

**Original article****A STUDY ON KNOWLEDGE, ATTITUDE AND PRACTICE OF BIO-SAFETY AMONG HEALTHCARE WORKERS IN A TERTIARY CARE HOSPITAL, AHMEDABAD****KAP study of bio-safety**

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**ABSTRACT:****Introduction:**

The field of bio-safety covers risk assessment, management of such risks, the regulation, communication & mitigation of adverse events with the aim of promoting a safe environment for Clinical Laboratory testing.

**Methodology:**

This was a comparative cross sectional study which used a standardized, structured self-administered questionnaire consisting of thirty question, ten each to survey Knowledge, Attitude and Practice(KAP) of bio-safety among healthcare workers(HCWs). A total of 75 randomly selected HCWs participated in the study.

**Results:**

Awareness regarding Universal precaution guidelines and hand hygiene were found to be 98.67% and 88% respectively. 80% HCW know highest risk of acquiring Hepatitis B infection after Needle Stick Injury(NSI), 92% know it is prevented by vaccination. However only 74.67% know what to do in case of NSI, only 25.33% know to write injury report to authorities. Though 45.33% participants had NSI, only 6.66% reported to authority. 73.33% were aware about Bio-medical Waste(BMW) rules 2016. Only 52% participants were aware that segregation is the key step in BMW management and the knowledge improved significantly after training.

**Discussion:**

This current study revealed that nursing staff have lowest and laboratory technicians have highest mean scores of KAP about bio-safety in the pre-interventional phase. Knowledge and attitude of HCWs after educational video intervention were extremely statistically significant (P value <0.0001, paired t-test).

**Conclusion:**

From this educational interventional study, it was concluded that knowledge and attitude regarding various aspects of bio-safety among HCWs were quite unsatisfactory. Knowledge and attitude improved substantially in post-training assessment.

**Key words:** Bio-safety, Health Care Workers(HCWs), Needle Stick Injury(NSI)

## **INTRODUCTION:**

The technical advances of the past 150 years have transformed medicine from an art to a modern science. The field of bio-safety covers risk assessment, management of such risks, the regulation, communication & mitigation of adverse events with the aim of promoting a safe environment for Clinical Laboratory testing.<sup>1</sup>

Hazards are an inherent property of a substance, agent, source of energy or situation that has the potential of causing undesirable consequences while risk is the probability that damage to 'life, health, and or the environment' may occur from a hazard. In this regard, occupational hazards refer to workplace activities that have the potential to cause/increase the risk of injury or ill health.<sup>2,3,4</sup> Occupational safety is the control of hazards in the work place and protecting the health and safety of staff while on the job, irrespective of vocation.<sup>4,5</sup>

Occupational health and safety is an important issue because of high rates of associated morbidity and mortality of exposed workers. An estimated 100,000 people die from occupational illnesses, while about 400,000 new cases of occupational diseases are diagnosed every year.<sup>6,7</sup> Some studies have revealed that clinical laboratory personnel are 3 to 9 times more likely than general population to become infected with pathogens such as Mycobacterium tuberculosis and this reveals the extent of hazards such population group are exposed to.<sup>8</sup> It is therefore essential that bio-safety measures be implemented at all times in order to reduce the risk of exposure to hazard on pathogens and possibility of laboratory acquired infections on the part of workers in laboratory. Bio-safety will also help to reduce accidental discharge of such pathogens into the immediate environment. The knowledge & application of bio-safety principles also ensure that test methods are safe in the laboratory and that potentially infectious pathogens are handled with minimum risk to laboratory staff.<sup>9</sup>

The factors that contribute to occupational illnesses and injuries in health care facilities include negligence and carelessness of health care workers, lack of adequate protective aids and equipment, inadequate number of staff, excessive workload, failure to observe basic safety and hygiene guidelines and inadequate operational knowledge of modern healthcare equipment.<sup>10</sup> These prompted the US Centre for Disease Control and Prevention (CDC) to develop standard precautions for preventing occupational exposures and handling of infectious materials in health care facilities.<sup>11,12</sup> Adherence to the standard

precautions guidelines has been shown to be effective in curtailing occupational illnesses and injuries among HCW in health care facilities.<sup>13</sup>

Therefore, this study was undertaken to evaluate the Knowledge, Attitude and Practice of bio-safety among health care workers of in a tertiary care hospital, Ahmedabad.

## **METHODOLOGY:**

This was a comparative cross sectional study which used a standardized, structured self-administered questionnaire to survey knowledge, attitude and practice of bio-safety among healthcare workers. Study was carried out after getting ethical approval from Institutional Review Board. This study was carried out in April 2018. A total of 75 randomly selected healthcare workers participated in the study. Confidentiality of all the data was maintained.

The questionnaire was consisted of thirty standardized questions, ten each for knowledge, attitude and practice. Before the questionnaires were handed out to participants, the aims and objectives of the study were explained and a written informed consent form was duly signed by them. A post-educational (after training on bio-safety) questionnaire that is same as pre-educational questionnaire was administered to all enrolled healthcare workers after training on bio-safety.

After collecting, data were coded and captured on Excel for analysis.

## **RESULTS:**

Out of total 75 respondents 25 (33.33%) were resident doctors, 25 (33.33%) were nursing staff and 25 (33.33%) were laboratory technicians. Knowledge, Attitude and Practice (KAP) was assessed by asking questions about universal precautions, Needle Stick Injury (NSI), vaccination, Post Exposure Prophylaxis (PEP) and Biomedical Waste Management (BMW).

The first part of the questionnaire for this study was to assess knowledge regarding bio-safety. Correct response to the questions differs before and after training of bio-safety. The knowledge increased after training. 98.67% (74) of respondents had knowledge about universal precaution guidelines. Highest percentage of risk acquiring Hepatitis B virus infection following Needle stick injury, was well known amongst resident doctors, nursing staff and laboratory technicians(>75%). 92% of HCWs were aware of Hepatitis B and Tetanus can be prevented by vaccination. When asked about immediate response to NSI 74.67% of HCWs had knowledge about washing hands with soap and running water. When questioned as to how they draw attention of authorities towards their NSI, shockingly only 25.33% of respondents were aware to write an injury report to authority which was increased to 97.33% after training. Though 90.67% of the participants had knowledge regarding PEP, but only 80% were knew that PEP kits were available.

73.33% (55) of respondents know about biomedical waste management rules 2016. Strikingly only 32% resident doctors knew that segregation is the most important aspect of biomedical waste management. [Table I]

The second part of the questionnaire for this study was to assess attitude regarding bio-safety. If gloves get torn while working only 76% of HCWs remove gloves immediately and wash hands with soap and running water. 85.33% thought that hand washing is necessary after removing gloves. Approximately all respondents thought that it was necessary to get Hepatitis B vaccine and 80% had positive attitude regarding when they should take vaccine. Though 81.33% of the participants were aware how needles were disposed in their setup as per guideline 2016, but only 64% were aware that needle should not be recapped/ bent after use. 90.67% had positive attitude that there should be PEP guidelines in work areas. Correct waste bag filling proportion was found only in 42.67 % and 88% of HCWs were aware about which waste should be pretreated. [Table II]

The third part of the questionnaire for this study was to assess practice regarding bio-safety. Only 69.33% of HCWs attended any programme / training about bio-safety. 92% of respondents wear gloves, masks and aprons while dealing with blood/ body fluid. After exposure strikingly only 37.33% of HCWs were aware when to take PEP. Though 60% of HCWs had vaccination against Hepatitis B and tetanus, but only 44% had checked their anti-HBs titer. 45.33% of participants had NSI at least once and the frequency of NSIs was significantly higher among resident doctors (92%). Only 6.67% of HCWs reported the incidence to the hospital authority. Appropriate blood spillage practices were found only in 44%. After closing the sharps box, 58.67% use new box after finding a used needle on the floor. Shockingly only 21.33% respondents segregate the waste at the generation point.[Table III]

This current study revealed that nursing staff have lowest and laboratory technicians have highest mean scores of KAP about bio-safety in the pre-interventional phase.[Table IV]

## **DISCUSSION:**

Clinical laboratory scientists are among the most vulnerable to health care associated infections among hospital staff. Several types of hazardous events occur in the laboratories on a regular basis and it is therefore essential that we assess the bio-safety practices of these staff with respect to current bio-safety practices in the laboratory.

The concept of bio-safety is an important one particularly in developing countries such as ours where safety checks are not always in place or implemented. Important variables that may hinder safety in the laboratory include: lack of training for laboratory personnel on bio-safety, an excessive workload and excessive demands for a rapid turnaround time.<sup>14</sup>

This study shows that in the institute where the study was conducted, practices of laboratory technicians are safer in comparison to doctors and nurses. Laboratory technicians are careful and follow protocols and guidelines during their clinical practices such as: when to take PEP, appropriate blood spillage practices, safe needle disposal and checked anti HBs-titer.

Awareness regarding Universal precaution guidelines was found to be 98.67% which was increased to 100% after training. Hand hygiene is a major component of standard precautions and one of the simple and most cost effective methods to prevent transmission of pathogens to health care workers as well as the patients under care.<sup>15</sup> In our study overall 88% HCWs were aware of various aspects of hand hygiene. Another Indian study (2013) reported that 74% HCWs had awareness regarding hand hygiene.<sup>16</sup> In present study, overall awareness level regarding hand hygiene was more in laboratory technicians and resident doctors compared to nursing staff. Sharma S et al (Punjab, 2011) also had similar findings.<sup>17</sup> When knowledge of HCWs assessed it was found that most of HCWs(92%) know about the diseases prevented by vaccination. It is important to note that overall knowledge regarding the potential transmission of Hepatitis B, C and HIV was high (80%) among the participants. 74.67% of HCWs, after the NSI incident, let the wound bleed to reduce the potential viral load and also washed their hands, post interventional knowledge increased to 96%. Additionally, most of the participants exactly knew the post exposure prophylaxis.

Shockingly only 25.33% HCWs were aware to write an injury report to authority about their NSI and 45.33% participants had NSI, out of that, only 6.66% reported to authority. Perhaps it reflects lack of formal training or careless attitude and practice or prolonged working hours and work load. Most of them had positive attitude towards Hepatitis B protection. Resident doctors, nursing staff and laboratory technicians were immunized to Hepatitis B (23%, 88% and 65%); and Tetanus (96%,53% and 18%); respectively. Only 44% identified their immune status for hepatitis B. Only 37.33% HCWs were having appropriate practice towards PEP so most of the participants had positive attitude toward the availability of post exposure prophylaxis related guidelines in all health care departments.

In present study, 73.33% were aware about BMW rules 2016. Only 52% participants were aware that segregation is the key step in BMW management and the knowledge improved significantly after training. This is in contrast to the finding of a study conducted by Basu *et al.*<sup>18</sup> In the present study, shockingly only 21.33% of the HCWs were aware about segregation of waste at the point of generation which was similar to findings of Mannapur *et al.*<sup>19</sup> 81.33% agreed that it is important to always dispose needles in puncture-proof white containers and the scores increased after training. Jadhav *et al* in their study reported that 85.8% agreed that it is important to always dispose needled in puncture-proof containers, and the scores improved after training.<sup>20</sup> 64% HCWs were not recapping needle after use. Only 42.67% HCWs have positive attitude about correct waste bag filling proportion which was significantly increased after training. Surprisingly 88% HCWs agreed that Microbiology, Biotechnology

and other clinical laboratory waste should be pretreated before autoclaving. Most of participants have appropriate attitude and practice regarding usage and disposal of gloves. Blood spillage practices were implemented correctly by only 44% of HCWs. Knowledge and practice regarding bio-safety was better among laboratory technicians and doctors than nursing staff. A study done by Methew et al, Ludhiana showed the same results.<sup>21</sup> Knowledge and attitude of HCWs after educational video intervention were extremely statistically significant (P value <0.0001,paired t-test).

## CONCLUSION:

From this educational interventional study, it was concluded that knowledge and attitude regarding various aspects of bio-safety among HCWs were quite unsatisfactory. Knowledge and attitude improved substantially in post-training assessment. This indicates the need for intensive training programs at regular time interval to repeatedly train and retrain all the HCW to make them aware about bio-safety. Personal protective equipments and other resources like water and antiseptic solution should be supplied regularly and in sufficient quantity.

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Table I: Correct responses for questions on knowledge regarding bio-safety

Question	Correct Response n(%)							
	Resident Doctors		Nursing staff		Laboratory technicians		Total	
	Before training	After training	Before training	After training	Before training	After training	Before training	After training
1.Awareness regarding universal precaution guidelines	25 (100%)	25 (100%)	25 (100%)	25 (100%)	24 (96%)	25 (100%)	74 (98.67%)	75 (100%)
2. Awareness about hand hygiene	23 (92%)	25 (100%)	19 (76%)	23 (92%)	24 (96%)	25 (100%)	66 (88%)	73 (97.33%)
3.Highest percentage of risk of acquiring infection following Needle stick injury	19 (76%)	25 (100%)	19 (76%)	24 (96%)	22 (88%)	24 (96%)	60 (80%)	73 (97.33%)
4.Disease prevented by vaccination	25 (100%)	25 (100%)	24 (96%)	25 (100%)	20 (80%)	25 (100%)	69 (92%)	75 (100%)
5.Immediate response to needle stick injury-	19 (76%)	25 (100%)	20 (80%)	23 (92%)	17 (68%)	24 (96%)	56 (74.67%)	72 (96%)
6.Write injury report to authority about needle stick injury?	1 (4%)	25 (100%)	10 (40%)	24 (96%)	8 (32%)	24 (96%)	19 (25.33%)	73 (97.33%)
7.Post exposure prophylaxis awareness	20 (80%)	25 (100%)	24 (96%)	25 (100%)	24 (96%)	25 (100%)	68 (90.67%)	75 (100%)
8.PEP kits	24	23	17	24	19	24	60	71

	(96%)	(92%)	(68%)	(96%)	(76%)	(96%)	(80%)	(94.67%)
9. Biomedical waste management rules 2016 awareness	20 (80%)	24 (96%)	21 (84%)	24 (96%)	14 (56%)	24 (96%)	55 (73.33%)	72 (96%)
10. Segregation-most important aspect of biomedical waste management	8 (32%)	25 (100%)	11 (44%)	21 (84%)	20 (80%)	23 (92%)	39 (52%)	69 (92%)

Table II: Correct responses for questions on attitude regarding bio-safety

Question	Correct Response(%)							
	Resident Doctors		Nursing staff		Laboratory technicians		Total	
	Before training	After training	Before training	After training	Before training	After training	Before training	After training
1. Remove gloves & wash hands, if gloves get torn while working	25 (100%)	25 (100%)	15 (60%)	24 (96%)	17 (68%)	25 (100%)	57 (76%)	74 (98.67%)
2. After removing gloves hands should be washed	25 (100%)	25 (100%)	20 (80%)	21 (84%)	19 (76%)	23 (92%)	64 (85.33%)	69 (92%)
3. Need of Hepatitis B vaccine	24 (96%)	25 (100%)	25 (100%)	25 (100%)	25 (100%)	25 (100%)	74 (98.67%)	75 (100%)
4. Needle should not be recapped/bent after use	18 (72%)	25 (100%)	13 (52%)	24 (96%)	17 (68%)	24 (96%)	48 (64%)	73 (97.33%)
5. Hepatitis B vaccine guidelines	20 (80%)	25 (100%)	19 (76%)	24 (96%)	21 (84%)	24 (96%)	60 (80%)	73 (97.33%)
6. most severe form of exposure for needle stick injury	8 (32%)	25 (100%)	15 (60%)	24 (96%)	12 (48%)	25 (100%)	35 (46.67%)	74 (98.67%)
7. PEP guidelines in work areas	25 (100%)	25 (100%)	19 (76%)	25 (100%)	24 (96%)	25 (100%)	68 (90.67%)	75 (100%)
8. Correct way to dispose needles	17 (68%)	25 (100%)	21 (84%)	23 (92%)	23 (92%)	24 (96%)	61 (81.33%)	72 (96%)
9. Correct waste bag filling proportion	9 (36%)	25 (100%)	12 (48%)	25 (100%)	11 (44%)	25 (100%)	32 (42.67%)	75 (100%)



10. Waste to be pretreated	25 (100%)	25 (100%)	20 (80%)	20 (80%)	21 (84%)	23 (92%)	66 (88%)	68 (90.67%)
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Table III: Correct responses for questions on practice regarding bio-safety

Question	Correct Response(%)			
	Resident Doctors	Nursing staff	Laboratory technicians	Total
1. Undergone training on bio-safety	19 (76%)	15 (60%)	18 (72%)	52 (69.33%)
2. Personal protective devices	25 (100%)	22 (88%)	22 (88%)	69 (92%)
3. After exposure Post Exposure Prophylaxis should ideally be taken within:	5 (20%)	8 (32%)	15 (60%)	28 (37.33%)
4. Vaccinated against hepatitis B and tetanus	22 (88%)	12 (48%)	11 (44%)	45 (60%)
5. Post vaccination anti-HBs titer testing	4 (16%)	11 (44%)	18 (72%)	33 (44%)
6. Incidence of needle stick injury	23 (92%)	7 (28%)	4 (16%)	34 (45.33%)
7. Blood spillage management procedure	11 (44%)	8 (32%)	14 (56%)	33 (44%)
8. Proper steps to dispose used needle which was found on the floor after closing sharp box	11 (44%)	16 (40%)	17 (68%)	44 (58.67%)
9. Steps to be taken after exposed to infected blood/ blood products	25 (100%)	18 (72%)	22 (88%)	65 (86.67%)
10. Segregate the waste at generation site	3 (12%)	4 (16%)	9 (36%)	16 (21.33%)

Table IV: Paired t-test results of correct responses regarding bio-safety

Groups	Knowledge		Attitude		Practice
	Mean $\pm$ SD		Mean $\pm$ SD		Mean $\pm$ SD
	Pre-intervention	Post-intervention	Pre-intervention	Post-intervention	Pre-intervention
Resident doctors	7.36 $\pm$ 0.86	9.88 $\pm$ 0.33	7.84 $\pm$ 1.31	10 $\pm$ 0	5.92 $\pm$ 1.15
P value(Paired t-test)	<0.0001		<0.0001		-
Laboratory technicians	7.68 $\pm$ 1.68	9.52 $\pm$ 0.71	7.6 $\pm$ 1.68	9.72 $\pm$ 0.54	6 $\pm$ 2.27
P value(Paired t-test)	<0.0001		<0.0001		-
Nursing staff	7.6 $\pm$ 1.41	9.52 $\pm$ 0.82	7.16 $\pm$ 1.65	9.4 $\pm$ 1	4.6 $\pm$ 2.16

P value(Paired t-test)	<0.0001	<0.0001	-
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