

Awareness to health hazards and biosafety precautions among laboratory technicians working in tertiary-care center in Rajasthan, India

Himanshu Shekhar¹, Mukesh Patel¹, Cheeni Jain¹, Neha Garg¹, Ketan Mangukiya²

¹Department of Pathology, Geetanjali Medical College and Hospital, Udaipur, Rajasthan, India.

²Department of Biochemistry, Geetanjali Medical College and Hospital, Udaipur, Rajasthan, India.

Correspondence to: Ketan Mangukiya, E-mail: dr.ketan.mangukiya@gmail.com

Received September 2, 2014. Accepted September 18, 2014

Abstract

Background: Awareness to health hazards and biosafety precautions among laboratory workers is an important aspect. Technicians handle blood or any biological sample may be at risk for accidental injury or exposure. They are exposed to a large pool of specimens from patients suffering from infections such as hepatitis B virus and human immunodeficiency virus. The lack of awareness regarding biosafety issues results in improper handling and/or dangerous laboratory practices during sample collection, processing, and discarding of specimens, potentially making laboratory technicians more exposed to pathogens.

Objective: The aim of this study was to find out the level of awareness and biosafety measures taken by laboratory technicians during their routine work in a tertiary-care center.

Material and Methods: A cross-sectional study was conducted at Geetanjali Medical College and Hospital (Central Lab), using a standardized and basic questionnaire, which enquired about awareness and precautions taken by technicians during laboratory work. All ($N = 24$) technicians enrolled in this study were from departments of pathology, biochemistry, microbiology, blood bank, and sample collection room.

Results: Of 24 laboratory technicians, maximum (33.3%) technicians were from pathology department followed by biochemistry (25%) department. According to age, the youngest technician was of 24 years and the oldest was of 46 years. On the basis of their response regarding awareness, knowledge, and biosafety precaution questions, of 24 technicians, 8 (33.3%) were found aware of universal work precaution, 18 (75%) were found immunized with hepatitis B vaccine, and 18 (75%) were found to leave the laboratory without following proper hand wash rule after finishing duty.

Conclusion: Knowledge of all the technicians is adequate but there is lack of awareness and practicality among them. There is need to develop standard operating procedures with biosafety training programs and self-hygienic procedures for laboratory workers.


KEY WORDS: Awareness, biosafety, technicians, hepatitis B

Introduction

Awareness and biosafety is an important issue in laboratory settings worldwide, especially in developing countries where

standard operating procedures (SOPs) are lacking. Biosafety during laboratory work and the transferring of laboratory material from one place to another is a critical tool in the global fight against infectious diseases and exposures to laboratory personnel, particularly those working in microbiological laboratories as they are exposed to biohazards that may result in laboratory-acquired infections.^[1] The prevention of occupational hazards in laboratories requires a thorough knowledge of the risks and practical measures to be taken.^[2] Biosafety is a concept that promotes safe laboratory practices, procedures, and proper use of containment equipment and facilities by laboratory workers.

Laboratory workers should familiarize themselves with “universal work precautions,” which, as defined by the Centers

Access this article online	
Website: http://www.ijmsph.com	Quick Response Code:
DOI: 10.5455/ijmsph.2015.020920143	

for Disease Control and Prevention, are a set of precautions designed to prevent transmission of human immunodeficiency virus (HIV), hepatitis B virus (HBV), and other blood-borne infections when providing first aid or health care. Under universal work precautions, blood and certain body fluids of all patients are considered potentially infectious for HIV, HBV, and other blood-borne pathogens.^[3] Universal work precautions apply to blood, other body fluids containing visible blood, semen, and vaginal secretions. These also apply to tissues and to the following fluids: cerebrospinal, synovial, pleural, peritoneal, pericardial, and amniotic fluids. These do not apply to feces, nasal secretions, sputum, sweat, tears, urine, and vomitus unless they contain visible blood. These also do not apply to saliva except when visibly contaminated with blood or in the dental setting where blood contamination of saliva is predictable.

Universal work precautions involve the use of protective barriers such as gloves, gowns, aprons, masks, or protective eyewear, which can reduce the risk of the health-care worker's skin or mucous membranes to potentially infective materials. In addition, it is recommended that all health-care workers take precautions to prevent injuries caused by needles, scalpels, and other sharp instruments or devices. Identifying the epidemiological distribution of hazardous exposures during collection, processing, storage, and disposal of specimens is very important.^[4]

All the work tables, biosafety cabinets, and other surfaces of the laboratory should be wiped with a disinfectant after the work is complete and also before starting any new work daily. Disinfect laboratory surfaces weekly or monthly or call sweepers to clean on that time schedule. Safety glasses or other protective devices must be worn when it is necessary to protect the eyes and face from splashes. Both gloves and laboratory coats should be used that protect personnel from contact with infectious materials.

Reuse of disposable syringes and their improper disposal are the major causes of transmission for HBV, hepatitis C virus, HIV, and viral hemorrhagic fevers.^[5–8] Recapping used needles is strictly prohibited according to Biosafety in Microbiological and Biomedical Laboratories (BMBL).^[9]

"Sharps" constitute a special category of medical waste that can expose waste handlers to infection via puncture injuries during collection, transportation, and disposal. To comply with SOPs, sharps must be carefully placed in conveniently located puncture-resistant containers.

Centrifuge machines are one of the main vectors to disperse aerosol in the laboratory environment as they spin at a great velocity and exert the force needed to produce respirable aerosols. If these aerosols are inhaled, laboratory-acquired infections could result. Therefore, while centrifuging, the tubes should be closed with a suitable cap to avoid biohazards due to inhalation. Similarly, the centrifuge machine should also be closed before operating. Breakage of tubes in a centrifuge can also disperse large amounts of aerosols so sealed buckets should be used for all samples. If breakage of the tube occurs, the centrifuge buckets and rotor must be removed, autoclaved, and disinfected.

Materials and Methods

This cross-sectional study of laboratory technicians was conducted in July 2014 at the Central Lab of Geetanjali Medical College and Hospital, Udaipur, Rajasthan, India. A total of 24 technicians were enrolled in this study from the departments of pathology, biochemistry, microbiology, blood bank, and sample collection room.

A questionnaire was developed on the basis of available standard texts,^[10,11] which contained basic questions regarding routine laboratory practices, such as unsafe work practices (e.g., eating or drinking in laboratories); mouth pipetting of biological samples; use of personal protective equipment; and proper disinfection, specimen handling, collection, and processing. Questions regarding disposal of used syringes and sharps were also included. After securing informed consent documentation, we interviewed technicians and filled out the questionnaire. The statuses of hepatitis B vaccination and other chronic diseases were also determined. Information sought included age, sex, department, occupational hazards, and preventive measure questionnaires.

Result

In this study, we found that of 24 laboratory technicians [18 men (75%) and 6 women (25%)], maximum (33.3%) technicians were from the pathology department and then from the biochemistry laboratory (25%). According to age, the youngest technician was of 24 years and the oldest was of 46 years [Table 1].

On the basis of the response received regarding awareness, knowledge, and biosafety precaution questions, of 24 technicians, 8 (33.3%) were found aware of universal work

Table 1: Distribution of study subject: department, age, and sex

	Number	Percentage
Department		
Pathology	8	33.4
Biochemistry	6	25
Microbiology	4	16.6
Blood bank	4	16.6
Collection room	2	8.4
Age		
Minimum age	24	Not applicable
Maximum age	46	
Mean age	33.91	
Standard deviation	6.392	
Variance	40.862	
Sex		
Male	18	75
Female	06	25

Table 2: Status of awareness, knowledge, and biosafety

Occupational hazard	Number (%)	Frequency
Aware of universal work precautions	8(33.3)	Always
Immunized against hepatitis B	18(75)	Once
Infected with infections such as hepatitis C, tuberculosis, Brucellosis, Shigellosis	Nil	Never
Biosafety training	6(25)	Once
Injury while working	16(66.7)	Occasionally
Used first aid after injury	09(37.5)	Always
Wearing of gloves for all procedures	12(50)	Always
Experienced torn gloves	14(58.3)	Occasionally
Awareness of the risk of being infected	14(58.3)	Always
Eating in laboratory	6(25)	Daily
Storage of food and water in refrigerator	10(41.7)	Daily
Work without wearing laboratory coat	16(66.7)	Daily
Leave lab without proper hand washing	18(75)	Daily
Work without wearing laboratory coats	04(16.7)	Occasionally
Chewing tobacco and smoking in laboratory	08(33.3)	Daily

precaution, 18 (75%) were found immunized with hepatitis B vaccine, and 18 (75%) were found to leave the laboratory without following proper hand wash rule after finishing duty. While working, 16 (66.7%) and 14 (58.3%) technicians experienced injury and torn gloves, respectively. None of them had any severe infections such as tuberculosis, and hepatitis C earlier in life, and 6 (25%) of them had biosafety training earlier.

Discussion

Laboratory technicians are at greater risk of blood-borne diseases due to their constant exposure to blood, body fluids, or sharps contaminated with blood. In this study, 24 technicians of various age group and gender from Central Lab and Blood Bank were enrolled. We found that the level of awareness about universal work precautions among laboratory technicians is as low as only (8) 33.3%. In recent years, the incidence of infection with HBV has declined in health-care workers largely due to the widespread immunization with hepatitis B vaccine. In our study, 75% of our technicians were immunized with hepatitis B vaccine, which shows their awareness of being infected. We found only 25% of technicians have biosafety training certificate, which is a must for all. None of those (66.7%) who had sustained injuries reported it to the hospital authorities though there is proper safety tool and help desk center for staff and treated elsewhere. Of 16 (66.7 %) technicians, 9 (37.5%) made use of the first aid boxes. Further in our study on the basis of questionnaire, we found that technicians were eating in laboratory (25%), chewing tobacco and smoking (33.3%), storing food and water in refrigerator (41.7%), working without gloves (50%) and laboratory coat (66.7%), and leaving

laboratory without proper hand washing (75%), which is not acceptable. However, we found that technicians from our blood bank were more aware, knowledgeable, trained, and practical in all aspects in comparison to those from other departments.

Conclusion and Suggestions

From this study we found that the knowledge of all the technicians is adequate as they are qualified (B.Sc. DMLT) to work in a laboratory, but there is lack of awareness and practicality among them. To address this issue, there must be institutional biosafety support to organize basic training programs to increase awareness of basic biosafety principles and self-hygienic procedures for laboratory workers along with the appointment of a biological safety officer to oversee the proposed work activities, procedures, equipment, personnel, storage, material transfer and transport, and proper destruction of biological material. This officer should indicate risk analyses and develop written SOPs for the laboratories.

There should be a registration system for laboratories at the national level. Before issuing a license to any laboratory, proper evaluation should be done to examine laboratory design, proper ventilation, entrance, and exit by experts to ensure laboratory biosafety.

References

- Aksoy U, Ozdemir MH, Usluca S, Ergönen AT 2008. Aksoy U, Ozdemir MH, Usluca S, Ergönen AT. [Biosafety profile of laboratory workers at three education hospitals in Izmir, Turkey]. *Mikrobiyol Bul* 2008;42:469–76.
- Ogunbodede EO 1996. Ogunbodede EO. Occupational hazard and safety in dental practice. *Nig J Med* 1996;5:11–13.
- Johnson & Johnson Medical, Inc. Blood-borne Infection: A Practical Guide to OSHA Compliance. Arlington, TX: Johnson & Johnson Medical, 1992.
- Misra UB, Agarwal AK, Parmar NK, Bhalwar R 2001. Misra UB, Agarwal AK, Parmar NK, Bhalwar R. An epidemiological study of biohazards in a microbiology laboratory at a large teaching hospital. *J Acad Hosp Admin* 2001;12(2).
- Hutin YJF, Harpaz R, Drobeniuc J, Melnic A, Ray C, Favorov M 1999. Hutin YJF, Harpaz R, Drobeniuc J, Melnic A, Ray C, Favorov M, et al. Injections given in healthcare settings as a major source of acute hepatitis B in Moldova. *Int J Epidemiol* 1999;28:782–6.
- Luby SP, Qamruddin K, Shah AA, Omair A, Pahsa O, Khan AJ 1997. Luby SP, Qamruddin K, Shah AA, Omair A, Pahsa O, Khan AJ, et al. The relationship between therapeutic injections and high prevalence of hepatitis C infection in Hafizabad, Pakistan. *Epidemiol Infect* 1997;119(3):349–56.
- Hersh BS, Popovici F, Jezek Z, Satten GA, Apetrei RC, Beldescu N 1993. Hersh BS, Popovici F, Jezek Z, Satten GA, Apetrei RC, Beldescu N, et al. Risk factors for HIV infection among abandoned Romanian children. *AIDS* 1993;7:1617–24.
- Fisher-Hoch SP, Tomori O, Nasidi A, Perez-Oronoz GI, Fakile Y, Hutwagner L 1995. Fisher-Hoch SP, Tomori O, Nasidi A, Perez-Oronoz GI, Fakile Y, Hutwagner L, et al. Review of cases

- of nosocomial Lassa fever in Nigeria: the high price of poor medical practice. *BMJ* 1995;311(857):857–9.
9. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institutes of Health. *Biosafety in Microbiological and Biomedical Laboratories* 5th, Bethesda: MA: National Institutes of Health, 2007. Available at www.cdc.gov/od/ohs/biosfty/bmbl5/bmbl5toc.htm.
 10. Barker JH, Blank CH, Steere NV. *Designing a Laboratory*, Washington, DC: American Public Health Association, 1983:59–126.
 11. World Health Organization (WHO). *Laboratory Biosafety Manual*, 2nd ed. Geneva: WHO, 1993. pp1–47, 55–83, 99–119.

How to cite this article: Shekhar H, Patel M, Jain C, Garg N, Mangukya K. *Laboratory Biosafety Manual*, 2nd ed. Geneva: WHO, 1993. pp Int J Med Sci Public Health 2015;4:15-18

Source of Support: Nil, **Conflict of Interest:** None declared.