

**A COMPARITIVE STUDY OF ESR BY MODIFIED WESTERGREN METHOD AND  
VESMATIC CUBE 30 TM****Dr. Malabika Mahato\*<sup>1</sup> and Dr. P. Karkuzhali<sup>2</sup>**<sup>1</sup>Post Graduate, Department of Pathology, Sree Balaji Medical College, Chennai, Tamilnadu.<sup>2</sup>Professor & HOD Department of Pathology, Sree Balaji Medical College, Chennai, Tamilnadu.**\*Corresponding Author: Dr. Malabika Mahato**

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**ABSTRACT**

**Aims:** The aim of study is to compare the ESR values by VesMATIC cube30™ against the modified Westergren method. **Materials and Methods:** This is a cross-sectional study conducted at pathology laboratory in SBMCH, Chrompet. The samples taken were as per the recommendations charted out by International Council for Standardization in Hematology (ICSH) for comparing automated and modified Westergren method. **Results and Conclusions:** The analysis revealed a low degree of agreement between the manual and automated method. Over all whole ESR data analysis shows, mean difference  $1.2 \pm 3.032$  (95% limits agreement, -4.742 to 7.142) for 1 hour. The fully automated system VesMATIC cube30™ for ESR measurement and manual ESR readings are very close and also satisfying the 95% agreement limit. Hence, both methods can be used, but automated erythrocyte sedimentation rate analyzer improve work flow, turnover time and laboratory safety by minimizing contact with blood samples. So it is preferable to use automated method.

**KEYWORDS:** erythrocyte sedimentation rate, VesMATIC cube30™, Westergren method.**INTRODUCTION**

Erythrocyte sedimentation rate (ESR) is used as a parameter for prognostication and even diagnosis of certain clinical conditions. It is still widely used in clinical practice as an indicator of inflammation, infection, trauma, or malignant disease. Apart from complete blood counts (CBC) and peripheral smear, ESR is often preferred by clinicians in the requisition forms in almost all laboratories. The most satisfactory method of performing the test was introduced by Westergren in 1921. The original method recommended by International Council for Standardization in Hematology (ICSH) is based on that of Fahraeus and Westergren. Subsequently, modifications of this reference method were made and ICSH guidelines now allow for the use of alternative ESR techniques provided that comparability with the Westergren method is achieved.

Over the last few years, newer and safer methods have evolved to determine ESR accurately without added risks. The VesMatic cube30™ analyzer is a new automated instrument for measuring ESR. The advantage conferred by this automated method is that it can generate the ESR readings in 30 minutes of 30 patients with all the temperature corrections at 18°C. Additionally, the same EDTA sample collected for

complete blood counts can also be used for ESR analysis by this automated machine.

**MATERIALS AND METHODS**

It was a cross-sectional study done on routine hemogram samples over a period of one week at SBMCH. A venous blood sample was obtained from 100 random patients who had a requisition form, marked for ESR; arriving at the sample collection centre. All the samples were evaluated using the 2 methods in our clinical laboratory as per the methodology for each of the individual methods. All the ESR tests were carried out within 3 hours from the time of collection.

**Inclusion Criteria**

Patients from both sexes and all age groups were included in the study.

**Exclusion Criteria**

Blood collected by venipuncture taking more than 30 seconds and with excessive venous stasis were excluded from the study. Blood samples which were not in proper proportions to the anticoagulant, strongly lipemic, hyperbilirubinemic and hemolyzed samples were also excluded.

### Samples

Under all aseptic precautions, samples were collected from the antecubital vein using a 10-ml syringe with 24G needle. Four milliliter of blood sample was drawn in the two special 2-ml EDTA vacutainers containing 1.5 mg/ml of EDTA and mixed immediately five times.

### Conventional Westergren Method

In this method, a disposable, plastic tube with a bore size of 2.55 mm and a length of 230 mm, vertically aligned, open at both ends was used. The pipette was filled with K3 EDTA anticoagulated venous blood to a height of at least 200 mm. The sedimentation occurring at 60 minutes from the beginning of the test was noted in mm/hour equivalent to the Westergren ESR.

### VesMatic cube30™ instrument

The vesMatic cube 30 is a benchtop analyzer designed & programmed to determine the sedimentation rate one hour on primary EDTA tubes. The loading samples per set of tubes 1 to 30 is carried out manually in a specific rack. The stirred vesMatic cube samples and a first optical measurement of the level of blood through the labels is carried out. 15min latter a second measurement time evaluates the level of sedimentation. 3 matrices calculations interprets 2 readings is then extrapolated to 1 hr & finally adjusted to the temperatures at which the analysis was performed. Then the results get printed out.

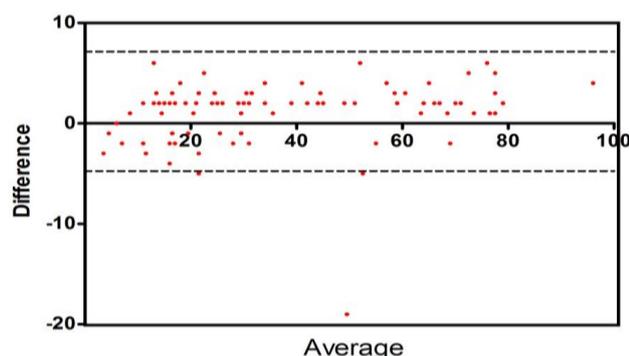
### Statistical Analysis

Evaluation of method was done as described by Bland and Altman. Modified Westergren method was considered as the reference method. Therefore mean value for ESR with both the methods is plotted against the difference between the Westergren and the VesMATIC cube30™. The 95% limits of agreement were calculated as  $d \pm 1.96 SD$  where  $d$  = mean difference between the two measurements; and  $SD$  = standard deviation of differences.

## RESULTS

### Sample statistics

No. of Sample	BIAS	SD	95% Limit of Agreement	
			From	To
100	1.2	3.032	-4.742	7.142



### Bland & Altman analysis of whole samples ESR data values {95% limit of agreement [Mean $\pm$ 1.96 x SD]-(-4.472 to 7.142)}

The results obtained with the reference method were plotted against the difference between the reference and the automated method for 1 hour values. The mean difference between the two methods and 95% limits of agreement at 1 hour for whole data was found to be  $1.2 \pm 3.032$  (95% limits of agreement, -4.742 to 7.142).

### DISCUSSION

The results obtained with the Vesmatic cube30™ analyzer were compared with the modified Westergren method using the agreement analysis of Bland and Altman. Agreement analysis is a more sensitive method than the correlation coefficient for comparison between the two methods. Over all whole ESR data analysis shows, mean difference  $1.2 \pm 3.02$  (95% limits agreement, -4.742 to 7.142) for 1 hour. The use of Bland and Altman analysis for evaluating the agreement between the two methods, not only assesses the mean of the difference ( $d$ ) between the two methods (i.e., bias) but also the limits of agreement by calculating the standard deviation of the differences ( $d \pm 1.96SD$ ). Only when the difference ( $d \pm 1.96SD$ ) does not affect the clinical interpretation, the two methods can be used interchangeably.

### CONCLUSIONS

The fully automated system Vesmatic cube30™ for ESR measurement and modified westergren ESR readings are very close and also satisfying the 95% agreement limit. So both methods can be used. But automated erythrocyte sedimentation rate analyzer improve work flow, turnover time and laboratory safety by minimizing contact with blood samples. Hence, it is preferable to use automated analyzation.

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