, Nava AJ, George TI. Evaluation of the Beckman Coulter UniCel DxH 800, Beckman Coulter LH 780, and Abbott Diagnostics Cell-Dyn Sapphire Hematology Analyzers on Adult Specimens in a Tertiary Care Hospital. *American Journal of Clinical Pathology*. 2011;135(6):939-951. doi:<https://doi.org/10.1309/ajcp1v3uxeiqtsle>.
8. Briggs C, Culp N, Davis B, d'Onofrio G, Zini G, Machin SJ. ICSH guidelines for the evaluation of blood cell analysers including those used for differential leucocyte and reticulocyte counting. *International Journal of Laboratory Hematology*. 2014;36(6):613-627. doi:<https://doi.org/10.1111/ijlh.12201>.
9. XN-1000 / 2000 XN-Series Automated Haematology Analysers Shaping Haematology Lighting the Way with Diagnostics. https://www.sysmex-ap.com/wp-content/uploads/2020/08/XN-1000_2000-Brochure.pdf.
10. Alinity h-series | High-Volume Integrated Hematology Analyzer and Testing System | Core Laboratory at Abbott. [www.corelaboratory.abbott](https://www.corelaboratory.abbott/int/en/offerings/brands/alinity/Alinity-h-hematology-system.html). <https://www.corelaboratory.abbott/int/en/offerings/brands/alinity/Alinity-h-hematology-system.html>.