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Original Article

Pathology Section

Types and Frequency of Preanalytical Errors in Haematology Lab

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ABSTRACT

Aim: This study was conducted to evaluate the frequency of the preanalytical errors occurring in a haematology laboratory.

Material and Methods: A retrospective study was conducted by collecting and analyzing data in duration of one year in the haematology section of the laboratory. Data for all the preanalytical variables according to the predefined categories were scanned. Both IPD and OPD patients were segregated.

Result: A total of 135808 samples were received in haematology lab during this period, out of which in 1339 samples, preanalytical errors were found, which approximately constituted 1 % of all samples.

Conclusion: Highest number of samples were rejected due to misidentification, that is 0.35 % and least number were rejected due to dilution of the samples, that is 0.04 %.

Keywords: Pre–analytical errors, Haematology, Laboratory

INTRODUCTION

Pathology laboratories play a central role in patient care and diagnosis. Though there is lot of automation in haematology and clinical pathology labs, still there are many variables which can influence the lab results [1]. Correct reporting requires that all the phases i.e. pre-analytical [1–5], analytical and post–analytical [6] should be free from errors, as far as possible. Earlier, it was required that main emphasis on quality be made in analytical phase, but it is equally important that it be recognized in all phases [7]. It has been estimated that up to 62 % errors happen during pre-analytical phases [8]. In another study, 93 % errors occurred during pre-analytical and post–analytical phases combined [9].

The aim of this study was to survey preanalytical procedures to find sources of error and their relative frequencies in the haematology laboratory of the hospital, associated with our medical college, so that corrective actions could be taken.

MATERIAL AND METHODS

Current study was a retrospective one and it was carried out in haematology unit of Chatrapati Shivaji Hospital; an 800 bedded hospital associated with Subharti Medical College, Meerut. Duration of study was one year, from Jan 2011 to Dec 2011. All samples received during this period in haematology unit were included. Sample collection for OPD patients was centralized for different sections of central laboratory, like haematology, clinical pathology, biochemistry and microbiology units. IPD samples were collected in wards, ICUs and OTs and transported to IPD sample collection centre by attendants of the respective wards. From collection centres, samples and forms were distributed to various units of the central lab for analysis.

Total samples received in haematology unit were 135808, out of which 73825 were from OPD patients and 61983 were from IPD patients. Samples were collected using vacuum collection tubes.

Following categories of pre-analytical data were available for study period.

1. Misidentification (incorrectly labeled vials or incorrectly filled forms).
2. Incorrect samples (wrong choice of vials).
3. Clotted samples.
4. Inadequate samples.
5. Diluted samples.
6. Haemolyzed samples.

Data for time delay was not available.

The reason for doing a retrospective study was to find out preanalytical variables and sources of errors occurring in our laboratory. CMEs and workshops were planned for all laboratory staff, as well as for doctors and nurses. A prospective study was planned to measure the outcome of all these exercises.

RESULTS

Out of total 61983 samples received from IPD patients, pre-analytical errors, according to above mentioned criteria, were found in 829 samples (1.34 %). Distribution has been given in table below. The most common mistakes were incorrect filling of forms (wrong names or IDs) or mislabelling of vials (289 cases, 0.47%). Second most common cause was the use of incorrect vials (149 cases,

	IPD	%	OPD	%	IPD+OPD	%
Total Samples	61983		73825		135808	
Misidentification	289	0.47	193	0.26	482	0.35
Incorrect vials	149	0.24	72	0.10	221	0.16
Clotted sample	102	0.16	78	0.11	180	0.13
Inadequate sample	136	0.22	128	0.17	264	0.19
Diluted	58	0.09	Nil	0.00	58	0.04
Hemolysed	95	0.15	39	0.05	134	0.09
Total	829	1.34	510	0.69	1339	0.99

[Table/Fig-1]: Percentage of preanalytical errors IPD & OPD samples

Parameters	Our study		G B Pant hospital study	
	IPD %	OPD %	IPD %	OPD %
Misidentification	0.47	0.26	0.45	0.51
Incorrect vials	0.24	0.10		
Inadequate samples	0.22	0.17	0.08	0.37
Diluted samples	0.09	0.00	N/A	N/A
Hemolysed samples	0.15	0.050	1.10	0.20
Clotted samples	0.16	0.11	N/A	N/A
Lipaemic samples	N/A	N/A	0.03	0.11

[Table/Fig-2]: Table of comparison between our study and similar study in clinical chemistry lab in G B Pant Hospital

0.24 %). In the outpatient sample collection, situation was slightly better, with total errors being found in 510 cases (0.69%). Here too, most common cause was mismatch between form and sample (193 cases, 0.26 %). Other causes have been given in the table. Total preanalytical errors were found in 1339 out of 135808 samples (0.99%). We could not ascertain other causes of pre-analytical errors due to paucity of data, especially time lag between sample collection and actual analytic process [Table/Fig-1].

DISCUSSION

Currently, there is lot of emphasis on managing Total Testing Process in medical laboratories, as there is recognition of fact that not only analytical phase but that pre-analytical and post-analytical phases are equally important for correct reporting of the results [4, 6]. As labs are going for various accreditations, there is requirement of reducing errors in all phases of laboratory functioning. Keeping track of pre-analytical data errors may lead to significant decrease in errors occurring during later processes. Preparation of pre-analytical quality manual may help in reducing these errors [5].

In our study, pre-analytical errors were more common in IPD sample collection, where usually nurses and paramedical staff collected samples, many of whom did not recognize/ were not aware of the importance of collection of samples by correct techniques. This may also be caused by rotational duties, excessive workload and variety of workload [1]. In our view, these may be the main reasons behind mislabeling of samples and/ or incorrect identifications in the request forms.

Clotted samples are one of the leading causes of pre-analytical errors. Clotted samples are easy to detect, but micro-clots are difficult to detect, especially in haematology lab (because of anti-coagulated samples) [3]. The most common reason for clotting is improper mixing of samples just after collection, which may have been the case in our hospitals and labs. In other labs, inadequate quality control during in house preparation of EDTA vials may be one of the reasons.

Inadequate samples are usually found in paediatrics and ICU patients. Samples diluted with IV fluids are found in IPD patients only, due to obvious reasons. Nursing staff sometimes fail to recognize the importance of using veins in which IV lines have not been introduced.

Prevalence of haemolysed samples has been reported in up to 3.3% of routine samples [10] but haemolyzed samples are slightly difficult to detect in haematology labs as compared to biochemistry labs, as samples are usually not centrifuged in the former. This may result in falsely lower number of preanalytical errors caused by haemolysis in haematology labs like ours, as compared to those seen in other studies done in biochemistry labs [1]. Phlebotomy techniques may have major effects on number of haemolysis cases [11] and others on preanalytical errors [12].

Majority of times, these preanalytical errors usually do not cause bodily harm to the patients, apart from repeat sampling, delay in reporting, etc. but in many cases, it may have serious consequences [13] or may result in completely wrong treatment for the patient.

In our study, pre–analytical errors were found in approximately 1 % of total samples in haematology, which were comparable to those seen in other studies, but this was too high, because it meant that in one out of every 100 samples was erroneous, even before start of the testing procedure. We compared the results of our study with those of by Chawla et al., [1], [Table/Fig-2] performed in clinical chemistry laboratory in a big hospital in India, which showed that most of their results were comparable with those of our study.

As a first step, we organized a CME on preanalytical errors for all the doctors and paramedical staff of our institute. In this, we discussed various preanalytical variables, including necessity of using paediatric blood collecting vials. It was quite informative to all the staff. Outcomes of these types of CMEs will be presented in due course of time.

CONCLUSION

Though there is a lot of development in analytical phase of testing in pathology labs, many errors still occur and they will continue to occur in pre-analytical phase, as there is human intervention in every step, right from filling the requisition form to receiving and preparing the samples for analysis. The better practices reported by the laboratory staff are likely to be the result of quality improvement initiatives undertaken in the laboratories. Competency checks should be done for improvement in the preanalytical phase, after regular training programmes are provided to the staff. This would result in a define level of competence among sample collecting and lab staff. Standardization, training and collaboration between laboratory and wards can all reduce preanalytical errors. For success of these initiatives, getting active support from top management is probably a key factor. Furthermore, quality improvement in healthcare is an evolutionary process involving continuous adaptation to organizational factors. Some suggestions can be made for quality improvement in the laboratories –

*Providing sampling procedure education to all concerned staff.

*Coordination between lab and ward staff.

*Daily registration and analysis of preanalytical errors occurring in the lab.

* Issuing of competency certificate for trained staff.

*Computerization of the laboratory.

With proper training to staff, preparing and adhering to pre-analytical quality manuals, better communication with clinical staff at all levels, pre-analytical errors can be minimized to a certain extent.

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