Research Article

Knowledge, attitude, and practice of safety precautions among laboratory technologist of clinical microbiology laboratory

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ABSTRACT

Background: Laboratory workers are exposed to a variety of potential occupational health hazards including infectious materials and cultures, toxic and flammable chemicals, as well as electrical hazard. It is important for laboratory workers to be aware of the potential hazards and ensure safety in practices. Carelessness, negligence, and unsafe practices may result in serious injuries not only to the individual but also coworkers and patients as well. **Objective:** The objective of the study was to assess the knowledge, attitude, and practice (KAP) of laboratory safety precautions among technicians working in clinical microbiology laboratory. **Materials and Methods:** The study was a cross-sectional study on KAP of laboratory safety precautions among technicians. A close-ended structured questionnaire was canvassed to the technicians and responses were analyzed. **Results:** A total of 30 laboratory workers participated in the study. The overall correct responses regarding knowledge of laboratory safety precautions were 74% (673/900) and practices of the same were 79% (427/540). Few (10/30) perceived biomedical waste management as a burden and some (9/30) felt that too much of effort is required to follow optimal hand hygiene. **Conclusion:** Training and retraining on laboratory safety precautions are required along with counseling to induce a positive attitudinal change.

KEY WORDS: Occupational Hazard; Laboratory Safety; Laboratory Workers; Safety Precautions; Laboratory Acquired Infections

INTRODUCTION

Laboratory workers are exposed to a variety of potential occupational health hazards, including infectious materials and cultures, toxic and flammable chemicals, as well as electrical hazard.

Laboratory-acquired infection represents one such occupational hazard and it is unique to laboratory workers, especially those working in the microbiology laboratory. Exposures may occur inadvertently (may not be recalled), or due to lapses in techniques leading to accidental inoculation. Surveys of staff working in clinical microbiology laboratory had reported tuberculosis and enteric infections (especially shigellosis) as the most common laboratory-acquired infections.[1]

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Most risks from biological hazards can be reduced by the use of appropriate microbiological procedures and techniques, containment devices and facilities, and protective barriers. The foundation of all safety programs is the training of workers so that they understand the need for safety procedures and follow them. It is the joint responsibility of laboratory management and employees to develop and adhere to safety programs that reduce the risk of laboratory-acquired infections and other laboratory accidents. Carelessness, negligence and unsafe practices may result in serious injuries not only to the individual but also coworkers and patients as well.

As it is important for laboratory workers to be aware of these potential hazards and ensure safety in their practices, the present study was conducted to assess the knowledge, attitude, and practice (KAP) of laboratory safety precautions among technicians working in a clinical microbiology laboratory.

MATERIALS AND METHODS

Study Design

The study was a cross-sectional study on KAP of laboratory safety precautions among technicians. A close-ended structured questionnaire was canvassed to the technicians. The questionnaire was developed based on standard guidelines and updated literature.[2-4] The questionnaire included demographic details (age, gender, qualification, and experience), KAP about eating, drinking, smoking, and applying cosmetic in laboratory, mouth pipetting, standard precautions, hand hygiene (HH), personal protective equipment (PPE), biomedical waste (BMW) management and disposal of sharp, hazardous material, spill management, immunization, and fire safety plan. In total, there were sixty-eight questions.

Site of Study

The study was conducted in the Clinical Microbiology Laboratory of Vardhman Mahavir Medical College and associated Safdarjung Hospital. The hospital is multispecialty, tertiary care, and public hospital situated in Delhi, India. The hospital has a clinical microbiology laboratory that performs microscopy, serology, culture, identification, and sensitivity of various microorganisms by conventional and/or molecular techniques as per standard microbiological protocols.

Inclusion Criteria

The technicians working in the clinical microbiology laboratory were included in the study. Participation in the study was on a voluntary basis. The confidentiality of the participants was ensured by avoiding the use of the name or other identifying characters.

Data Collection

The data points were coded and entered into an excel sheet for further analysis.

Ethical Considerations

The study was approved by the Vardhman Mahavir Medical College and Safdarjung Hospital Ethics Committee.

RESULTS

Thirty laboratory technicians participated in the study. There were 13 male and 17 female technicians. Their age ranged from 21 to 57 years and years of experience from 1 to 25 years. Seventeen technicians had the qualification of BSc MLT or MSc MLT.

Figure 1 depicts the knowledge of laboratory technicians regarding laboratory safety precautions. In total, there were 30 questions to assess the knowledge and overall correct responses were 74% (673/900). The majority of the technicians had knowledge that standard precautions should be taken while handling clinical samples 90% (27/30). There were more than 90% correct responses regarding knowledge about prohibition of eating/drinking/smoking/mouth pipetting/applying cosmetics in the laboratory 92% (110/120), the requirement of wearing gloves while doing venepuncture or handling clinical samples 100% (60/60), and indications of using biohazard symbol 100% (60/60). Only 17% (5/30) of the technicians reported knowing about PPE and 13% (4/30) about the right duration of HH by alcohol hand rub [Figure 1].

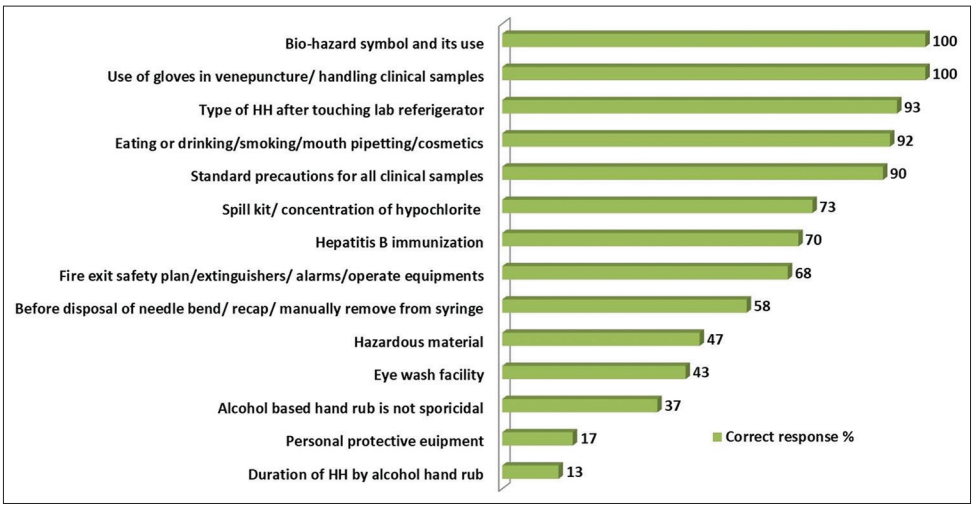

Figure 1: Knowledge of laboratory technicians regarding laboratory safety precautions

Figure 2 represents the practice of safety precautions as reported by the laboratory technicians while working in the clinical microbiology laboratory. In total, there were 18 questions to assess the practice and overall correct responses were 79% (427/540). Majority of the technicians reported not eating/drinking/smoking/applying cosmetics/mouth pipetting in the laboratory 98% (118/120). They also reported wearing gloves during venepuncture or when handling clinical samples 98% (59/60). About 63% (19/30) of the technicians immunized against hepatitis B (hep B). On further questioning, it was found that these technicians indeed received hep B vaccine in the past but some of them were unable to recall whether they had received all three doses of vaccine. Only 23% (7/30) reported being tested for protective hep B antibody titer [Figure 2].

Figure 3 shows the attitude of the staff toward laboratory safety precautions. Overall there were 20 questions on attitude (15 on safety precautions and five on measures to improve HH). All technicians agreed that hep B immunization and wearing gloves at the time of phlebotomy are essential for their safety (30/30). However, 10/30 technicians perceived BMW management as a burden and 9/30 perceived performing HH as too much effort to comply [Figure 3].

Figure 4 shows the attitude toward the effectiveness of actions to improve HH in the laboratory. The majority of the technicians felt that the suggested measures will improve the HH compliance in the laboratory [Figure 4].

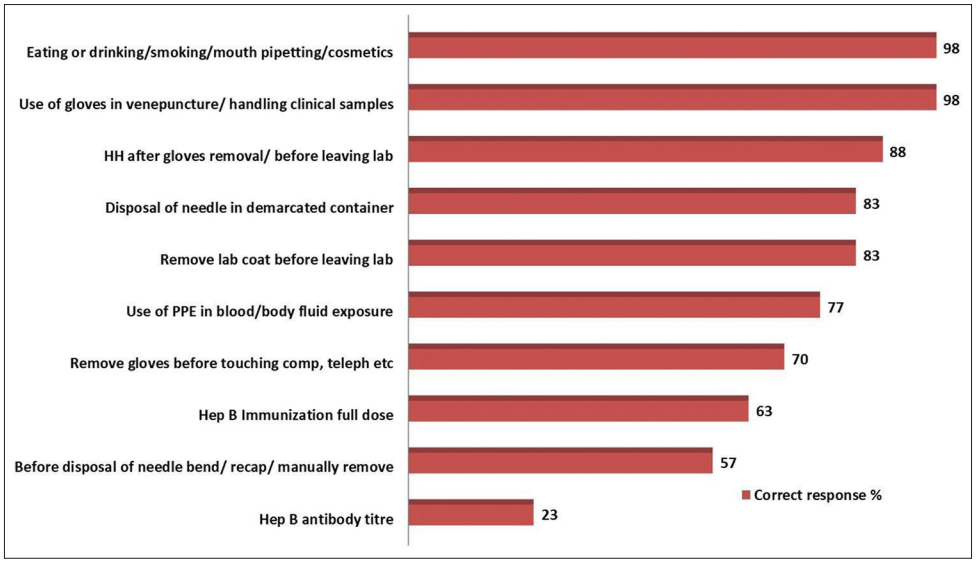

Figure 2: Practice of safety precautions as reported by the laboratory technicians

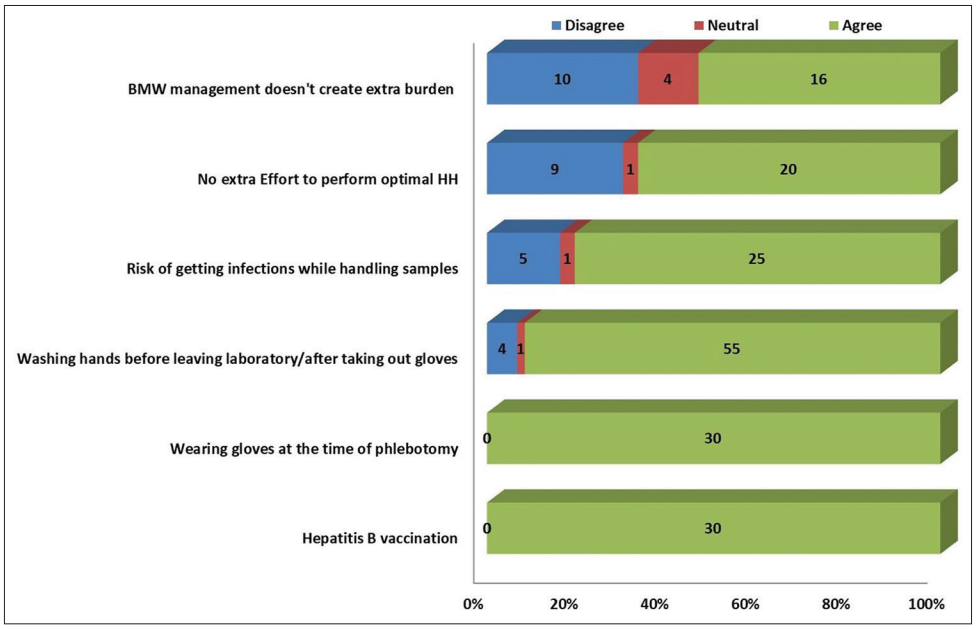

Figure 3: Attitude of the staff toward laboratory safety precautions

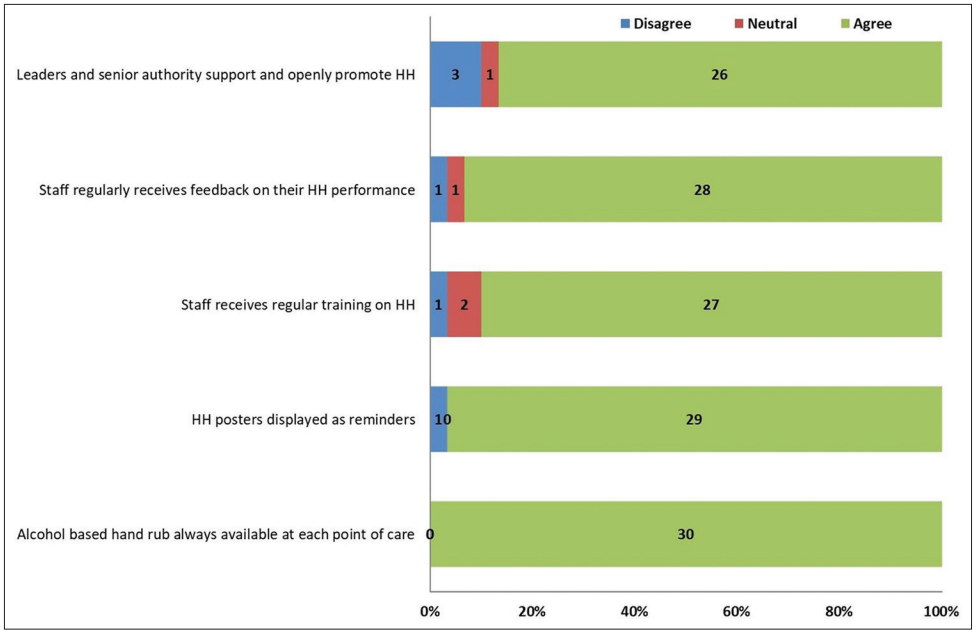

Figure 4: Attitude toward the effectiveness of actions to improve hand hygiene in the laboratory

DISCUSSION

Laboratory technicians are exposed to a variety of potential occupational health hazards. Although all occupational hazards are important, laboratory-acquired infections have gained much of the attention and undermine the other hazards that are inherent in the laboratory activities. The laboratory practices also include the use of chemical reagents, gases, and solvents that may constitute a non-microbiological hazard. These agents may be explosive, flammable, or toxic, and fires, gassings, and explosions may occur in laboratories. To these immediate hazards, the long-term risk involved in handling carcinogenic chemical reagents must also be added.[5]

The actual risk of a laboratory-acquired infection is difficult to measure because there is no systematic reporting system at the national level or professional society level that monitors the laboratory workers and the infections associated with the workplace. Furthermore, surveillance data on laboratory-associated infections are difficult to collect because the infections are often subclinical and have an atypical incubation period and/or route of infection.[6]

International Organization for Standardization has developed a standard that will help organizations to improve employee safety, reduce workplace risks, and create better, safer working conditions in the medical laboratory.[7] It is important for every laboratory worker to be aware of potential hazards and safety practices. Hence, the present study was conducted to assess the KAP of laboratory safety measures among technicians working in a clinical microbiological laboratory.

Standard precautions are designed to reduce the risk of transmission of microorganisms from both recognized and unrecognized sources of infection like clinical samples. HH, PPE, and proper handling of needles and sharps are components of standard precautions.[8] In the present study, it was observed that the majority of the technicians had reported having good knowledge about standard precautions (90%) in contrast to the study conducted by Shekhar *et al*.[9] However, only 17% of the technicians reported knowing about PPE and 13% about the right duration of HH by alcohol hand rub. There were only 58% correct responses regarding the right method of disposing of needles [Figure 1]. This suggests that further training is required regarding the various components of standard precautions. Furthermore, not even half of the technicians were aware of the hazardous material in their laboratory or eyewash facility.

The majority of the technicians reported practicing safety precautions while working in the laboratory. As the correct responses about the knowledge of the right way of disposing of needles were 58%, the same was reflected in the practices also (57% correct responses). The status of protective hep B antibody titer was known only to 23% of the technicians; hence, active measures are required regarding immunization against hep B infection.

The behavior patterns and attitudes of individuals toward safety programs influence their involvement in laboratory accidents that put themselves as well as fellow workers at risk.[10,11] Studies reported characteristics of persons who had few accidents were adherence to safety regulations, respect for infectious agents, "defensive" work habits, and the ability to recognize a potentially hazardous situation. In contrast, persons involved in laboratory accidents tend to had low opinions of safety programs, to take excessive risks, to work too fast, and to be less aware of the infectious risks of the agents they were handling.[6] In the present

study, the technicians perceived various components of laboratory safety precautions as an important measure for their own safety [Figure 3]. However, few perceived BMW management as a burden and some felt that too much of effort is required to follow optimal HH. Behavioral change regarding these aspects may be incorporated in the training program of the technicians. Furthermore, training and retraining on laboratory safety precautions are required along with counseling to induce a positive attitudinal change especially on BMW management and HH.

There are some limitations of the study. First, the findings are based on a self-reported questionnaire and not on observations; hence, some bias in the results cannot be ruled out. Second, the study is a single department study with a small sample size. This limits the generalizability of the results.

CONCLUSIONS

The laboratory technologists had poor knowledge about PPE, alcohol-based hand rub, eyewash facility, and hazardous material. Overall staffs are following good laboratory safety precautions. However, behavioral change in the management of BMW and HH is required.

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