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"STUDY OF COMPARISON OF ESR VALUES MEASURED BY AUTOMATED AND MANUAL METHODS IN HAEMATOLOGY LAB OF PATHOLOGY DEPARTMENT, ESIC MEDICAL COLLEGE & HOSPITAL, ALWAR, RAJASTHAN"

Pathology

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ABSTRACT

Introduction : Erythrocytes sedimentation rate at which red blood cells in whole blood descend in a standarised tube in a period of 1 hour. ESR is a very useful investigation in assessing diagnostic and prognostic aspect of the disease. It is used in the diagnosis of autoimmune diseases. The aim of the study is to compare between ESR values measured by automated and manual methods. The present study was done in Haematology Lab of ESIC Medical College & Hospital, Alwar, Rajasthan **Materials And Method :** This is a retrospective study which was carried out in haematology lab of ESIC Medical College and Hospital Alwar. The ESR values of 100 patients were compared. The manual method used in ESIC Medical College & hospital is Westergren method. Westergren tube is a straight thick walled pipette open at both ends, 30cm long with 2.5mm internal diameter. It is calibrated in millimeters from 0 to 200. It holds about 1ml of blood. A rubber bulb and Westergren rack or stand is also required. A 3.8% tri sodium citrate is used in the proportion of 1:4 of citrate : blood, so 1.6ml venous blood is mixed with 0.4 ml citrate. In this method 1.6ml of venous blood is collected in a tube containing 0.4 ml of sodium citrate (1 part anticoagulant : 4 part blood). Then the tube is placed vertically for 1 hour. After exactly 1 hour, the distance from the bottom to top of column of red cells is recorded in millimeters. The values are measured in mm in 1 hour. The automated analyser used is ALIFAX ROLLER 20 LC [S.N. R 202554LG]. The principle of this analyser is photometrical capillary stopped flow kinetic analysis. Given in mm/hr. Range = 2 to120 mm/hr. Room temperature (18 -25° C) should be maintained. **Result** : The mean of ESR calculated from the values obtained by manual method is 32.24.The mean of ESR calculated from the values obtained by automated method was 26.81.The mean of the ESR obtained from manual methods were found to be higher than the values obtained from automated methods. **Conclusion :** When the automated and manual ESR measuring methods were compared there was a marked discrepancy in the results regarding high ESR values. It was not the same for normal ESR values, which is unacceptable. Similar findings were noted by other researchers. Hence it is required to use some correction methods. Hence ESR is a very useful in the diagnosis of many infections diseases, chronic inflammation.

KEYWORDS

ESR, Blood, Westergren, mm/hr, Alifax

INTRODUCTION

Erythrocyte sedimentation rate is the rate at which red blood cells in whole blood descend in a standardized tube in a period of 1 hour. It is a common hematology test. It is a very useful investigation in assessing the diagnostic and more importantly prognostic aspect of the disease. ESR is useful in the diagnosis of trauma, infection, malignant disease, and other autoimmune diseases. It serves as an indicator of chronic inflammation.

But now automated ESR is used widely since in manual methods the lab physicians will have to handle blood manually. Due to increase in blood borne diseases like HIV and Hepatitis B it is always safer to use automated methods. It consumes less time.

The aim of my study is to compare the values of ESR obtained from manual and automated methods. My study was done in the hematology lab in Department Of Pathology, ESIC Medical College & Hospital, Alwar. The study was done using the blood samples of 100 patients. The rouleaux formation is largely determined by increased levels of plasma fibrinogens and globulins. The original method recommended by the ICSH is based on that of Fahraeus and Westerner.

Some interferences which increase ESR Increased levels of fibrinogens and globin. Technical factors such as tilted tube, high temperature.

Some interferences which decrease ESR Abnormally shaped RBC(sickle cells, sperocytosis) Technical errors such as short ESR tubes, low room temperature, clotted blood sample, excess blood coagulants, bubbles in tube.

Clinicalutility

ESR can be used in the diagnosis of of Hodgkin disease, prostatic cancer, rheumatoid arthritis, chronic inflammation, polycythemia, sickle cell, spherocytosis and to monitor disease activity (tuberculosis, rheumatic fever)

MATERIALS AND METHODS

Manual : Westergren

This is a retrospective study which was carried out in hematology lab of ESIC Medical College and Hospital, Alwar. The ESR values of 100 patients were compared. The manual method used in ESIC Medical College & hospital is Westergren method. Westergren tube is a straight thick walled pipette open at both ends, 30cm long with 2.5mm internal diameter. It is calibrated in millimeters from 0 to 200. It holds about 1ml of blood. A rubber bulb and Westergren rack or stand is also required. A 3.8% trisodium citrate is used in the proportion of 1:4 of citrate : blood, so 1.6ml venous blood is mixed with 0.4 ml citrate. In this method 2ml of venous blood(or 1.6ml of blood + 0.4ml of citrate) is collected in a tube containing 0.4 ml of sodium citrate (1 part anticoagulant : 4 part blood). Then the tube is placed vertically for 1 hour. After exactly 1 hour, the distance from the bottom to top of column of red cells is recorded in millimeters. The values are measured in millimetres in 1 hour. The automated analyzer used is ALIFAX ROLLER 20 LC [S.N. R 202554LG]. The principle of this analyzer is photometrical capillary stopped flow kinetic analysis. Given in mm/hr. Range = 2 to120 mm/hr. Room temperature (18 -25° C) should be maintained.

Stages of ESR

(1) Stages of aggregation /rouleaux formation = 10 minutes.
(2) Stage of settling =40 minute.
(3) Stage of packing =10 minute.

Automated :ALIFAX ROLLER20LC (S.N. R 202554LG)

The principle of ALIFAX is quantitative capillary photometry, which allow in just 20 sec of analysis, to obtain the ESR result of the sample, expressed in mm/hr.

Quantitative capillary photometry studies the dynamic behavior of RBC. The blood sample flows in a transparent capillary inside the instrument and the reactivity of the RBC is analyzed when this flow is suddenly interrupted: this abrupt interruption, together with the rheological characteristics of the sample itself, and the presence or absence of the proteins of the acute phase in it, starts or not the process of aggregation by stacking RBC.

The diagnostic algorithm of the Alifax Roller LC ESR instrumentation transforms the measurement performed in just 20sec of analysis, into a photometric quantity, expressed in mm/hr, without waiting for the entire stacking, sedimentation and sample stacking process.

The result is expressed in mm/hr. Measures ESR values ranging between 2 – 120 mm/hr.

Sample Requirement:
The sample must be whole blood collected in EDTA anti coagulant. It is better to test the sample within 2-6 hours from venipuncture or within 24 hours if kept in +4/+8°C, provided it is rewarmed to room temperature, before testing.

RESULT:
Erythrocytes sedimentation rate at which red blood cells in whole blood descend in a Westergren tube in a period of 1 hour. ESR is a very useful investigation in assessing diagnostic and prognostic aspect of the disease. It is used in the diagnosis of autoimmune diseases. The aim of the study is to compare between ESR values measured by automated and manual methods. The present study was done in hematology lab, ESIC Medical College, Alwar, Rajasthan.

The mean for the ESR values measured using manual method was found to be 32.24.

The mean for the ESR values measured using automated method was found to be 26.81.

Difference of mean values calculated using manual and automated was found to be 5.43

MEAN	MANUAL	AUTOMATED	DIFFERENCE
	32.24	26.81	5.43

Discrepancy in the results regarding high ESR values were found. This high ESR values were found. This problem did not exist for normal and low ESR values. In such cases where there is high ESR values it is always better to use correction methods. Usage of such correction methods helps us to eliminate such discrepancies. It is always better to use manual methods in some special cases.

Automated analyser methods underestimated the values measured by manual methods, since the values are underestimated, they cannot be accepted for clinical interpretation. This was clearly seen in samples which had high ESR values. The same was not evident in samples with low ESR values. The mean values of ESR measured by automated analyzer was found to vary with the values measured by the manual methods. The same findings were noted in other researchers done by researchers Arulselvi Subramanian, Kanchana Rangarajan, Ravindra Mohan Pandey, Jatin S Gandhi,Vijay Sharma, Sanjeev Kumar Bhoi. They also recommend the use of such correction methods to avoid discrepancies. So it is always better to use manual methods for higher ESR values, to prevent such discrepancies.

DISCUSSION:
Erythrocytes sedimentation rate at which red blood cells in whole blood descend in a standardised tube in a period of 1 hour. ESR a very useful investigation in assessing diagnostic and prognostic aspect of the disease.

Erythrocyte sedimentation rate is used as an indicator for chronic inflammation, infection, autoimmune disease, multiple myeloma, temporal arthritis, polymyalgia rheumatic, systemic lupus erythromatosus, chronic kidney disease, Kawasaki disease, infective endocarditic, sub acute thyroiditis, non infectious inflammatory disorders, inflammatory bowel disease like crohn's disease and ulcerative colitis.

The best manual method employed for the measurement of erythrocyte sedimentation rate is Westergren method. This methods has some disadvantages. It includes modification such us using unopened samples of blood. Due to increase in the rate of blood borne diseases such as Hepatitis B, HIV infections, westergren methods and other manual methods are avoided. This may be one reason as to why automated methods are recommended over manual methods. The time consumed by automated methods were found to be less, compared to that of manual methods.

The Automated analyzer used in our hospital (ESIC Medical College and Hospital) is Automated : ALIFAX Roller 20LC (S.N.R202554LG). The principle used is Photometrical capillary stopped flow kinetic analysis. The result is expressed in mm/hr. Measures ESR values ranging between 2 - 120mm/hr. Sample requirement: The sample must be whole blood collected in EDTA anti coagulant. It is better to test the sample within 2 - 6 hours from venipuncture or within 24 hours hour's if kept in +4/+8°C, provided it is rewarmed to room temperature, before testing. I have compared my research with the research of Arulselvi Subramanian, Kanchana Rangarajan, Ravindra Mohan Pandey, Jatin S Gandhi,Vijay Sharma, Sanjeev Kumar Bhoi. The automated machine used in their research is Monitor 100. This automated ESR requires only 15 minutes to produce the result. Westergren was the manual method used. Their study also showed a marked difference in the values of erythrocyte sedimentation rate measured by automated and manual method. They have also indicated that such discrepancies were experienced by other researchers[8]. Another study[6] [7]. also indicates low agreement between values measured by automated and manual methods. Thus it is recommended to use correction methods to avoid such discrepancies.

CONCLUSION
When the automated and manual ESR measuring methods were compared there was a marked discrepancy in the results regarding high ESR values. It was not the same for normal ESR values, which is unacceptable. Similar findings were noted by other researchers. Hence, it is required to use some correction method[2]. Hence, ESR is a very useful in the diagnosis of many infections, diseases, chronic inflammation.

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