Original Article

Unintentional Injuries in the Three References Laboratories: Sana'a, Yemen

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Abstract

Background: The aim is to determine the incidence rate of unintentional injuries and its associated factors and determine the pattern of these injuries among laboratory staff in three reference laboratories in Sana'a, Yemen. **Methods:** A cross-sectional study was conducted among laboratory staff in the three reference laboratories in Sana'a, Yemen. A pretested structured questionnaire was used to collect data on the unintentional injuries during the past 12 months including the type of injury. **Results:** A total of 93 technicians responded and filled the questionnaires. Of the 93 technicians, 51 (54.8%) technicians reported that they had been injured in the past 12 months. Of all injuries, 38% of technicians were caused by needle sticks, 21% by sharp materials other than needles, 15% by hot materials, 15% by exposure to chemicals, and 11% of them by other exposures. Only 18% of injuries were reported to safety officer in the laboratory. Those who had an experience of <5 years were more likely to experience injury in the past 12 months than those who had 5 years of experience or more (odds ratio = 8.3; 95% confidence interval: 2.2, 27.4; $P < 0.005$). **Conclusions:** About half of laboratory technicians in Yemen reported that they had been injured in the past 12 months, with the needle stick being the most common cause of injury. Therefore, there is a need for targeted interventions to laboratory technicians to increase their awareness on the risk of injuries in the laboratory. Bio-safety training among laboratory technicians deemed very necessary.

Keywords: *Field epidemiology training program, laboratory technicians, medical laboratories, unintentional injuries, Yemen*

Introduction

Medical laboratories involve a variety of possible hazards including needle stick injury, exposure to highly inflammable and toxic gases and liquids, biological agents, and infectious materials. The lack of awareness regarding bio-safety issues results in improper handling and/or dangerous practices during sample collection, processing, and discarding of specimens, potentially making laboratory technicians more exposed to hazards and pathogens.[1]

Injuries from sharp objects are among the most frequently reported occupational accidents among medical staff.[2] Approximately 80% of health-care workers have been affected by needle stick injuries.[3] In Lebanon, one study showed that the incidence of episodes of needle stick injuries was 9.3% among laboratory staff.[4] Of all injuries from needles and other sharp objects among health-care workers in a secondary care hospital in Saudi Arabia, 10% occurred among technicians.[5]

Moreover, sharps injuries have become one of the most important sources for infections among health-care workers.[6,7] More than 20 diseases have been perceived to be transmitted by needle sticks.[8] Needle stick injuries have resulted in documented transmission of hepatitis B and C viruses and human immunodeficiency virus in health-care workers.[9,10] Globally, three million laboratory personnel experience injuries each year.[11] In Egypt, it was estimated that about 24,000 health-care workers acquire new infections with hepatitis C virus and 8617 new infections of hepatitis B virus each year.[12]

Center for Disease Control of the United States has developed guidelines for the prevention of these injuries.[13] However, these guidelines are not implemented in Yemen and the potentially fatal injuries have not received adequate attention. Moreover, there is no standardized system for reporting of unintentional injuries in the medical laboratories in Yemen. This study aimed to determine the incidence

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rate of unintentional injuries and its associated factors and determine the pattern of these injuries among laboratory staff in the three reference laboratories in Sana'a, Yemen. Such information will help to increase awareness on injuries as a public health problem in the laboratories and will guide future interventions to improve safety measures and setting injury reporting system.

Methods

Study design

A cross-sectional study was conducted among 181 laboratory staff in the three reference laboratories in Sana'a, Yemen: The National Center of Public Health laboratory with 120 technicians, the Central Laboratory with 37 technicians and the Police Hospital Laboratory with 24 technicians. A trained laboratory quality control officer visited the three reference laboratories and invited all technicians who were available at the time of visit to participate in this study. A total of 93 technicians who were available at the time of visit in the three laboratories agreed to participate in the study with a response rate of 100%. Ethical approval was obtained from the Ethics Committee of Ministry of Public Health and Population, Yemen. The study procedures were conducted in accordance with the ethical standards of the responsible committee on human experimentation (Ministry of Public Health and Population, Yemen) and with the Helsinki Declaration of 1975, as revised in 2000.

Data collection

A pretested structured questionnaire was distributed to the laboratory workers by the trained laboratory quality control officer. The questionnaire was administered to the 93 staffs who were available in the three laboratories at the time of visit. The first part of the questionnaire included items on the sociodemographic characteristics of technicians including gender, age, years of experience, and educational level. Another part of the questionnaire included information about training on safety at laboratory, number of samples processed/day, and availability and use of personal protective equipments. The third part of the questionnaire included questions about the unintentional injuries during the past 12 months including the type of injury, reporting of injuries, outcome, and immunization status. The questionnaire was pilot tested on 10 respondents who were not included in the study.

An unintentional injury in the laboratory was defined as an injury that occurred without predetermined intent to harm and was caused by chemicals, hot materials, sharps objects/needle sticks, inhalation, contact, and ingestion.[14]

Data were analyzed using SPSS IBM version 20 (IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp). Data were described using frequencies and percentages. Chi-square test was used to compare percentages. Multivariate analysis of factors associated with unintentional injury of any type was conducted using binary logistic regression. The dependent variable in the regression model was unintentional injury of any type. The possible predictors that were tested in the model included gender, age, years of experience, and educational level. The backward step-wise selection method was used to select the significant predictors. The value of $P < 0.05$ was considered as statistically significant.

Results

Participants' characteristic

A total of 93 laboratory technicians participated in the study and filled the questionnaires. More than two-thirds (69%) of the respondents were females, 37% aged 35 years or less, and 66% had a bachelor degree. Only 32% of laboratory technicians attended at least one bio-safety training course. Only 47% of respondents reported that they had been vaccinated against hepatitis B virus.

The use of personal protection equipments

Table 1 shows the use of personal protection equipments by technicians. A total of 91 (98%) and 88 (95%) technicians were found to wear gloves and laboratory coat, respectively. Goggles, mask, and safety cabinet were used by 19 (29%), 33 (35%), and 22 (24%) of technicians, respectively. Only one technician reported that he had used eye washing equipment.

Incidence of unintentional injury

Of the 93 technicians, 51 (54.8%) technicians (95% confidence interval: 44.7%-64.6%) reported that they had been injured in the past 12 months. Of those who were injured, 32 (62.7%) technicians reported one injury, 10 (19.6%) reported two injuries, 8 (15.7%) reported three injuries, and one reported four injuries. Of all injuries, 38% were caused by needle sticks, 21% by sharp materials other than needles, 15% by hot materials, 15% by exposure to chemicals, and 11% by other exposures. Only 18% of injuries were reported to safety officer in the laboratory.

Table 2 shows the incidence rate of injury according to sociodemographic characteristics. The incidence rate did not differ significantly according to age, gender, and level of education. The incidence rate differed significantly

Table 1: The use of personal protection equipment among 93 laboratory technicians in Yemen

Type	*n* (%)
Gloves	91 (98)
Goggles	19 (29)
Mask	33 (35)
Laboratory coat	88 (95)
Safety cabinet	22 (24)
Eye washing	1 (1)

Table 2: The incidence rate of unintentional injury among laboratory technicians according to sociodemographic characteristics*

Type	*n* (%)	Number of injured technicians (incidence rate of injury) (%)	*P*
Sex			
Female	64 (69)	36 (56)	0.856
Male	29 (31)	15 (52)	
Age (year)			
25-30	12 (13)	6 (50)	0.827
31-35	22 (24)	14 (64)	
36-40	16 (17)	8 (50)	
41-45	19 (20)	9 (47)	
46-53	24 (26)	14 (58)	
Education			
Diploma	18 (19)	9 (50)	0.896
Bachelor	61 (66)	34 (56)	
Higher than bachelor	14 (15)	8 (57)	
Years of experience			
<5	34 (39.5)	30 (88.2)	<0.005
5-15	34 (39.5)	15 (44.1)	
>15	18 (20.9)	9 (50.0)	

according to years of experience. The highest incidence rate (88.2%) was among those who had <5 years of experience. The incidence rate was 44.1% among those who had 6–15 years of experience and 50.0% for those who had more than 15 years of experience. In the multivariate analysis, only year of experience was significantly associated with unintentional injuries. Those who had an experience of <5 years were more likely to experience injury in the past 12 months than those who had 5 years of experience or more (odds ratio = 8.3; 95% confidence interval: 2.2, 27.4; $P < 0.005$)

Discussion

Unintentional injuries had been well-studied among health professionals, mainly among nurses and physicians. However, the data about unintentional injuries among laboratory technicians are limited. To the best of our knowledge, this is the first study on unintentional injuries among laboratory technicians in Yemen. The study showed that only one-third (32%) of those surveyed had training on bio-safety. This finding is similar to the observations that had been reported in other countries such Sudan where only 39.5% of the workers attended training courses on bio-safety.[15] Creating awareness among the staff through seminars, courses, and posters was considered to be the most important among the health-care workers in Malaysia to reduce sharps injury.[16] Among the laboratory workers at three education hospitals in Izmir, Turkey, 23.5% of the participants stated that they had previously taken education about biosafety.[17]

The proportions of laboratory technicians who reported the use of lab coats (95%) and gloves (98%) were higher than the reported proportion in Pakistan but similar to the reported proportion in Turkey.[18,19] One study among health-care workers in Ankara, Turkey, showed that 28% of the injured health-care workers were not using any personal protective equipment.[20] In the present study, less than one-third of the laboratory technicians did not use any personal protective equipment. A similar finding had been reported in a study in Pakistan (31.9%).[18]

This study revealed that unintentional injuries are common among laboratory technicians in Yemen. The most common cause of injury was needle stick, a finding that is consistent with the findings of other studies in Pakistan and Turkey.[19,21] In a cross-sectional survey among a random sample of health-care workers in Mauritius,[22] the main cause of injuries among medical technicians was cuts with sharp materials.

The risk of transmission of infection via needle stick injuries is reported to be 6%–30% for hepatitis B (without vaccination), 2%–3% for hepatitis C and 0.3% for HIV.[23,24] Vaccination is one of the best ways to protect laboratory technicians from infections, but vaccination is only available against hepatitis B. To decrease the risk of preventable infections, complete coverage of vaccination against hepatitis B should be achieved. As there is still no vaccine available against hepatitis C and HIV, preventive measures against needle stick injuries is of great importance. Hepatitis B vaccination coverage among health-care workers was low at a rate of 47%. According to the WHO estimates, vaccination coverage varies from 18% in Africa to 77% in Australia and New Zealand.[21]

Reporting occupational needle stick injuries directly to the occupational health service is of major importance preventing transmission of blood-borne diseases. In Yemen, the percentage of people who reported exposure was very low compared to other studies.[25,26]

In the multivariate analysis, those who had an experience of <5 years were more likely to experience injury in the past 12 months than those who had 5 years of experience or more. Similarly, a study in Kenya showed that the probability of ever having a needle stick injury is inversely related to years of experience.[27]

One of the limitations of this study is the small number of laboratories participating in the study. However, the obtained information constitutes the basis for formulating further studies. Another limitation is that this study did not collect comprehensive data about the possible predictors of unintentional injury.

Conclusions

About half of laboratory technicians reported that they had been injured in the past 12 months, with the needle stick injury being the most frequent cause of injury. Therefore, there is a need for targeted interventions to

laboratory technicians to increase their awareness on the risk of injuries in the laboratories. Bio-safety training among laboratory technicians deemed very necessary. These accidents could be reduced through education and monitoring of behaviors, and introduction of medical devices incorporating safety-engineered protection mechanisms with appropriate training. Laboratory staff should be immunized against HBV, and know policies and procedures for the postexposure management and prophylaxis.

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Conflicts of interest

There are no conflicts of interest.

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