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Original Research Paper

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A COMPARATIVE STUDY OF MANUAL VERSUS AUTOMATED METHODS OF ESTIMATION OF TOTAL AND DIFFERENTIAL LEUKOCYTE COUNT AMONG TRIBAL POPULATION OF JHARKHAND.

Nisha Kumari	Post-graduate Student Department of Pathology, Rajendra Institute of Medical Sciences, Ranchi.
K P Sinha	Professor Department of Pathology, Rajendra Institute of Medical Sciences, Ranchi.
Dilip Kumar*	Post-graduate Student Department of Community Medicine and RIMS Ranchi. *Corresponding Author

ABSTRACT

Introduction: An accurate estimation of total and differential leukocyte count is of utmost importance while investigating a patient and serve as both diagnostic parameter as well as baseline record for further management.

Aim: Our study was done among tribal population of Jharkhand with the aim of comparing the accuracy of the results while estimating total and differential leukocyte count by both manual and automated methods.

Material and methods: We have taken hundred blood samples received for TLC and DLC in automated hematology counter along with simultaneous manual estimation of the above mentioned parameter. Accuracy of the results of both the methods was compared on SPSS computer software.

Results: The study found that the accuracy by both the methods gave a satisfactory result.

Conclusion: After the comparative study between the two we concluded that manual methods are equally efficient. But for saving time, we prefer automatic cell counter over the manual.

KEYWORDS : Accuracy, Manual versus Automated methods, Tribal population

INTRODUCTION:

As per 2011 census, the scheduled tribe population of Jharkhand state is 8,645,042 of the total population 32,988,132 of the state. The Scheduled Tribes are primarily rural as 91.7 percent of them reside in villages. Gumla district has the highest population of STs (68.4 percent).[1]

The tribes of Jharkhand consist of 32 tribes. These are mainly Munda, Santhal, Oraon, Kharia, Gond, Kol, Kanwar, Savar, Asur, Baiga, Banjara, Bathudi, Bedia, Binjhia, Birhor, Birjia, Chero, Chick-Baraik,Gorait, Ho, Karmali, Kharwar, Khond, Kisan, Kora, Korwa, Lohra, Mahli, Mal-Paharia, Parhaiya, Sauria- Paharia, Bhumiji.[2]

Prevalence of infectious diseases among tribal population of Jharkhand are mainly diarrhoea, acute respiratory tract infections, tuberculosis, malaria, typhoid, skin diseases, filaria, kala-azar etc.[3] Therefore estimation of total and differential leukocyte count is of utmost importance while investigating a tribal patient and serve both as a diagnostic parameter as well as a baseline record for further management. It is advised in almost every admitted case, most of out-patient and in all females undergoing antenatal checkup.[4]

MATERIAL AND METHODS:

A consecutive sampling was done to collect 100 samples of tribal patients, attending Pathology department RIMS, Jharkhand. Venous blood was used for sampling. All samples were collected in EDTA vial. These samples were run in the automated cell counter along with manual methods for estimation of TLC and DLC.

INCLUSION CRITERIA:

All tribal patients having age more than 18 year and less than 60 year were included.

EXCLUSION CRITERIA:

Non-tribal patient were excluded from study

Tribal patients having age less than 18 year and more than 60 year were excluded from study.

TLC estimation was done on 20 micro liter of well mixed blood sample and WBC diluting fluid (Turk's fluid) in 0.38 ml which consist of Gentian violet, 1% aqueous (1 ml) and acetic acid, glacial (2ml) and added distilled water to make 100ml, this produced 1:20 dilution. The Neubauer chamber was charged after through mixing and WBCs were counted in the outer four squares of the chamber at 10X magnification.[5]

DLC estimation was done manually on a well made peripheral smear. The blood smears were stained by Leishman stain which was prepared by using commercially available Leishman powder (150mg) and mixed with water free absolute methyl alcohol (100 ml). Entire smear was scanned under low power for quality of smear. Relative proportion of various types of WBCs was observed under 40X magnification. Firstly WBCs were classified and then counted by moving one field to another field. Total hundreds WBCs were counted which were expressed as a percentage.[5]

TLC and DLC were also counted by automated hematology cell counter. Automated hematology cell counter is based on the principle called as Coulter' concept of electrical impedance.[6]Using this technology, cells are sized and counted by detecting and measuring changes in the electrical resistance when a particle passes through a small aperture. Specially formulated reagents cause the WBC membrane to shrink around the nucleus while the cell intact allowing separation white cells according to their volume. Lymphocytes fall the small region, Neutrophils within large cell region and remaining cells into mid size cell region. The automated counter provided five part differential which classified cells to Neutrophils, Eosinophils, Basophils, Lymphocytes, Monocytes. Data was collected and entered in MS excel and data analyzed in SPSS version 20.

RESULTS:

The results were accessed using both parameters. The accuracy of the results obtained by both the methods are given in the following tables. The Table 1,2,3,4,5 and 6 show comparision of accuracy of TLC, Neutrophils, Lymphocytes, Monocytes, Eosinophils and Basophils by both manual and automated methods respectively

DISCUSSION:

TLC and DLC are the most commonly advised test in laboratory. The total count is done by using counting chamber having some drawbacks like technical errors and statical errors. The technical errors include errors in blood collection, errors in pipetting and errors in filling chamber.[5] DLC by peripheral smear also having some disadvantages. When 200 cells are counted the error are of the order of 7%[7] and if only 100 cells are counted a 10% error is expected. Manual counting is subjected to sampling error because few cells are

counted compared with automated cell counter. If a differential count shows other than distributional abnormalities there is no substitute of the human observer for recognition and enumeration of abnormal cells. There have been few studies which have tried to work on accuracy between manual versus automated analyser. One study was done in Multan (Pakistan) by Waqar Azin et al.[8] and other is a study from Malavi (Africa) by A medina Lara et al.[9] There is one more study was done in our country, command hospital(CC), Lucknow by Richa Ranjan, R K singh, Rigvardhan.[10] Waqar Azim et al concluded that the both manual as well as automated method are accurate.[8] The African study also concluded that it is needed to take account not only cost, but also simplicity, accuracy, speed, available manpower and technical skills of their laboratory work force and the health needs of population before we choose a method.[9] But study done by Richa Ranjan, R K Singh in lucknow concluded that time taken by automated method is much less as compared to manual method, manual method can be resorted to only when the samples received are not too many. As far as accuracy goes, both the methods give a satisfactory result[10].

Table:1 Comparison of accuracy of TLC by both Automated and Manual methods

	No of sample	Minimum count	Maximum count	Mean	Std. Deviation
TLC (Automated)	100	4900.0	11890.0	7968.000	1853.0663
TLC (Manual)	100	4700.00	12100.00	7961.000	1891.44245

Table:2 Comparison of accuracy of Neutrophils by both Automated and Manual methods

	No of sample	Minimum count	Maximum count	Mean	Std. Deviation
Neutrophils (Automated)	100	48.10	80.70	61.210	8.87752
Neutrophils (Manual)	100	43.00	79.00	61.300	8.66259

Table:3 Comparison of accuracy of Lymphocytes by both Automated and Manual methods

	No of sample	Minimum count	Maximum count	Mean	Std. Deviation
Lymphocytes (Automated)	100	12.20	39.00	29.0548	6.92303
Lymphocytes (Manual)	100	15.00	38.00	29.3400	6.57086

Table:4 Comparison of accuracy of Monocytes by both Automated and Manual methods

	No of sample	Minimum count	Maximum count	Mean	Std. Deviation
Monocytes (Automated)	100	1.58	7.70	4.1396	1.78412
Monocytes (Manual)	100	1.00	9.00	3.9000	1.90957

Table:5 Comparison of accuracy of Eosinophils by both Automated and Manual methods

	No of sample	Minimum count	Maximum count	Mean	Std. Deviation
Eosinophils (Automated)	100	0.20	13.60	4.7700	3.17122
Eosinophils (Manual)	100	1.00	13.00	4.8200	3.05300

Table:6 Comparison of accuracy of Basophils by both Automated and Manual methods

	No of sample	Minimum count	Maximum count	Mean	Std. Deviation
Basophils (Automated)	100	0.00	0.30	0.0380	0.06633
Basophils (Manual)	100	0	0	0.00	0.000

CONCLUSION:

The study was done on hundred samples received for total and differential leukocyte count by using automated cell counter and manual methods. As per above observation we concluded that there is not much of a difference in results between automated cell counter and the reading by manual methods. Therefore after comparative study between two methods , the manual methods are equally efficient and accurate as that of automated cell counter. But for saving time, we prefer automated cell counter over the manual methods. As time taken by automated cell counter is less as compared to manual methods, manual method can be resorted to only when the samples received are not too many. As far as accuracy goes, both the methods give a satisfactory results.

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