Saudi Journal of Pathology and Microbiology (SJPM)
Scholars Middle East Publishers
Dubai, United Arab Emirates
Website: http://scholarsmepub.com/

ISSN 2518-3362 (Print)
ISSN 2518-3370 (Online)

A Comparative Study of Erythrocyte Sedimentation Rate by Automated ESR Analyser and Manual Westergren's Method

Dr. Siva Ranjan D[1], Dr. Mohammed Abdul Wahab[1]
[1]Assistant Professor, Department of Pathology, Apollo Institute of Medical Sciences and Research, Hyderabad

Orginal Research Article

***Corresponding author**
Dr. Siva Ranjan D

Article History
Received: 14.01.2018
Accepted: 22.01.2018
Published: 30.01.2018

DOI:
10.21276/sjpm.2018.3.1.8

Abstract: The erythrocyte sedimentation rate (ESR) is a nonspecific screening test to assess elevations of acute phase proteins that occur in various acute and chronic diseases. The aim of the study was to compare the ESR values by automated analyzer against the standard Westergren's method. The comparison was done among 450 patient's samples. In which 90 samples showed high degree of difference because of high ESR values and 180 samples showed low degree of difference because of low ESR values. The conclusion was automated ESR estimation helped a lot in measurement of ESR values in short time, but marked difference of ESR values shown in high ESR values.

Keywords: Westergren method, erythrocyte sedimentation rate, automated ESR analyzer.

INTRODUCTION

The erythrocyte sedimentation rate (ESR) is a straightforward, inexpensive, but nonspecific screening test to assess an inflammatory or acute phase response [1]. The reference method to determine the ESR is based on the Westergren method [2,3]. ESR can be effective in determining prognosis in chronic diseases like Rheumatoid arthritis, Hodgkin's disease and prostatic cancer [4-6]. The greatest advantage with the automated ESR analyzer is that it can give the ESR readings of 10 patients within 30 minutes with all the temperature corrections at 18°C using infrared barriers. The selected method of the International Committee for Standards in Hematology for measuring ESR is that of Westergren [7]. Recently, a number of new automated ESR methods have become available which offer results within 25 to 30 minutes of venepuncture, combined with the added benefit of reduced operator workload [8,9].

MATERIALS AND METHODS

In the Present study The Westergren's ESR reading at 1 hour correlated with 30 minutes reading of automated analyzer. The present study is a cross-sectional study which is done on routine haemogram samples for a period of one month in 2017. From the time of blood collection all the 450 patients samples were processed within 2 hours of collection. Samples were collected from all the patients from both male and female patients of all age groups. Samples were collected from the antecubital vein using a 5-ml disposable syringe with 24G needle under all aseptic precautions. Four millilitre of blood sample was drawn in the two special 2-ml EDTA vacutainers containing 1.5 mg/ml of EDTA and mixed immediately five to eight times.

In manual method of ESR estimation Glass tube with length of 230 mm and bore size of 2.5 mm which is opened at both ends was used. The pipette was filled with K3 EDTA anticoagulated venous blood to a height of at least 200 mm and the sedimentation occurring at 60 minutes from the beginning of the test was noted in mm/hour.

In automated method the blood was drawn into special vacutainers of auto analyser which has the advantage of giving the results of 10 samples in 30 minutes which is equivalent to 1 hour Westergren's reading, with all the temperature corrections at 18°C using infrared barriers.

RESULTS

Out of 450 patient's samples which were taken for study over a period of one month, 279 showed abnormal values of ESR and 171 showed normal values. Out of 270 abnormal ESR values 72 samples showed higher values of ESR that is more than 50 mm/hr and 198 samples showed lower abnormal values of ESR that is less than 50 mm/hr. Table 1 shows the distribution of number of patients according to the ESR value.

While there appears to be a linear relationship between the automated and manual methods, there was

a large degree of difference which increased with the level of ESR. It is of concern that there were 72 patient sample results which were markedly elevated when measured by the manual method but were classified as being with low rise and a few within the normal range by the automated method.

Table-1: Showing the number of patients according to ESR values.

ESR Values	More than 50 mm/hr	Less than 50mm/hr	Normal Values
Total number of patients	72	198	180

DISCUSSION

Westergren's method is the gold standard technique for measuring ESR. However, it has many disadvantages like rise in blood borne diseases such as Hepatitis B, HIV etc, which are prevented by using an automated analyzer.[10] Though the automated analyzer techniques has more benefits in terms of reduction in the processing time, reduced biohazard risks and results within 30 minutes, but it is essential to validate and evaluate these equipments against the standard Westergren's method to enable routine.

Automated ESR analyzer is a newly developed automated method which can give the ESR readings in 30 minutes (equivalent to 1 hour Westergren's) of 10 patients with all the temperature corrections at 18°C using infrared barriers [4]. Newer automated systems for measuring ESR have shown comparably good agreement results enabling their use in clinical laboratories with a high workload as well as for emergency laboratories [11,12]. In the present study we used the similar analyzer for automated ESR estimation. The results obtained with the automated technique were compared with the gold standard manual Westergren's method.

The measurement of ESR is an important investigation in the diagnosis and monitoring of treatment. We should keep in mind that the automated device evaluation is important because the errors in values may affect the patient management. There was a large degree of difference between automated method and manual method when the ESR values are high. It is of concern that there were 72 patient sample results which were markedly elevated when measured by the manual method but were classified as being within low rise in ESR and a few samples showed normal range by the automated method. The reason for the discrepant results is notknown, but repeat samples and analysis revealed the automated result to be inconsistent.

The ESR is affected by factors such as packed cell volume and plasma albumin, globulin and fibrinogen concentrations [13]. Because there is no visual confirmation of results produced by the automated ESR analyzer, an error with the photocell reading of the plasma or red cell interface would be unlikely to be detected and an erroneous result could be reported. Taken together with the risk of the new automated ESR analyzer method significantly underestimating the true result, replacement of the manual Westergren's method which is the gold standard technique for measuring ESR cannot be recommended.

CONCLUSION

To conclude the automated ESR estimation helped a lot in measurement of ESR values in short time, but marked difference of ESR values shown in high ESR values. The Westergren's manual method in measurement of ESR is recommended.

REFERENCE

1. Sox, H. C., & Liang, M. H. (1986). Diagnostic decision: the erythrocyte sedimentation rate: guidelines for rational use. *Annals of internal medicine*, *104*(4), 515-523.
2. Lewis, S. M. (2009). International Council for Standardization in Haematology–the first 40 years. *International journal of laboratory hematology*, *31*(3), 253-267.
3. National Committee for Clinical Laboratory Standards 2000. *Reference and Selected Procedures for the Erythrocyte Sedimentation Rate (ESR) Test (H2-A4).* Wayne, PA: NCCLS; 2000.
4. User manual. Monitor 100. Forli, Italy: Electra Lab s.r.l.; 2005.
5. Brigden, M. L. (1999). Clinical utility of the erythrocyte sedimentation rate. *American family physician*, *60*(5), 1443-1450.
6. Bull, B.S., Chien, S., Dormandy, J.,A., Lewis, S.M. (1998). Guidelines for selection of laboratory tests for monitoring the acute phase response. J Clin Pathol. (41), 1203-12.
7. Westergren, A. L. F. (1921). Studies of the suspension stability of the blood in pulmonary tuberculosis. *Journal of Internal Medicine*, *54*(1), 247-282.
8. Imafuku, Y., Yoshida, H., Greenfield, S., & Rabinovitch, A. (1998). Automated measurement of erythrocyte sedimentation rate and its relation to red blood cell concentration and plasma proteins. *Hematology and cell therapy*, *40*(1), 27-32.
9. Harvey, P. A., Tandon, R., & Singh, A. K. (1995). Automated ESR analysis in 20 minutes. *The British journal of ophthalmology*, *79*(4), 396.
10. Atas, A., Cakmak, A., Soran, M., & Karazeybek, H. (2008). Comparative study between the Ves-matic and microerythrocyte sedimentation rate method. *Journal of clinical laboratory analysis*, *22*(1), 70-72.
11. Mahlangu, J. N., & Davids, M. (2008). Three-way comparison of methods for the measurement of the

erythrocyte sedimentation rate. *Journal of clinical laboratory analysis*, *22*(5), 346-352.

12. Akalin, S. A. N. (2007). Comparison of the erythrocyte sedimentation rate measured by the Micro Test 1 sedimentation analyzer and the conventional Westergren method. *Annals of Saudi medicine*, *27*(5), 362.
13. STUART, J. (1988). Guidelines on selection of laboratory tests for monitoring the acute phase response. *Journal of Clinical Pathology*, *41*(11), 1203-1212.