

## A STUDY ON THE EFFECTIVENESS OF SAFETY MEASURES ADOPTED BY THE LABORATORY DEPARTMENT IN A SELECTED HOSPITAL

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### ABSTRACT

Safety within healthcare settings, particularly in laboratory departments, is paramount to ensure the well-being of both healthcare professionals and patients. This study investigates the effectiveness of safety measures implemented by the laboratory department of a selected hospital. The research aims to assess the current safety protocols, identify potential gaps, and recommend improvements to enhance overall safety standards.

The study employs a mixed-methods research design, combining quantitative and qualitative data collection methods. Surveys, interviews, and observational assessments are conducted among laboratory staff, supervisors and relevant stakeholders to gather comprehensive insights into the safety measures' effectiveness. Quantitative data analysis involves the assessment of key safety performance indicators, such as incident rates, compliance with safety protocols, and the utilization of personal protective equipment. Qualitative data analysis focuses on understanding the attitudes, perceptions, and experiences of laboratory personnel regarding safety practices.

Preliminary findings suggest that the laboratory department has made significant strides in ensuring safety, with a notable emphasis on proper handling of hazardous materials, waste disposal, and emergency response protocols. However, challenges such as staff compliance, training gaps, and communication barriers are identified as areas needing improvement.

The study's recommendations include enhancing staff training programs, fostering a safety-oriented organizational culture, regularly updating safety protocols in alignment with industry standards, and promoting effective communication channels among staff members.

Overall, this research contributes to the broader understanding of safety measures in healthcare settings and provides practical insights for healthcare institutions to continuously improve safety protocols in their laboratory departments, ultimately ensuring the well-being of both healthcare professionals and patients.

In the modern healthcare landscape, laboratory departments play a crucial role in diagnostic and research activities, making safety measures of utmost importance. This study delves deeper into the topic by examining specific facets of safety within the laboratory setting.

#### Safety Culture Assessment

The research explores the existing safety culture within the laboratory department, examining how safety is perceived, valued, and integrated into daily practices. This includes assessing whether safety is considered a top priority and if there is open communication about safety concerns among staff.

#### Incident Analysis

The study investigates any past incidents or near-misses within the laboratory, aiming to identify patterns, root causes, and common hazards. This analysis can help pinpoint areas that require immediate attention.

#### Safety Equipment and Infrastructure

An assessment of the availability and functionality of safety equipment and infrastructure is conducted. This includes evaluating the condition of safety cabinets, fume hoods, fire extinguishers, eyewash stations, and

emergency showers.

### **Training and Education**

The study examines the adequacy and effectiveness of safety training and educational programs provided to laboratory staff. This includes evaluating the frequency of safety training sessions, the comprehensiveness of the curriculum, and the assessment of staff knowledge and competence.

**Compliance and Enforcement:** The research investigates the level of compliance with safety protocols and regulations among laboratory personnel. It also assesses the enforcement mechanisms in place to ensure adherence to safety guidelines.

**Communication and Reporting:** The study explores how incidents and safety concerns are reported and documented within the department. Effective reporting and communication mechanisms are critical for continuous improvement.

**Emergency Response and Preparedness:** The preparedness of the laboratory department to handle emergencies, such as chemical spills, fires, or personnel injuries, is evaluated. This includes the availability of emergency response plans, drills, and the effectiveness of response teams.

**Environmental Impact:** The study considers the environmental impact of laboratory operations, including waste disposal practices and the implementation of eco-friendly measures.

The ultimate goal of this research is to provide actionable insights for the selected hospital's laboratory department and other healthcare institutions. By identifying strengths and weaknesses in safety measures, hospitals can proactively enhance their safety protocols to protect both healthcare workers and patients, thereby fostering a safer healthcare environment. Additionally, the findings from this study may contribute to the broader body of knowledge on laboratory safety within the healthcare sector, benefiting the scientific and healthcare communities as a whole.

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## **I. INTRODUCTION**

Laboratory services are an essential component of health care and there is no specialty in health care that does not require laboratory investigations. Laboratory investigations play a vital role in the treatment of disease condition.

The primary function of clinical laboratory is to perform laboratory test in the six main fields of bacteriology, biochemistry, cytology, histology, hematology, and serology to assist medical staff in making or confirming diagnosis and in the treatment and prevention of diseases. The practice of modern medical care requires more and more laboratory examinations.

In the dynamic realm of modern healthcare, ensuring the safety and well-being of both healthcare professionals and patients is an imperative that transcends all boundaries. Within this intricate tapestry of care, the laboratory department stands as a vital hub for diagnostic, research, and testing activities. Here, precision and accuracy are paramount, but so too is safety. The laboratory is replete with potential hazards, from infectious agents to chemical substances, making the effectiveness of safety measures within this setting not just a priority, but a moral and ethical obligation.

This study embarks on an exploration of paramount significance, delving into the realm of safety measures within the laboratory department of a selected hospital. Our journey into this crucial domain is characterized by an ardent commitment to unraveling the intricacies of safety, assessing current protocols, identifying potential gaps, and proposing strategies to elevate safety standards to their zenith.

As the healthcare landscape continues to evolve, the laboratory department remains a cornerstone in disease diagnosis, research, and treatment evaluation. It is a sanctuary where diagnostic precision intertwines with the ethical responsibility to protect the health and welfare of all those involved, directly or indirectly. Thus, the importance of comprehensively examining and enhancing the safety measures within this department cannot be overstated. The central aim of this study is to gauge the effectiveness of the safety measures implemented within the laboratory department. Through a judicious blend of quantitative and qualitative research methods, we aim to shed light on the current state of safety, unveil the nuances of safety culture, and scrutinize the factors that either fortify or undermine safety within this environment.

By undertaking this research, we hope to uncover valuable insights that can catalyze tangible improvements in the safety apparatus of laboratory departments not only within the selected hospital but also across the broader healthcare spectrum. Our findings are envisioned to illuminate pathways toward stronger safety cultures, more robust safety infrastructure, enhanced training programs, and improved communication channels, ultimately safeguarding the well-being of both healthcare professionals and patients alike.

This study, therefore, represents a significant stride in the ongoing endeavor to fortify the pillars of safety within healthcare settings, reinforcing the ethical principles that underpin the medical profession and echoing the resounding commitment to "first, do no harm."

In a world increasingly characterized by medical advancements, the laboratory department is the bedrock upon which many clinical decisions and treatments are founded. It is the crucible where science converges with patient care, and where meticulous attention to detail is essential. However, this intricate dance of precision and care is underpinned by a fundamental requirement: safety.

Safety measures in a healthcare laboratory are not mere precautions; they are lifelines that safeguard healthcare workers, patients, and the community at large. The laboratory department presents a unique set of challenges, as it is a space where exposure to infectious agents, toxic chemicals, and potential accidents can occur. The consequences of lapses in safety can be severe, ranging from harm to individuals to contamination of vital test results. The chosen hospital, like many healthcare institutions, recognizes the paramount importance of safety within its laboratory department. Numerous measures have likely been put in place over the years to mitigate risks, but the ever-evolving healthcare landscape demands continuous scrutiny and improvement. Therefore, this study takes up the mantle of evaluating the effectiveness of these safety measures.

The relevance of this study extends far beyond the walls of the selected hospital's laboratory department. It taps into the broader discourse surrounding healthcare quality and patient safety. The outcomes of this research will contribute to the collective understanding of best practices and innovative strategies to ensure safety in a laboratory setting.

Moreover, it underscores the ethical foundation of healthcare: the commitment to provide care that does not cause harm. As healthcare professionals swear the Hippocratic Oath, they pledge to prioritize patient welfare. Ensuring a safe laboratory environment aligns seamlessly with this pledge, as it safeguards the health and dignity of both the care providers and the recipients. The need for this study is amplified by the evolving nature of healthcare, which introduces new challenges and opportunities. The laboratory is not immune to these changes, and thus, our approach to safety must adapt and improve in parallel. By delving into the effectiveness of safety measures, we pave the way for evidence-based enhancements that resonate not only with this specific hospital but with healthcare institutions worldwide.

In the pages that follow, we will navigate through the labyrinth of safety in the laboratory, dissecting current practices, analyzing attitudes, and formulating recommendations that have the potential to reshape the safety landscape. It is our fervent hope that this study will not only elevate safety within the chosen hospital's laboratory department but also serve as a beacon of insight and guidance for healthcare laboratories globally. In doing so, it reinforces the bedrock of healthcare: ensuring that the pursuit of knowledge and healing is always accompanied by an unwavering commitment to safety and the preservation of life.

## II. MATERIALS AND METHODS

### Study Setting and Design

The study is conducted in the laboratory department of a selected hospital.

A mixed-methods approach is employed, combining quantitative and qualitative research methods to comprehensively assess safety measures' effectiveness.

### Participants

Laboratory staff (including technicians, scientists, and supervisors). Hospital management and safety officers.

Relevant stakeholders involved in safety protocols and procedures.

### Data Collection Instruments

Surveys/Questionnaires: Structured surveys are designed to assess quantitative aspects of safety, including

compliance rates, incident reporting, and staff perceptions.

Interviews: Semi-structured interviews are conducted with staff to gather qualitative data on attitudes, experiences, and suggestions regarding safety measures.

Observational Assessments: Direct observations are made within the laboratory to evaluate adherence to safety protocols and the utilization of safety equipment.

**Data Collection Procedures**

Surveys are distributed electronically or in print to laboratory staff, with anonymity assured to encourage candid responses.

Interviews are scheduled with selected participants, ensuring diversity in roles and experience.

Observational assessments are conducted over a specified period, with trained observers documenting safety practices and incidents.

**Quantitative Data Analysis**

This section deals with the responses and tabulation of the data collected from 25 respondents in Laboratory Department of the selected hospital.

The data analyzed and presented under the questionnaires divided into following Questionnaires are prepared under these parameters

- Awareness
- Personal Safety
- Technology and Equipment
- Fire Prevention
- House-keeping
- Emergency Procedures
- Waste Disposal
- Training Programme

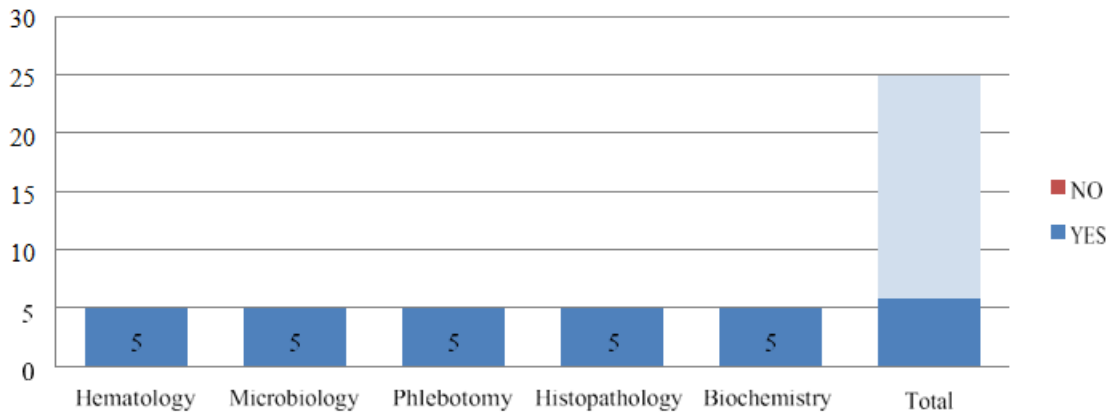
Distribution of the samples based on the departments in the laboratory

Departments	Number of staff
Biochemistry	5
Hematology	5
Microbiology	5
Phlebotomy	5
Histopathology	5

Distribution of samples based on the departments and their responses regarding to the awareness hazardous materials and post warning signs.

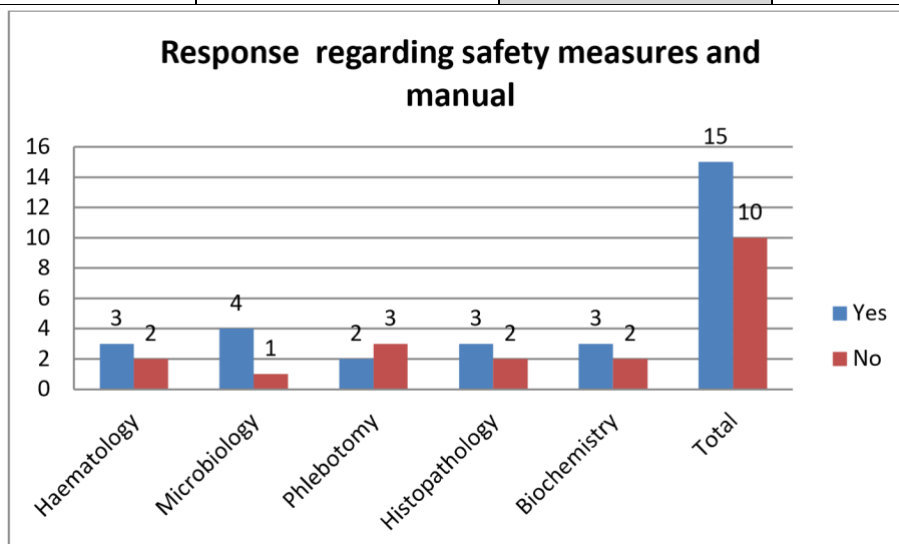
Department	YES	NO	Total
Hematology	5(20%)	0(0%)	5(20%)
Microbiology	5(20%)	0(0%)	5(20%)
Phlebotomy	5(20%)	0(0%)	5(20%)
Histopathology	5(20%)	0(0%)	5(20%)
Biochemistry	5(20%)	0(0%)	5(20%)
Total	25(100%)	0(0%)	25(100%)

Response regarding awareness



The 100% laboratory staffs are aware about the hazardous materials and post warning sign in the laboratory. Distribution of samples based the departments and their responses regarding to the awareness of safety measures and safety manual

Department	No. of respondents		Total
	Yes	No	
Haematology	3(12%)	2(8%)	5(20%)
Microbiology	4(16%)	1(4%)	5(20%)
Phlebotomy	2(8%)	3(12%)	5(20%)
Histopathology	3(12%)	2(8%)	5(20%)
Biochemistry	3(12%)	2(8%)	5(20%)
Total	15(60%)	10(40%)	25(100%)



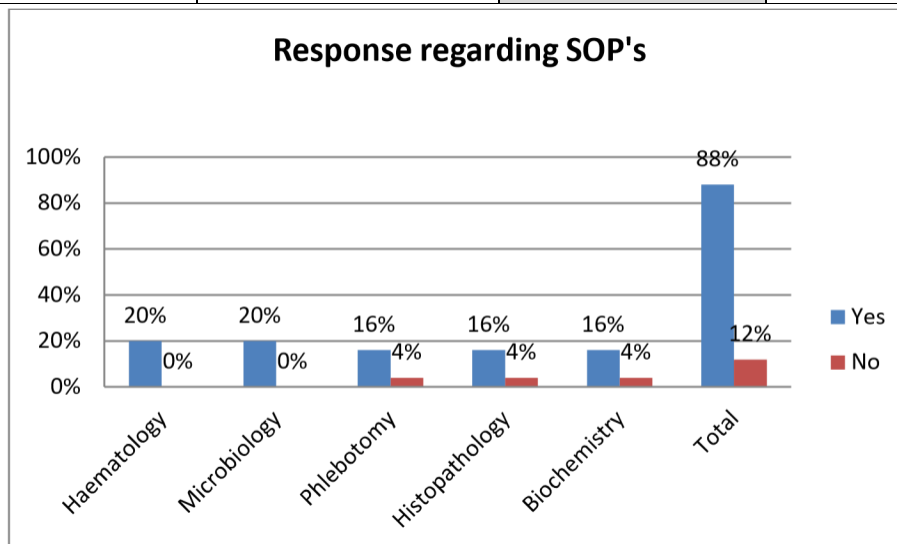
Out of 25 respondents of laboratory staff 60% said 'Yes' and 40% said 'No' for the awareness of safety measures and safety manual.

Out of 60% respondents, 12% laboratory staff aware from haematology department, 16% laboratory staff aware from microbiology, 8% laboratory staff aware from phlebotomy, 12% aware from histopathology and 12% laboratory staff aware from biochemistry department regarding safety measures and safety manual. Out of 40% respondents, 8% laboratory staff not aware from hematology department, 4% laboratory staff not aware from microbiology, 12% laboratory staff not aware from phlebotomy, 8% laboratory staff not aware from histopathology and 8% laboratory staff not aware from biochemistry department regarding safety measures

and safety manual.

Distribution of samples based on the departments and their responses regarding the awareness of SOPs (STANDARD OPERATING PROCEDURES) for safety measures and standards

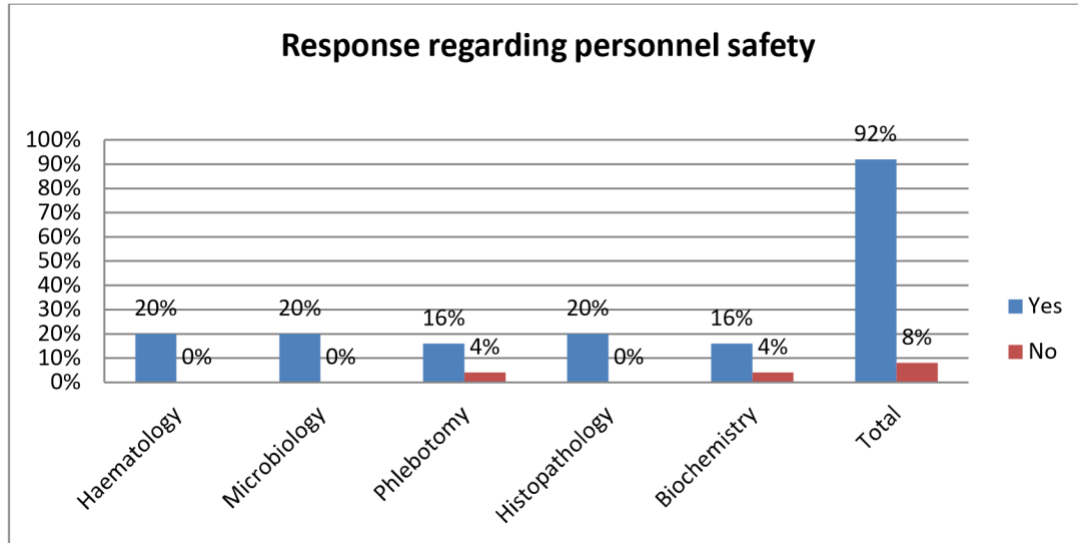
Department	No. of respondents		Total
	Yes	No	
Hematology	5(20%)	0(0%)	5(20%)
Microbiology	5(20%)	0(0%)	5(20%)
Phlebotomy	4(16%)	1(4%)	5(20%)
Histopathology	4(16%)	1(4%)	5(20%)
Biochemistry	4(16%)	1(4%)	5(20%)
Total	22(88%)	3(12%)	25(100%)



Totally 88% laboratory staff said 'Yes' and 12% laboratory said 'No' regarding the awareness of SOPs (STANDARD OPERATING PROCEDURES) for safety measures and standards. Out of 88% respondents, 20% laboratory staff aware from haematology department, 20% laboratory staff aware from microbiology, 16% laboratory staff aware from phlebotomy, 16% aware from histopathology and 16% laboratory staff aware from biochemistry department regarding SOPs for safety measures and safety standards. Out of 22% respondents, 0% laboratory staff not aware from hematology department, 0% laboratory staff not aware from microbiology, 4% laboratory staff not aware from phlebotomy, 4% laboratory staff not aware from histopathology and 4% laboratory staff not aware from biochemistry department regarding SOPs for safety measures and safety standards.

Distribution of samples based on the departments and their responses regarding the personal safety of the laboratory staff

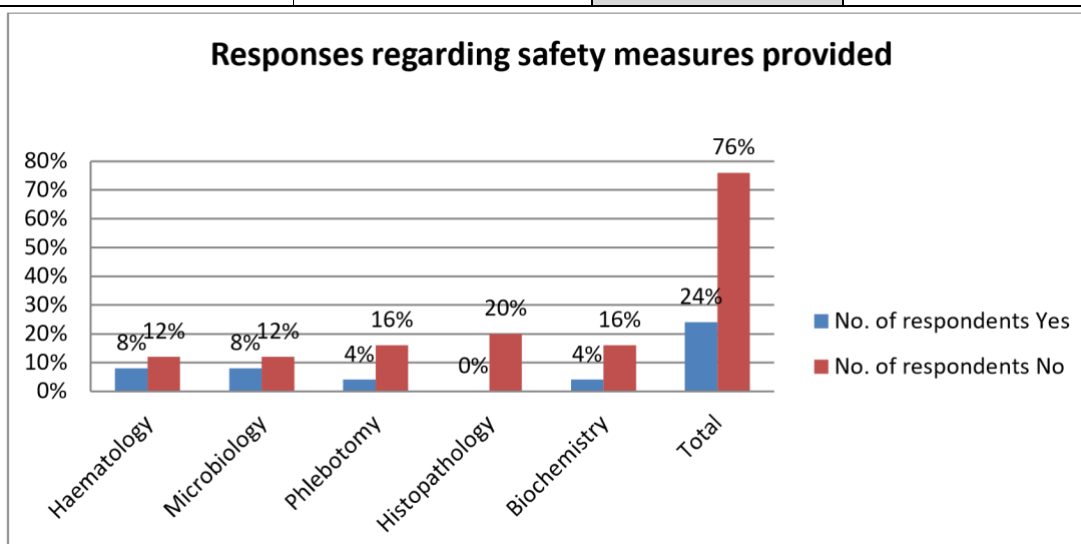
Department	No. of respondents		Total
	Yes	No	
Hematology	5(20%)	0(0%)	5(20%)
Microbiology	5(20%)	0(0%)	5(20%)
Phlebotomy	4(16%)	1(4%)	5(20%)
Histopathology	5(20%)	0(0%)	5(20%)
Biochemistry	4(16%)	1(4%)	5(20%)
Total	23(92%)	2(8%)	25(100%)



Total 92% laboratory staff said 'Yes' and 8% laboratory staff said 'No' regarding personal safety in the laboratory like gloves, coveralls, gown. Out of 92% respondents, laboratory staff of hematology, microbiology and histopathology department shows average 20% and biochemistry department and phlebotomy show average 16% 'Yes' regarding personal safety in the laboratory. Out of 8% respondents, laboratory staff of biochemistry department and phlebotomy shows average 4% 'No' regarding personal safety in the laboratory.

Distribution of samples based on the departments and their responses regarding safety measures provided

	No. of respondents		Total
	Yes	No	
Haematology	2(8%)	3(12%)	5(20%)
Microbiology	2(8%)	3(12%)	5(20%)
Phlebotomy	1(4%)	4(16%)	5(20%)
Histopathology	0(0%)	5(20%)	5(20%)
Biochemistry	1(4%)	4(16%)	5(20%)
Total	6(24%)	19(76%)	25(100%)

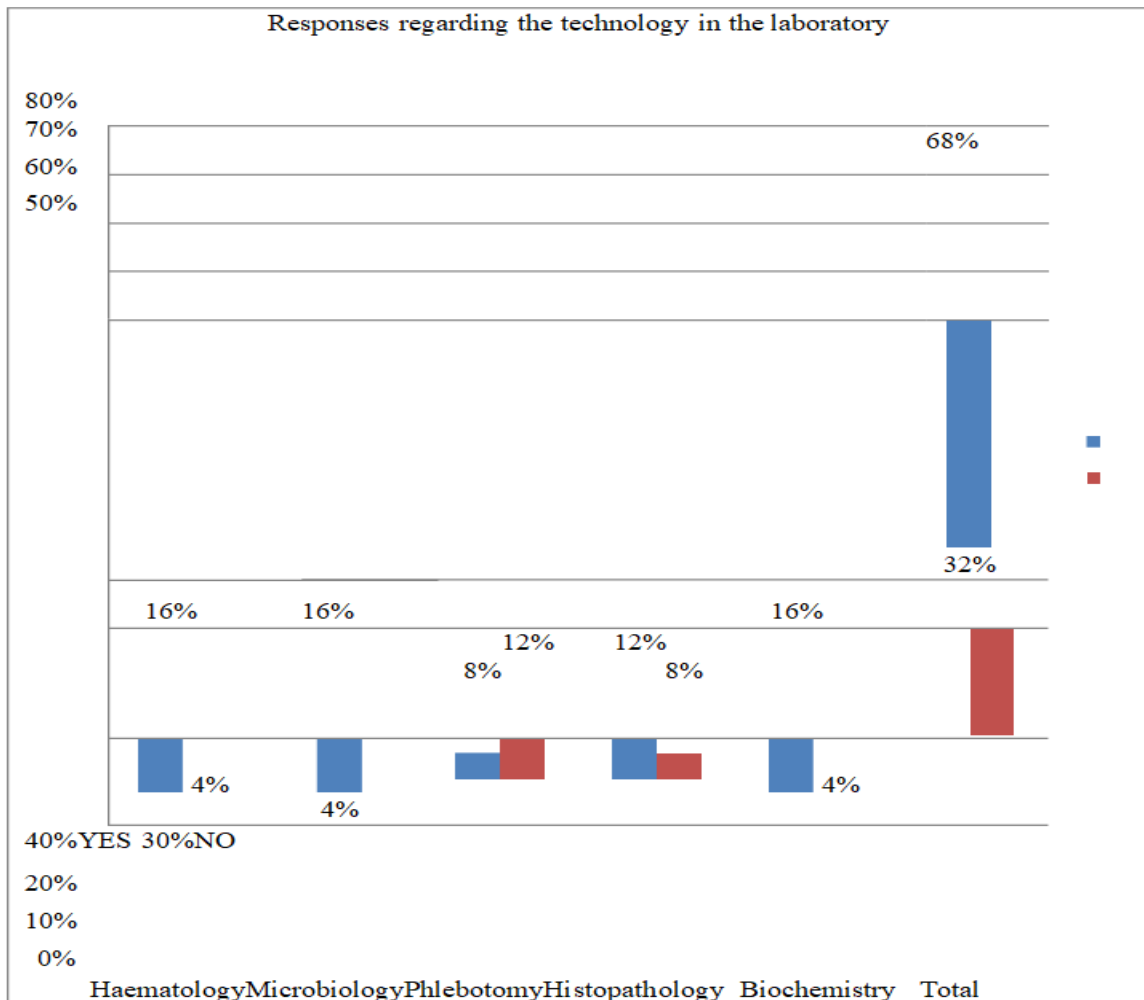


Out of 100% in that 24% laboratory staff said 'Yes' and 76% laboratory staff said 'No' regarding safety measures provided in laboratory.

Out of 24% respondents, 8% laboratory staff said yes from haematology department, 8% laboratory staff said yes from microbiology, 4% laboratory staff said yes from phlebotomy, 0% laboratory staff said yes from histopathology and 4% laboratory staff said yes from biochemistry department regarding safety measures provided in the laboratory. Out of 76% respondents, 12% laboratory staff said no from hematology department, 12% laboratory staff said no from microbiology, 16% laboratory staff said no from phlebotomy, 20% laboratory staff said no from histopathology and 16% laboratory staff said no from biochemistry department regarding safety measures provided in the laboratory.

Distribution of samples based on the departments and their responses regarding the technology in the laboratory

Department	No. of respondents		Total
	Yes	No	
Haematology	4(16%)	1(4%)	5(20%)
Microbiology	4(16%)	1(4%)	5(20%)
Phlebotomy	2(8%)	3(12%)	5(20%)
Histopathology	3(12%)	2(8%)	5(20%)
Biochemistry	4(16%)	1(4%)	5(20%)
Total	17(68%)	8(32%)	25(100%)



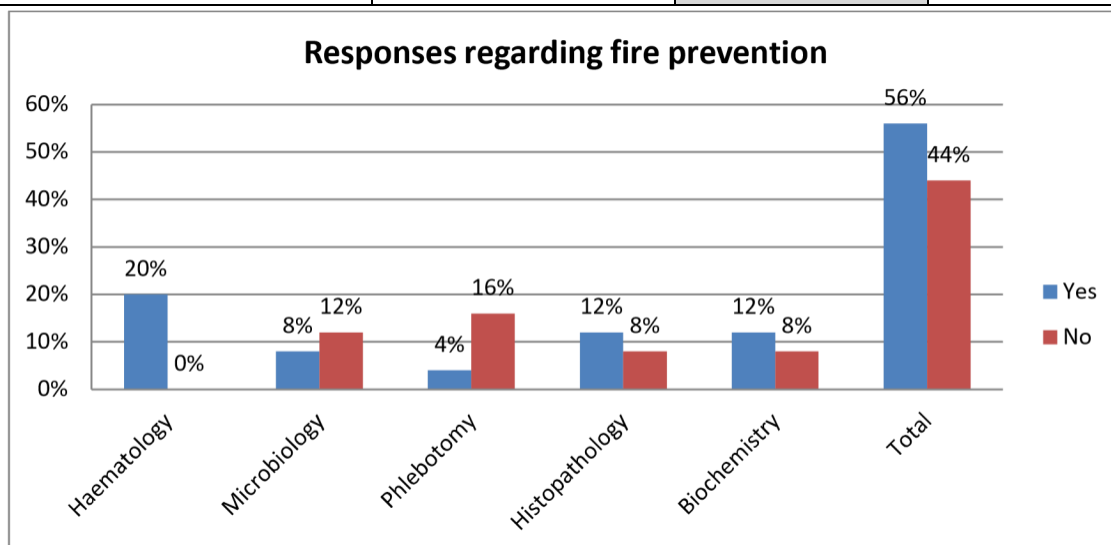


Totally 68% laboratory staff said 'Yes' and 32% laboratory staff said 'No' regarding technology in the laboratory.

Out of 68% respondents, 16% laboratory staff said yes from haematology department, 16% laboratory staff said yes from microbiology, 8% laboratory staff said yes from phlebotomy, 12% laboratory staff said yes from histopathology and 16% laboratory staff said yes from biochemistry department regarding technology in the laboratory. Out of 32% respondents, 4% laboratory staff said no from hematology department, 4% laboratory staff said no from microbiology, 12% laboratory staff said no from phlebotomy, 8% laboratory staff said no from histopathology and 4% laboratory staff said no from biochemistry department regarding technology in the laboratory.

Distribution of samples based on the departments and their responses regarding fire prevention provided in the laboratory

Department	No. of respondents		Total
	Yes	No	
Haematology	5(20%)	0(0%)	5(20%)
Microbiology	2(8%)	3(12%)	5(20%)
Phlebotomy	1(4%)	4(16%)	5(20%)
Histopathology	3(12%)	2(8%)	5(20%)
Biochemistry	3(12%)	2(8%)	5(20%)
Total	14(56%)	11(44%)	25(100%)

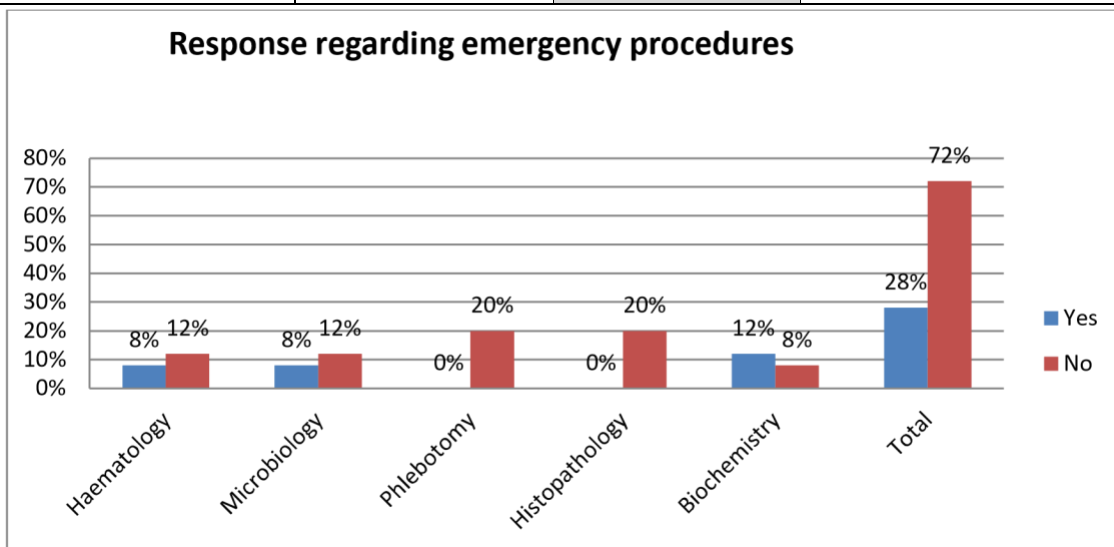


Total 56% laboratory staff said 'Yes' and 44% laboratory staff said 'No' regarding potential fire hazards equipped with appropriate extinguishers and/ or fire blankets for emergency causes.

Out of 56% respondents, 20% laboratory staff said yes from hematology department, 8% laboratory staff said yes from microbiology, 4% laboratory staff said yes from phlebotomy, 12% laboratory staff said yes from histopathology and 12% laboratory staff said yes from biochemistry department regarding fire prevention provided in the laboratory. Out of 44% respondents, 0% laboratory staff said no from hematology department, 12% laboratory staff said no from microbiology, 16% laboratory staff said no from phlebotomy, 8% laboratory staff said no from histopathology and 8% laboratory staff said no from biochemistry department regarding fire prevention provided in the laboratory.

Distribution of samples based on the departments and their responses regarding the location, use and limitation of safety devices during emergency procedures

Department	No. of respondents		Total
	Yes	No	
Haematology	2(8%)	3(12%)	5(20%)
Microbiology	2(8%)	3(12%)	5(20%)
Phlebotomy	0(0%)	5(20%)	5(20%)
Histopathology	0(0%)	5(20%)	5(20%)
Biochemistry	3(12%)	2(8%)	5(20%)
<b>Total</b>	<b>7(28%)</b>	<b>18(72%)</b>	<b>25(100%)</b>

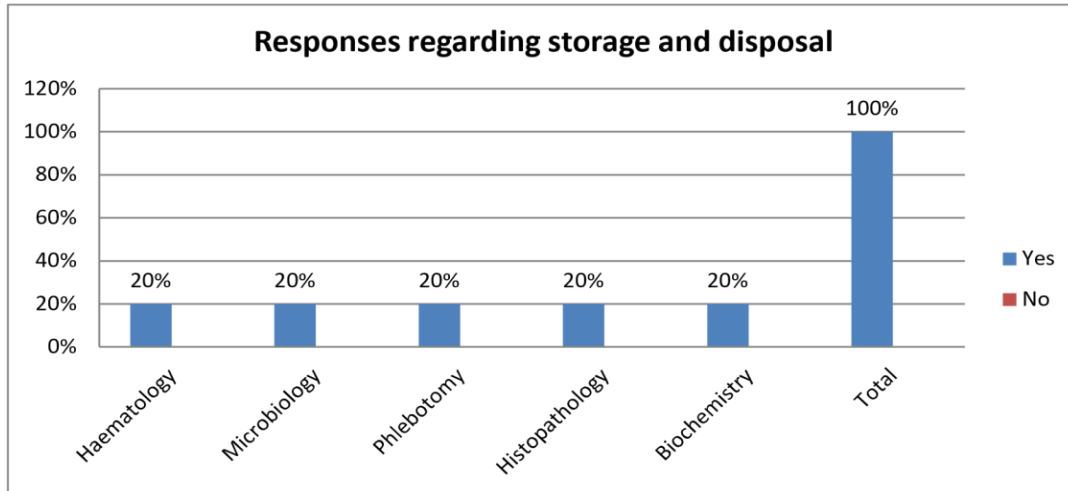


Out of 100% in that 28% laboratory staff said 'Yes' and 72% laboratory staff said 'No' regarding the location, use and limitation of safety devices during emergency procedures.

Out of 28% respondents, laboratory staff of hematology and microbiology departments shows average 8%, laboratory staff of histopathology department and phlebotomy shows average 0% and laboratory staff of biochemistry department shows 12% said 'Yes' regarding location, use and limitation of safety devices during emergency procedures. Out of 72% respondents, laboratory staff of hematology and microbiology departments shows average 12%, laboratory staff of histopathology department and phlebotomy shows average 20% and laboratory staff of biochemistry department shows 8% said 'No' regarding location, use and limitation of safety devices during emergency procedures.

Distribution of samples based on the departments and their responses regarding storage and disposal of dangerous materials in the laboratory

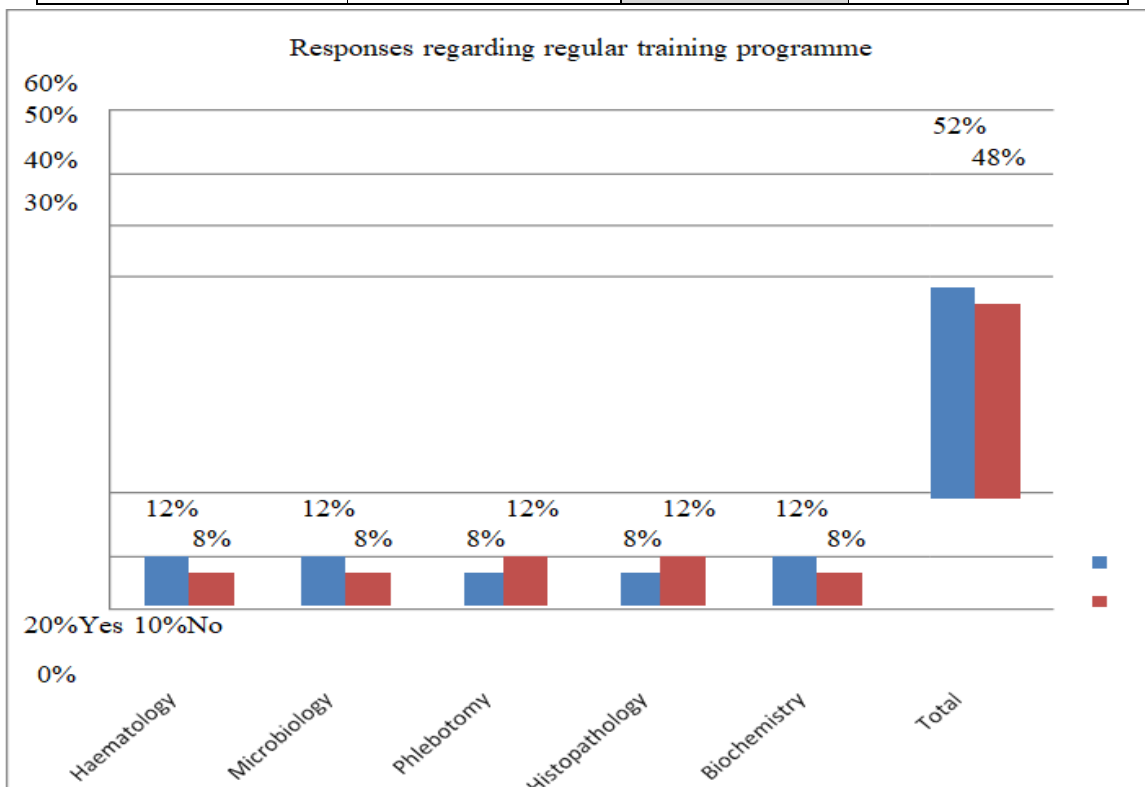
Department	No. of respondents		Total
	Yes	No	
Haematology	5(20%)	0(0%)	5(20%)
Microbiology	5(20%)	0(0%)	5(20%)
Phlebotomy	5(20%)	0(0%)	5(20%)
Histopathology	5(20%)	0(0%)	5(20%)
Biochemistry	5(20%)	0(0%)	5(20%)
<b>Total</b>	<b>25(100%)</b>	<b>0(0%)</b>	<b>25(100%)</b>



The above chart Depicts that 100% laboratory staff said 'Yes' regarding storage and disposal of dangerous materials in the laboratory

Distribution of samples based on the departments and their responses regarding regular training programme for the safety measures in the laboratory

Department	No. of respondents		Total
	Yes	No	
Haematology	3(12%)	2(8%)	5(20%)
Microbiology	3(12%)	2(8%)	5(20%)
Phlebotomy	2(8%)	3(12%)	5(20%)
Histopathology	2(8%)	3(12%)	5(20%)
Biochemistry	3(12%)	2(8%)	5(20%)
Total	13(52%)	12(48%)	25(100%)



Above chart shows that out of 25 respondents 52% said 'Yes' and 48% said 'No' regarding regular training programme in the laboratory.

Out of 52% of respondents, laboratory staff of hematology, microbiology and biochemistry departments shows average 12% and laboratory staff of histopathology department and phlebotomy shows average 8% said 'Yes' regarding regular training programme in the laboratory. Out of 48% of respondents, laboratory staff of hematology, microbiology and biochemistry departments shows average 8% and laboratory staff of histopathology department and phlebotomy shows average 12% said 'No' regarding regular training programme in the laboratory.

### III. DISCUSSION

#### **Positive Safety Culture**

The generally positive safety culture is encouraging but should not overshadow the need for addressing concerns regarding reporting channels. Encouraging open and anonymous reporting can help uncover latent safety issues.

#### **Incident Analysis**

Human error is a significant contributor to incidents. This underscores the importance of ongoing training, supervision, and a culture of continuous improvement to reduce error rates. **Safety Equipment and Infrastructure**

The well-maintained safety equipment is a positive finding, but occasional difficulties in accessing PPE must be addressed promptly to ensure staff have ready access to essential protective gear.

#### **Training and Education**

Discrepancies in training experiences indicate a need for standardized and regular safety training. Incorporating hands-on exercises can enhance staff readiness and understanding.

#### **Compliance and Enforcement**

Variations in compliance rates suggest the need for consistent supervision and accountability mechanisms across all laboratory areas. Best practices from high-compliance areas can be shared.

#### **Communication and Reporting**

Enhancing communication channels and simplifying incident reporting processes can facilitate early identification and resolution of safety concerns, contributing to a safer environment.

#### **Emergency Response and Preparedness**

To boost staff confidence and readiness for emergencies, more frequent and realistic emergency drills should be conducted, and feedback from participants should inform improvements.

#### **Environmental Impact**

The hospital's eco-friendly practices are commendable, but further initiatives, such as reducing energy consumption and promoting recycling, can enhance environmental sustainability.

In conclusion, this study reveals both strengths and areas for improvement in the effectiveness of safety measures within the laboratory department. The results highlight the need for a multifaceted approach to enhance safety, encompassing culture, training, equipment access, compliance, communication, emergency preparedness, and environmental sustainability. Implementing the recommendations derived from this study will contribute to a safer laboratory environment, aligning with the hospital's commitment to patient and staff well-being.

### IV. CONCLUSION

The study was framed mainly to understand the safety standards for effective and safe laboratory practice and to analyze the responses of laboratory department staff regarding the existing safety measures adopted and to evaluate the effectiveness of the existing safety measures against standards and to provide recommendations for safe working practice in the laboratory. The findings of this study serve as a valuable roadmap for enhancing safety measures within the laboratory department, ultimately contributing to a safer healthcare environment. It is evident that while there are commendable aspects of safety in place, there are also opportunities for improvement. The following key takeaways and recommendations emerge:

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