

## Research article

**Effect of education on knowledge, attitude and practices of safety precautions among laboratory technicians of a tertiary care center in Mangalore**Mamatha B.V.<sup>1</sup>, Bhagyajyothi M. Bhat<sup>1</sup>, Preeval Shreya Crasta<sup>2</sup>, Niranjana P. Khadilkar<sup>3</sup><sup>1</sup>Department of Biochemistry, <sup>2</sup>Department of Community Medicine, <sup>3</sup>Department of Pathology, Kanachur Institute of Medical Sciences, Natekal, University Road, Mangaluru, 575018, Karnataka, India

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Corresponding author: **Bhagyajyothi M. Bhat**. Email: dr.bhagyajyothi@kanachur.edu.in**ABSTRACT**

**Introduction and Aim:** The clinical laboratory technicians are expected to have knowledge, to have a favourable attitude and practice safety precautions at their workplace. Though they are trained with safety precautions during their study period, they may not adhere to them upon joining the job. The present study was aimed at assessing the effect of educational intervention on knowledge, attitude and practices of safety precautions among laboratory technicians of our medical college hospital.

**Materials and Methods:** This interventional study included all the technicians. A validated questionnaire containing questions related to personal information, knowledge, attitude and practices of safety precautions was used. Pre-test was conducted followed by a lecture session regarding safety precautions. After one hour, post-test was conducted in a similar way as pre-test and responses were collected. Data was analysed using the statistical software SPSS version 28. Qualitative variables were presented as frequency and percentage and quantitative variables as mean SD. McNemar test was employed to find the association between the knowledge, attitude questions with pre-test and post-test scores. Paired t test was used for comparison of knowledge and attitude overall scores. p value less than 0.05 was considered statistically significant.

**Results:** The study showed a significant difference at the level of knowledge towards safety precautions before and after the educational intervention. There was no significant difference at the levels of attitude among the participants.

**Conclusion:** Regular training of safety precautions may improve the knowledge of laboratory technicians, which will benefit both the technicians and the institution.

**Keywords:** Knowledge; attitude; practices; laboratory technicians; safety precautions.

**INTRODUCTION**

Clinical laboratory plays an important role in health care system. Laboratory technicians are the health care workers who are an integral part of health care system. They are usually exposed to many types of samples in the laboratory during handling, transporting, collecting, storage and disposal (1-3). They also have potential risk of infections if they do not follow safety precautions. Centre for Disease Control (CDC) has defined universal work precautions which are to be followed by all the health care workers (4), which may reduce the risk of laboratory acquired infections which are known to cause serious harm to their health. Laboratory technicians are already aware of safety precautions as a part of their training. However, because of increased workload and negligence, they might not adhere to the protocols of safety (5). Therefore, educating them constantly with the help of small group discussions and demonstrations might help in reducing the incidence of infections and hazards (6). Different observations were demonstrated by earlier workers on this aspect (7,8). In view of this, the present study was designed, involving the assessment of the knowledge, attitude and practices (KAP) of laboratory technicians regarding safety protocol and also

assessment of the effect of educational intervention on knowledge, attitude and practices of safety precautions among laboratory technicians of our medical college hospital.

**MATERIALS AND METHODS**

The present institutional based interventional study included all the laboratory technicians having qualification of Diploma in Medical Laboratory Technology (D.MLT), BSc Medical Laboratory Technology (BSc MLT) and BSc Medical Laboratory Technology interns working in various sections of Central Laboratory of our medical college hospital. The study was conducted in the Central Laboratory of our medical college hospital. The study included all the laboratory technicians and interns who gave written informed consent. The research work was carried out after obtaining the ethical clearance (EC/NEW/INST/2023/3522/KIMS-IEC/A013/2023) from the Institutional Ethics Committee. A modified questionnaire of Mehta and Diwakar (6) was employed. Self-administered questionnaire was used which included demographic details, questions on knowledge, attitude and practices. The questionnaire was validated for the content by 2 subject experts. There were 10 questions on knowledge, 9 each on

attitude and practices section. Brief explanation of the purpose of the study, the questions, and implications of the study was given to the participants and only those who volunteered for the study were included. Participants were given serial numbers and were seated in the demonstration room away from each other to avoid cross communication. Pre-test was conducted prior to the lecture session and the responses were collected. A brief lecture session was conducted by the investigator using a power point presentation regarding safety precautions and their importance, followed by active interaction with the participants. After one hour, post-test was conducted in a similar way as pre-test and responses were collected. Confidentiality was maintained throughout the study.

### Statistical analysis

Data was entered in Microsoft Excel, analysed using the statistical software SPSS version 28. Qualitative variables are presented as frequency and percentage. Quantitative variables are presented as mean  $\pm$  SD. McNemar test was employed to find the association between knowledge, attitude questions with pre-test and post-test scores. Paired t test was used for comparison of knowledge and attitude overall scores. p value  $<0.05$  was considered statistically significant.

### RESULTS

Out of total 47 participants, 38(80.9%) were female and 9 (19.1%) were male participants. Mean age of study participants was  $26.64 \pm 4.341$  years ranging between 19 and 44 years. Considering the education

qualification, 21(44.7%) were D.MLT and 26(55.3%) were BSc MLT holders.

There was significant improvement in the level of knowledge among laboratory technicians regarding universal work precaution for disposal of unused blood bag, prophylactic measure to be taken after injury/exposure at workplace, duration needed for alcohol based hand rubs to eliminate the germs, strength of hypochlorite solution for laboratory spillage use, the ideal method of disposal of used syringe needles in the laboratory, the correct colour coding method for disposing used cotton swab and the first step in correct hand rub usage. However, laboratory technicians had sound knowledge about some of the safety precautions (Table 1).

Majority of the laboratory technicians showed a favourable attitude towards the questions provided (Table 2).

Attitude towards wearing gloves and overcrowding increasing the risk of infection spread showed a significant increase after the teaching session. It was observed that all the laboratory technicians practiced hand hygiene before leaving the laboratory and the majority took a shower/bath regularly after working hours. Using hand gloves during phlebotomy, doffing hand gloves before touching computer or telephone at workplace and closing the lid of centrifuge before centrifugation was commonly practiced. Only a few participants checked Hepatitis B antibody titres in blood at regular intervals (Table 3).

**Table 1:** Knowledge regarding safety precautions among laboratory technicians

Sl. No.	Questions	Correct response		P value
		Pre-test n (%)	Post-test n (%)	
1	Universal work precaution for disposal of unused blood bags.	14(29.8)	44(93.6)	0.0001*
2	Disease with highest potential risk of infection in the laboratory	42(89.4)	46(97.9)	0.219
3	Prophylactic measure to be taken after injury/exposure at workplace	26(55.3)	45(95.7)	0.0001*
4	Duration needed for alcohol-based hand rubs can eliminate the germs	17(36.2)	47(100.0)	0.003*
5	Activities is prohibited at the workplace	46(97.9)	46(97.9)	1.000
6	The strength of hypochlorite solution for laboratory spillage use	22(46.8)	41(87.2)	0.0001*
7	The vaccination which is mandatory for all laboratory workers	45(95.7)	47(100.0)	0.500
8	The ideal method of disposal of used syringe needles in the laboratory	35(74.5)	41(87.2)	0.035*
9	The correct color-coding method for disposing used cotton swab	37(78.7)	47(100.0)	0.002*
10	The first step in correct hand rub usage	21(44.7)	45(95.7)	0.0001*

Statistical test used: McNemar test. \*p value  $<0.05$  is considered statistically significant

**Table 2:** Attitudes regarding safety precautions among laboratory technicians

Sl. No.	Questions	Positive attitude		p value
		Pre-test n (%)	Post-test n (%)	
1	The risk of infection can be decreased by following proper personal hygiene	43(91.5)	46(97.9)	0.250
2	Biomedical waste management is an extra workload on the laboratory personnel	36(76.6)	37(78.7)	1.000
3	Proper hand hygiene precautions to be taken before leaving the laboratory and after removing gloves	47(100.0)	47(100.0)	0.500
4	Completion of vaccination against hepatitis B is an essential prerequisite for all laboratory workers	44(93.6)	46(97.9)	0.625
5	I feel guilty if I do not practice good hand hygiene at workplace	37(78.7)	43(91.5)	0.109
6	I think wearing gloves can replace the need of hand hygiene practices at workplace	18(38.3)	29(61.7)	0.021*
7	I feel overcrowding in the workplace increases the risk of laboratory acquired infections	36(76.6)	44(93.6)	0.039*
8	I practice proper Biomedical waste management at laboratory	37(78.7)	39(83.0)	0.689
9	I think periodic training programs on biosafety measures are helpful for laboratory personnel	40(85.1)	41(87.2)	1.000

Statistical test used: McNemar test. \*p value <0.05 is considered statistically significant

**Table 3:** Practice regarding safety precautions among laboratory technicians

Sl. No.	Questions	Frequency (n=47)	Percentage
1	Using hand gloves during phlebotomy	41	87.2
2	Practicing hand hygiene before leaving the laboratory	47	100.0
3	Wearing your scrubs outside workplace	4	8.5
4	Doffing hand gloves before touching computer or telephone at workplace	40	85.1
5	Methods of disposal of needle after use		
	Bend	3	6.4
	Recap	15	31.9
	Manually remove	14	29.7
	Burn	15	31.9
6	Checking Hepatitis B antibody titer in blood at regular intervals	16	34.0
7	Taking shower/bath regularly after working hours	46	97.9
8	Closing the lid of centrifuge before centrifugation	44	93.6
9	Regular fumigation of workstations	23	48.9

**Table 4:** Comparison of knowledge and attitude scores pre-test and post-test among laboratory technicians

Variables	Pre-test score	Post-test score	Absolute learning gain	Class average normalized gain (g)	t value	p value
Knowledge	6.47±1.333	9.28±0.949	2.81	0.778	-12.270	0.0001*
Attitude	14.13±1.527	14.32±1.40	1.70	0.134	-3.450	0.512

Statistical test used: Paired -'t' test ; \*p value <0.05 is considered statistically significant

The study revealed that the mean score for knowledge in the pre-test was 6.47±1.333 and post-test was 9.28 ±0.949 and the difference was statistically significant (p value =0.0001). There was no significant difference in the attitude of the study participants (p value =0.512). Hake's class average normalized gain metrics clearly indicated good learning gain only in the knowledge section (Table 4).

## DISCUSSION

The present study was conducted to assess the effect of teaching sessions on the laboratory technicians'

knowledge, attitude and practices of safety precautions. The authors observed a significant improvement at the level of knowledge after the teaching session.

Laboratory technicians are exposed to teaching regarding the safety precautions during their study period and internship as a part of their University curriculum. However, upon joining for duty, there is a tendency to forget these lessons. Their attitude may turn unfavourable and they may not practice. Multiple reasons may contribute to this deviation such as heavy work schedule, less time availability,

poor manpower in the workplace, low levels of motivation, unavailability of materials needed for the practice and many more (6,7).

In the present study, significant differences at the level of knowledge regarding some of the safety precautions between pre-test and post-test results were observed. The questions on the knowledge about the duration needed for alcohol based hand rub to eliminate germs, strength of hypochlorite used for laboratory spillage, first step of hand rub usage were answered correctly by less than 50% of participants in the pre-test session. However, significant improvement in the level of knowledge was observed in the post-test. Another significant finding was that a considerably sound knowledge regarding Hepatitis B infection/vaccination and workplace discipline demonstrated a fair orientation of basic knowledge. The present observation is contradictory to a few earlier studies, where a poor knowledge regarding Hepatitis B among the laboratory technicians was reported (9). Some of the earlier studies also demonstrated sound knowledge towards Hepatitis B among the health care workers (10).

The present study participants had an overall favourable attitude towards the laboratory safety precautions. No statistically significant change was noticed between pre-test and post-test values. This observation may be because of the fact that they already had good knowledge and attitude towards safety precautions. In some of the attributes like wearing gloves and overcrowding increasing the risk of infection spread, their attitude changed positively following the teaching intervention. This observation is different from few of the earlier similar studies, where the attitude of the participants was unfavourable (11). In a systematic review, a favourable attitude regarding safety precautions was reported (12).

The participants of the present study had received an orientation program on taking up employment. This might have resulted in demonstration of good levels of knowledge and favourable attitude. Certain aspects of both the knowledge and attitude domain were not appreciated in the pre-test session. This current observation is in partial accordance with an earlier study, where the pretest score was very poor and significant improvement was observed at the level of the knowledge followed by the teaching session (7). As part of working protocols, laboratories in medical college hospitals conduct periodic educational programs and assessments for health care workers. This may be very useful in reminding and re-orienting the health care workers of basic work precautions to be practiced. In this context, keeping in mind the past incidences of laboratory hazards, an interventional study was conducted, where the pre-test knowledge of the participants towards identification and immediate response for laboratory

hazards was poor (13). Low compliance to hand washing was observed in one of the earlier studies, wherein the authors expressed concern over the hospital being a tertiary care centre (14). The authors emphasised on the availability of materials for strict adherence of safety precautions including hand washing (14).

In an Indian study, a significant difference at the level of knowledge, attitude and practices was observed before and after the educational intervention, but there was no effect of teaching on the knowledge regarding barrier precautions (6). In a review article, poor levels of knowledge, attitude and practices on occupational safety among the laboratory workers was reported (15), which also emphasised on implementation of regular training sessions in order to improve all these aspects (15,16). Implementation and adherence of infection control guidelines was ascertained by earlier authors, wherein involvement of hospital administration and policy makers in providing the ambience for proper implementation of these guidelines was highlighted (17). The need for educational intervention in the form of training sessions was emphasised by many of the earlier workers in this field (11, 12, 15, 16, 18). In this regard, laboratory accreditation boards mandate periodic training of laboratory technicians and health care workers. Although the institution where the present study was conducted is only 8 years young and a majority of the laboratory technicians of our institution have relatively less work experience, they showed fairly good knowledge of safety precautions. This might be because of the fact that they have received an initial orientation program upon employment. Also, in our institution educational programs for laboratory technicians regarding hand hygiene, biomedical waste disposal, etc. are conducted every year for enriching their existing knowledge. Moreover, our BSc MLT students are encouraged to take part in poster presentation, collage making etc. on a regular basis as part of their extracurricular activities. Students are encouraged to take active participation in State and National level conferences. These may be the other reasons for their higher levels of knowledge. The present observation of significant improvement in the knowledge post-test is because of educational intervention. It is observed that some of the hospitals practice incentive driven knowledge enhancement educational programs for health care workers/laboratory technicians. Such activities are suggested to be institutionalised as part of work policy.

The present study has few limitations. The present study included both DMLT and BSc MLT qualified technicians who might not have the same level of knowledge and attitudes. The present study involved laboratory technicians working in various sections, some of whom may have higher levels of knowledge.

The questionnaire employed in the present study did not include all the attributes of standard biosafety measures, but only a few commonly practiced biosafety measures.

## CONCLUSION

In conclusion, the present study observed significant improved levels of knowledge of safety precautions among the laboratory technicians following the teaching session emphasizing the need for regular training programs. It may be suggested that the stand-alone laboratories and the laboratories attached to private hospitals make regular periodic training for laboratory technicians and health care workers, a policy, so that it can improve the levels of adherence and practice of these safety precautions. This will benefit the healthcare workers directly and the respective institution indirectly. It is suggested that changes may be implemented in the regular curriculum of BSc MLT course to include periodic assessment of their knowledge with regards to hand hygiene, biomedical waste management, safety precautions etc.

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## CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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