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Research Article

Knowledge, Attitude and Practice of Medical Students Regarding Risk of Blood-Borne Transmitted Diseases: A Cross Sectional Study

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ABSTRACT

BACKGROUND: Medical students are at a high risk of exposure to Blood-borne Pathogens (BBP) through their earlier clinical exposure.
Aim: Herein, we aim to evaluate their knowledge about BBP and demonstrate their attitudes toward reporting the exposure incident.

METHODS: A cross-sectional study was conducted using a structured questionnaire amongst medical students-Umm Al-Qura University.

RESULTS: With a moderate response rate (66.5%, n = 905), about 90% (n = 817) of participants had previous knowledge about BBP, 53.5% (n = 484) of the students had a high knowledge level about the mode of transmission of BBP, 78.7% (n = 713) demonstrated low attitudes toward the BBP. About 18% (n= 164) of the respondents were exposed at least once to BBP. The main hazards for student exposure to BBP were younger age, females, lacking prior education about BBP at or after the third year, human immunodeficiency virus as a BBP of major concern, and ignorance of reporting procedures.

CONCLUSION: Inadequate knowledge about BBP and some gaps in reporting were observed. Actual effective education for prevention and management is essential to minimize occupational exposure. In addition, it is compulsory to ensure students' knowledge and understanding before allowing them to start clinical training.

1. INTRODUCTION

Medical students, like all other health science students, have a higher risk of occupational exposure to Blood-Borne Pathogens (BBP) than the general population. Everyday handling and exposure to biomedical wastes, blood, and its products made them susceptible to Blood-Borne diseases, among which Hepatitis B (HBV), Hepatitis C (HCV), and Human immunodeficiency virus (HIV) are the commonest and really life-threatening infectious diseases involved in occupational exposure in healthcare workers (Deuffic-Burban et al., 2011; Iliyasu et al., 2020; Weber, 2012).

Previous studies reported that more than 400,000 splash exposure or sharp injury exposures are reported every year, and one out of ten healthcare workers in the United States (US) suffer exposure incidents (Henderson, 2012; Karmon et al., 2013). Reports from several institutes showed that lack of the students' awareness predisposed them to hazards (Abadiga et al., 2020; Getie et al., 2020; Motaarefi et al., 2016). Reports from nursing students showed the highest incidence of exposure to the BBP (14-100%) compared to those from medical students, which range from (16%-59%) (Osborn et al., 1999; Salzer et al., 2011; Sharma et al., 2009; Souza et al., 2017; Wicker et al., 2008; Wu et al., 2016; Yao et al., 2010).

Underreporting is considered a big problem; studies estimated that approximately 50-67% of all needle sticks and splash exposure to a Blood-Borne pathogen are not reported (Bernard et al., 2013; Dietz et al., 2020).

In the US, the expense of one critical Blood-Borne contamination might reach in excess of 1,000,000 dollars for drugs, follow-up laboratory testing, clinical assessment, lost wages, and disability payments. The exact costs of occupational exposures to hepatitis B and C and HIV may

be as high as $400 million (Leigh et al., 2007). The human costs after an exposure are beyond measures. Students may experience anxiety, depression, anger, fear, trouble sleeping, problems concentrating, difficulty with sexual relations and doubts regarding their career choice. Indeed, even in a low-risk exposure that does not bring about infection, the emotional effect can be long lasting (Cooke & Stephens, 2017; Mannocci et al., 2016; Zhang & Yu, 2013).

Understanding the mode of transmission is very crucial to enforce strict adherence to standard precaution in order to protect against their spread (Iliyasu et al., 2020; Mengistu & Tolera, 2020).It is mandatory for each medical school to have a blood/body fluid exposure incident reporting system and management plan for any exposure, and all students must adhere to it.

2. MATERIALS AND METHODS

A cross-sectional structured questionnaire of 24 elements was run electronically, and papers were distributed to 1361 college students from the faculty of medicine at Umm Al-Qura University, to evaluate the general knowledge and practice toward Blood-Borne pathogens (BBP). The electronic structured questionnaire was scattered among the students from April 2016 to June 2016. All questions in the questionnaire were prepared in English, and all students gave answers in English. The questionnaire contained single-response questions and one multiple-response question. The following data was assembled; the students' general characteristics, past academic education and knowledge about BBP; types, transmission, occupational exposure and vaccination. In addition, exposure incident was surveyed through the questionnaire, as students' education, attitudes and practice and reporting system (See Appendix 1). Participants' compliance was evaluated according to the participant's answers to the questionnaire. Occupational exposure was described as any needle-stick injury, splashes of blood and other body fluids into the skin or mucosa or instrument puncture or any other exposure to (Sofola et al., 2007). The questionnaire was pilot tested in a group of 12 students. After modifications to get clarity, the questionnaire was distributed to the students. All responses were anonymous, and the student's contribution was voluntary. The nature of the study was enlightened to all the students at the introduction of the questionnaire. The study followed the tenets of the Declaration of Helsinki and was approved by the regional University Ethics Committee.

2.1. Statistical Analysis

Statistical analysis was performed using the Statistical Package for the Social Science (SPSS: An IBM Company, Version 16.0, IBM Corporation, Armonk, NY, USA). All data were presented as mean ± standard deviations, median, range or percentage where appropriate. Student T-test was used to examine the relationship between two continuous variables, and the Chi-square test was used to examine the relationship between two categorical variables: "demographic factors – exposure", "demographic factors – attitudes", and "attitudes – kind of infection". $P < 0.05$ was regarded as significant.

3. RESULTS

3.1. Demographic Characteristics of the Study Group

The characteristics of the study group were listed in Table 1. A total of 1361 medical students from the faculty of medicine were encouraged to participate in this study. The response rate was 66.5% (905/1361). The median age of the participants was 22 (19-26). They were 396 (43.8%) male and 509 (56.2%) of them were female; the participation was equally among the five academic years, although more female students from each year participated when compared with male student participation ($P<0.0001$), and 55 students were married, with higher frequency among female students ($P = 0.016$).

Table 1: Characteristics of the participants (n = 905)

	Female	**Male**	**Total**	**P value**
	509 (56.2%)	396 (43.8%)	905 (100%)	
Age (Year) mean ± SD	21.9 ± 1.7	22 ± 1.6	21.9 ± 1.6	0.748
Median (range)	22 (19-26)	22(19-28)	22(19-28)	
Marital status (married %)	39 (70.9%)	16 (29.1%)	55 (6%)	0.016
Academic year				<0.0001
Second year	99 (51%)	95 (49%)	194 (21%)	
Third year	126(75.4%)	41 (24.6%)	167 (18%)	
Fourth year	82 (39.8%)	124 (60.2%)	206 (23%)	
Fifth year	124 (70.5%)	52 (29.5%)	176 (19%)	
Sixth year	78 (48.1%)	84 (51.9%)	162 (18%)	

3.2. Knowledge and attitude about the nature of BBP

Almost 817 (90 %) of the participants declared that they received at a specific time during their academic study an education regarding BBP mainly in the form of a lecture of more than 30 minutes (400, 44%), followed by short briefing education, and theoretical and practical training; 232 (26%) and 85 (9%) respectively. Significant differences were found among female and male students in the type of education (Fig.1 A).

Fig. 1

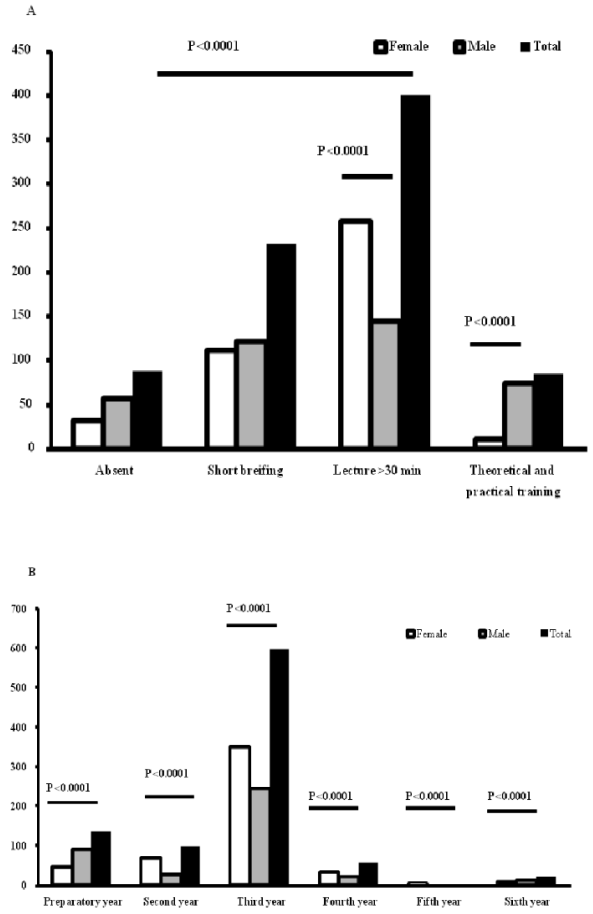

Fig. 1 (A, B): Types and timing of education regarding Blood-borne Pathogens taken by 905 medical students; the majority of them received it during their academic study as a lecture lasting more than 30 minutes, followed by a short briefing education, theoretical and practical training (A). The time for academic education was mainly in the third year (B).

Meanwhile, most of the students reported that their time of academic education was in the third year 595 (66%) (Fig.1 B), only 286 (31.6%) students thought that the suitable time for education was the third year and more than half of them thought that earlier education would be better 453 (51.2%) (Table 2).

Out of the three commonest pathogens transmitted by blood or body fluids, the majority of students had more concern about infection with HIV virus 611 (67.5%), *P* value of 0.024, with no significant difference about fear of HBV or HCV (Fig.2 A).

The knowledge about the mode of occupational transmission of BBP varied among students, it was found that only 484 (53.5%) of the respondents knew the correct occupational risk of BBP; unlike most of the previous results, the number of male students was significantly higher than that of female students, $P < 0.000$ (Fig.2 B).

Moreover, knowledge about vaccination and management of the three commonest viruses results varied among students depending on the type of the virus.

Table 2: Knowledge among medical students about the nature and management of Blood-borne pathogen.

	Female	**Male**	**Total**	**P value**
	509 (56.2%)	396 (43.8%)	905 (100%)	
Suitable time of previous education regarding BBP according to the student				<0.0001
Preparatory year	116 (51.1%)	111 (48.9%)	227 (25.1%)	
Second year	135 (57.2%)	101 (42.8%)	236 (26.1%)	
Third year	152 (53.1%)	134 (45.9%)	286 (31.6%)	
Fourth year	60 (61.2%)	38 (38.8%)	98 (10.8%)	
Fifth year	13 (100%)	0	13 (1.4%)	
Sixth year	18 (60%)	12 (40%)	30 (3.3%)	
Intern	15 (100%)	0	15 (1.7%)	
Treatment/ Vaccination for HIV after accidental exposure to infected / unknown blood				0.603
Do not know	229 (57.1%)	172 (42.9%)	401 (44.3%)	
Know	121 (57.9%)	88 (42.1%)	209 (23.1%)	
Do not have information	159 (58.9%)	136 (46.1%)	295 (32.6%)	
Treatment/ Vaccination for HCV after accidental exposure to infected / unknown blood				**<0.0001**
Do not know	183 (60.8%)	118 (39.2%)	301 (33.3%)	
Know	174 (65.9%)	90 (34.1%)	264(29.2%)	
Do not have information	152(44.7%)	188 (50.3%)	340 (37.6%)	
Treatment/ Vaccination for HBV after accidental exposure to infected / unknown blood				**<0.0001**
Do not know	51 (49.5%)	52 (50.5%)	103 (11.4%)	
Know	359 (64.1%)	201 (35.9%)	560 (61.9%)	
Do not have information	99 (40.9%)	143 (59.1%)	242 (26.7%)	
BBP; Blood-borne pathogen				

As regards the HIV students, equally distributed between those who knew about treatment and who did not know, $P = 0.603$, while for HCV, the majority of them did not know the presence of therapy or do not have information were significantly higher than those who know vaccination/ treatment for HCV, $P < 0.0001$. For HBV, 560 (61.9%) of students know the presence of vaccination/ treatment for HBV, $P < 0.0001$ (Table 2).

Fig. 2

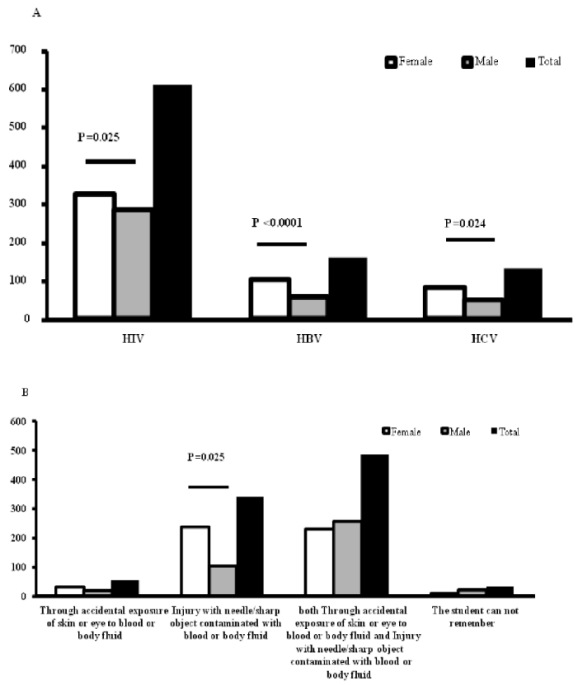

Fig. 2 (A, B): Discrepancy among medical students about types and modes of transmission of Blood-borne Pathogens. The majority of students had more concern about infection with HIV than with HBV or HCV (A). The knowledge about the mode of occupational transmission of BBP varied among students; about half knew the correct risk, and most of them were male students (B).

3.3. Knowledge and attitude about reporting exposure to BBP:

A total of 713 (78%) respondents reported no knowledge about the reporting procedures in case of blood/body fluid exposure without difference among female and male students, *P* = 0.533. Moreover, only 47 (5.2%) are used to report the incident (Fig.3).

A total of 544 (60.1%), 292 female students, and 252 male students did not willing to report the incident of exposure because they thought that might affect their career.

Fig. 3

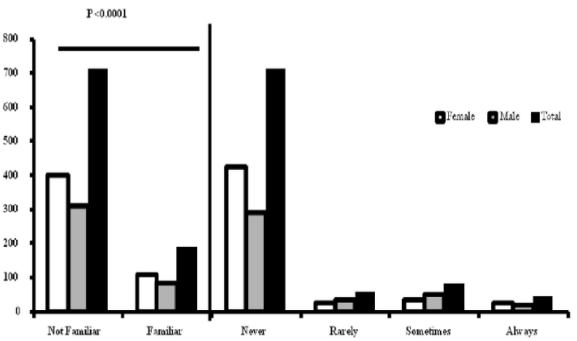

Fig. 3: Discrepancy among medical students about reporting incidents of Blood-borne Pathogens. Most students did not know about the reporting procedures at the faculty, and they were not willing to report the incident.

3.4 Exposure incident to BBP:

Exposure to blood or body fluids is shown in Fig.4. Among participants, 164 (18.1%) students reported having at least exposure to BBP. Out of the 82 (50.7%) were female. The times of exposure among the students varied from one to 15 with a median of two, and the mean ± SD was 2.68 ± 2.73. Female and male students showed no significant differences, *P* = 0.399, Female students median and (range) were two (1-15), (mean ± SD were 2.86 ± 3.1), while male students median and (range) were two (1-10), (mean ± SD were 2.5 ± 2.2). The details about the site of exposure were listed in Fig.4.

Of the student who remembered the place, 9.7% of them acquired the incident in the faculty laboratories, while 22.7 acquired it inside hospitals.

3.5 Factors Associated with Exposure to BBP:

Factors associated with exposure to BBP were listed in Table 3. We found several factors associated with a higher risk of exposure to BBP: Students who were younger (P < 0.0001), female (0.026), students without previous education regarding BBP (P < 0.0001), at 3rd year education level or more (P < 0.0001), afraid of being infected with HIV (P < 0.0001) and those who were not familiar with reporting procedures (P < 0.0001).

Table 3: Factors associated with exposure to BBP among medical students: results of multiple logistic regression analysis.

Variable	Odds ratio	95% confidence interval	P value
Age (young)	1.599	(4.329-5.903)	**<0.0001**
Sex (female)	1.515	(1.051-2.183)	**0.026**
Marital status (married)	1.623	(0.823 - 3.123)	0.147
Previous education regarding BBP(do not have)	1.885	(0.888-3.999)	**<0.0001**
Time of previous education regarding BBP (third year)	6.317	(2.-3.836)	**<0.0001**
BBP of major concern (HIV)	1.962	(1.269-3.034)	**<0.0001**
Familiarity with the reporting procedures (do not have)	3.271	(2.268-4.718)	**<0.0001**
BBP; blood-borne pathogen, HIV; human immune deficiency virus			

4. DISCUSSION

Medical education at Umm Al-Qura University requires that graduate students have a great level of knowledge and information on infection prevention and control. Therefore, infection control was included in the undergraduate topics for the medical graduate. About half of the participants in this study had a good knowledge about the mode of transmission of BBP; they lacked basic knowledge about the management of post-exposure prophylaxis to HIV. The proportion of exposure incidence of medical students was 18.1%, similar to results of previous institutes where the incidence of exposure to BBP among medical students ranged was (11.6%-59%) (Norsayani & Noor Hassim, 2003; Osborn et al., 1999; Patterson et al., 2003; Salzer et al., 2011; Sharma et al., 2009; Wicker et al., 2008). The percentage of occupational exposure reported in this study was higher than the frequencies in similar studies reported in Malaysia (Norsayani & Noor Hassim, 2003) but lower than studies in Austria (Salzer et al., 2011) USA (Patterson et al., 2003; Sharma et al., 2009) and Germany (Wicker et al., 2008). The majority of the respondent exposure incidents that occurred during clinical training in the hospitals could be linked to virus transmission. According to the protocols of the faculty of medicine, exposure incidents should be reported to the nominated faculty counsellor. Surveillance, reporting and management of occupational exposure to BBP among healthcare workers are less prevalent, and adherence to standard precautions can be poor. An inclusive strategy is highly recommended in training healthcare workers. Furthermore, standard precautions should be augmented through educating medical students to be accountable for their safety and health (Auta et al., 2017). Occupational health improvement and safety services in the healthcare system play a great role in reducing and preventing BBP. Globally, applying standard precautionary measures, regularly training on infection prevention, and routinely monitoring creating more safer working conditions (Mengistu et al., 2021).

In this study, a big percentage of the students (78.7%) were not familiar with the reporting procedures, which predisposed them to a higher risk of exposure to BBP (O.R= 3.271). This is similar to the previous studies which reported a lack of awareness among medical students that were the mean reason for not reporting exposure incidents (Cleveland et al., 2016; Iliyasu et al., 2020; Motaarefi et al., 2016; Salzer et al., 2011; Sharma et al., 2009). Therefore, it is mandatory to effectively update the reporting protocol and ensure that the procedures are clear for students to follow.

World health organization (WHO) states that standard precautions include dealing with all blood and body fluid as a source of infection, hand disinfection, using personal protective equipment (PPE), proper disposal of wastes, and vaccination all are important to avoid acquisition of Blood-Borne disease (Auta et al., 2017).

Other factors associated with more exposure to BBP among medical students were female gender, married, younger students and most of the infection control topics given by year three. Recently, a new curriculum was introduced to the faculty of medicine in 2017, with topics about infection prevention and control. Therefore, this curriculum can enhance the student learning experience and skills from the second year who seemed to be more involved in the exposure compared to senior students.

5. CONCLUSION AND RECOMMENDATIONS

Our finding demonstrated inadequate knowledge about BBP nature and transmission, and inadequate reporting, partially due to the student's concern about his or her future career if reported such anincident. Thus, suggesting the importance of continuous education about BBP in this population and using different tools, including theoretical and practical sessions, to prevent this infection.

Establishing an anti-HBV vaccination program and HIV orientation workshops is compulsory for medical students to reduce the harm caused by occupational exposure so that they can report and learn from their faults. It is essentialto ensure medical students' knowledge and understanding before allowing them to join clinical training.

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