

## Dental Students and Blood Borne Pathogens; Occupational Exposure, Reporting, Knowledge and Attitude of Riyadh Based Clinical Dental Students

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### Abstract

**Introduction:** Bloodborne exposures (BBEs) are of substantial concern throughout the clinical education of dental students. Developments in the incidence and type of BBEs should be thoroughly examined and assessed and suitable safety mechanisms and work practices be applied to decrease the frequency of BBEs. **Materials and methods:** This is a cross sectional study conducted among the dental students in Riyadh using an online survey. Dental universities in Riyadh were contacted and participants were requested to fill up the survey. 505 students from clinical levels were utilized in this study. **Results:** 66.5% had their Hep B vaccination done, 37.3% had their post HBV serology done, 65.5% had no previous exposure to bloodborne pathogen and 3.6% having more than 5 exposures previously. **Conclusion:** Knowledge seemed adequate, but the attitude and reporting protocol was lacking.

**Keywords:** Dental students, bloodborne, pathogens.

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## INTRODUCTION

Bloodborne exposures (BBEs) are of substantial concern throughout the clinical education of dental students. Developments in the incidence and type of BBEs should be thoroughly examined and assessed and suitable safety mechanisms and work practices be applied to decrease the frequency of BBEs. Forming a protocol to handle BBEs is important, and constant strengthening of the protocol is particularly essential in a dental school setting, where new providers are frequently included, and most are beginners (Cuny, Hoover & Kirk, 2011).

The World Health Organization stated that 90% of infections among healthcare workers are credited to blood and body fluid exposure in developing countries. Dental students are a mainly susceptible group due to their lack of experience and proficiencies. A study performed in Germany revealed that dental students had almost twice the quantity of needle stick injuries compared to general dental practitioners. Once dental students are subjected to blood-borne pathogens, they may not be given suitable and appropriate post-exposure management, which results from repeated

underreporting of occupational exposures (Wu *et al.*, 2016; Wicker & Rabenau, 2010).

A UK based research indicated that undesirable incidents are a characteristic of dental hospitals and highlighted the common causes, all of which are fundamental to the practice of dentistry. The significance of accurate and reliable reporting of data to make sure that these matters are monitored and tackled in support of lowering risks to staff, students, and patients (Hughes *et al.*, 2012). A Saudi based study demonstrated a generally good adherence to universal isolation safety measures among dental students in King Saud University. Although the attitude and conformity levels were satisfactory, the knowledge was fair. The shortfall of knowledge could be due to the lack of infection control educational resources during years of study. Additional reason might be the lack of belief that practice of basic precautions may interfere with patient health and care (Alharbi *et al.*, 2019).

Another investigation in Yemen reported substantially higher percentage of 5<sup>th</sup>-year students (58.9%) demonstrating positive attitudes toward the treatment of patients with infectious diseases, as

compared to only 31.0% of 4<sup>th</sup> year students ( $P < 0.01$ ). A large number of students (62%) registered non-sterile occupational percutaneous and mucous injuries while treating their patients (Halboub *et al.*, 2015). A Moroccan based study revealed that 42% students experienced at least one occupational exposure to patients' blood. Needle recapping has been the main reason of such injuries (41%). Most accidents happened, respectively, in the oral surgery (51%) and the restorative dentistry (17%) departments. According to many students, they had received inadequate education regarding this topic. More useful education on prevention and management of Occupational Blood Exposure Accidents is highly advised to lessen the prevalence of such injuries. Dental schools should set up a local management unit for following and supporting the exposed students (Hbib *et al.*, 2018).

Education strategies to draft a prevention policy including closer supervision to remind dental students regarding the significance of using PPE and reporting the occurrences, need to be established. A better targeting of the teaching strategies can allow for decrease in the number of accidents and increase in the reporting of cases, providing safety for undergraduate students and patients (Pinelli, Neri & Loffredo, 2016; Bush *et al.*, 2017)

#### Aims of the study

- To determine the prevalence of occupational exposure, reporting practice, knowledge and attitude of dental students towards bloodborne pathogens.
- To compare these variables between dental students of different clinical levels and genders.

## MATERIALS AND METHODS

**Study Design:** This is a cross sectional study conducted among the dental students in Riyadh using an online survey.

**Study Sample:** Dental universities in Riyadh were contacted and participants were requested to fill up the survey. 505 students from clinical levels were utilized in this study.

**Study Instrument:** Online questionnaire was constructed consisting of 29 questions related to

personal and demographic data followed by questions linked to bloodborne pathogens, exposure, reporting knowledge and attitude.

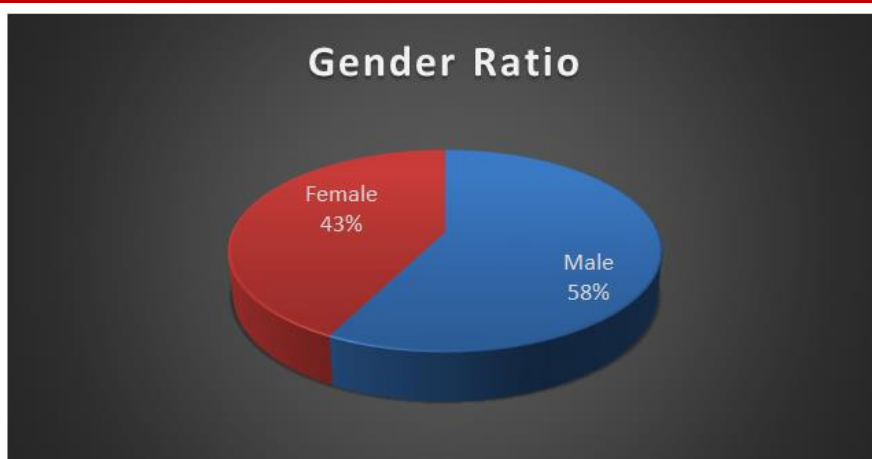
**Instrument Validity and Reliability:** A pilot study was conducted by sending the survey to 20 participants and the data will be inserted in SPSS version 22 to determine the reliability by using Chronbach's coefficient alpha (value: 0.891). Validity of the questionnaire was tested by sending it to experienced researchers in REU, but no changes were made.

**Statistical Analysis:** Collected data was analyzed using SPSS version 22, where descriptive as well as inferential statistics will be conducted. Comparisons between groups were made with the value of significance kept under 0.05 using Chi-Square test.

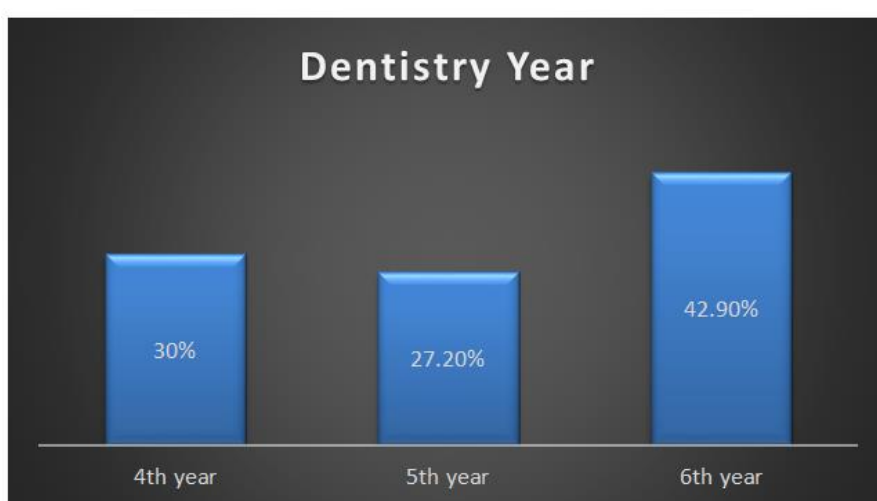
## RESULTS

A total of 505 dental students from clinical years participated in this study, which included 58% males and 43% females (Figure 1). Regarding their dentistry levels, 30% were from 4<sup>th</sup> year, 27.2% from 5<sup>th</sup> and 42.9% from 6<sup>th</sup> year (Figure 2). Table 1 shows the overall responses of survey questions from all participants, which show that 66.5% had their Hep B vaccination done, 37.3% had their post HBV serology done, 65.5% had no previous exposure to bloodborne pathogen and 3.6% having more than 5 exposures previously. Majority of them suffered injury during preparation for the procedure (25.8%) and 33.3% did not report the incident to their clinic supervisor. When inquired about their attitude, 47% reported they would not treat patient with infectious disease, with 19% having treated patients with Hep B before. 46.8% strongly agreed to have objection on treating patients with HIV, 45.6% would stop treating their patient if he developed HIV or Hepatitis.

Table 2 and 3 show the comparisons of gender and dentistry year sub-groups with the survey responses. When compared with gender, statistically significant differences were achieved when inquired about the participants' attitude. However, no statistically significant differences were achieved when assess their knowledge. On the other hand, dentistry levels showed all differences to be statistically significant.



**Figure 1: Gender ratio of study participants**



**Figure 2: Dentistry year of students**

**Table 1: Survey questions and their responses frequencies**

Survey Questions	Responses (%)
Hep B vaccination done?	Yes: 66.5% No: 33.5%
Number of doses	3: 0% Less than 3: 25.2% More than 3: 39.3% Don't remember: 6% None: 29.6%
Post HBV serology	Yes: 37.3% No: 62.7%
At least one bloodborne pathogen exposure	Yes: 45.2% No: 54.8%
Number of previous exposures	0: 65.5% 1: 16.5% 2: 8.7% 3-5: 5.8% >5: 3.6%
Timing of exposure	<6 months ago: 28.6% 6-12 months: 16.3% 1-3 years: 8.7% >3years ago: 3.2% None: 43.3%

Nature of injury	Percutaneous, with needle: 28.6% Percutaneous, with sharp object: 16.7% Mucous membrane exposure: 6.9% Non-intact skin exposure: 3.6% None: 44.2%
Stage of procedure	Preparing for procedure: 25.8% During the procedure: 15.5% Cleaning up after procedure: 12.7% Other: 3.4% None: 42.7%
Did you report your injury to the clinic supervisor?	Yes: 29.6% No: 33.3% Not applicable: 37.1%
Will you treat patients with infectious disease?	Yes: 53% No: 47%
Number of infectious patients treated?	0: 67.9% <5: 23.2% >5: 8.9%
What type of infectious disease have you treated?	Nil: 50.6% Hep B: 19% Non hep B: 30.4%
Do you remove accessories during a dental procedure?	No time: 61.3% Negative patient reaction: 14.1% Confidentiality issues: 8.7% Negative faculty reaction: 3.6% Felt there was little or no risk: 4.2% Unaware of reporting protocol: 8.1%
All patients must be considered HIV positive	Strongly Agree: 58.7% Agree: 19.2% Neutral: 14.3% Disagree: 3.4% Strongly disagree: 4.4%
All patients must be considered HBV carriers	Strongly Agree: 56.2% Agree: 19.2% Neutral: 16.3% Disagree: 4.4% Strongly disagree: 4%
I object to treating patients with HIV	Strongly Agree: 46.8% Agree: 17.3% Neutral: 18.5% Disagree: 10.7% Strongly disagree: 6.7%
I object to treating patients who had hepatitis B	Strongly Agree: 46.2% Agree: 16.5% Neutral: 19.2% Disagree: 9.9% Strongly disagree: 8.1%
If I found out that my longtime patient had HIV or hepatitis, I would stop treating him.	Strongly Agree: 45.6% Agree: 16.3% Neutral: 19.2% Disagree: 10.9% Strongly disagree: 7.9%
Dentists should have the opportunity to refuse to treat patients with HIV or hepatitis.	Strongly Agree: 45.4% Agree: 17.7% Neutral: 21.4% Disagree: 8.9% Strongly disagree: 6.5%
Can HIV be transmitted through air or water?	Yes: 33.7% No: 52.6%

	Don't know: 13.7%
Can HIV be transmitted through saliva?	Yes: 46.8% No: 39.9% Don't know: 13.3%
Can HIV be transmitted through blood or semen?	Yes: 67.5% No: 21% Don't know: 11.5%
Can HIV be completely cured with antiretroviral therapy?	Yes: 33.7% No: 48.8% Don't know: 17.5%
In health care professionals, hepatitis B can be transmitted through blood splashing into mucous membranes of the eye or mouth	Yes: 60.7% No: 22.8% Don't know: 16.5%
Is a hepatitis C vaccine available?	Yes: 35.1% No: 44.2% Don't know: 20.6%
Should individuals with hepatitis B or C infection receive dental treatment in the hospital?	Yes: 61.7% No: 22% Don't know: 16.3%
Are you familiar with the procedure in case of a needlestick injury?	Yes: 62.7% No: 26% Don't know: 11.3%

**Table 2: Comparison of survey responses on the basis of gender**

Survey Questions	Male	Female	p-value
Hep B vaccination done?	Yes: 62% No: 38%	Yes: 73% No: 27%	.010
Number of doses	3: 0% Less than 3: 21% More than 3: 36% Don't remember: 6% None: 37%	3: 0% Less than 3: 31% More than 3: 43% Don't remember: 6% None: 20%	.001
Post HBV serology	No Statistically Significant Association		.094
At least one bloodborne pathogen exposure	Yes: 38% No: 62%	Yes: 56% No: 44%	.000
Number of previous exposures	0: 73% 1: 13% 2: 8% 3-5: 4% >5: 2%	0: 56% 1: 21% 2: 9% 3-5: 7% >5: 6%	.001
Timing of exposure	<6 months ago: 28% 6-12 months: 12% 1-3 years: 7% >3years ago: 1% None: 52%	<6 months ago: 29% 6-12 months: 22% 1-3 years: 11% >3years ago: 6% None: 32%	.000
Nature of injury	Percutaneous, with needle: 26% Percutaneous, with sharp object: 13% Mucous membrane exposure: 6% Non-intact skin exposure: 3% None: 52%	Percutaneous, with needle: 33% Percutaneous, with sharp object: 21% Mucous membrane exposure: 8% Non-intact skin exposure: 4% None: 34%	.002
Stage of procedure	Preparing for procedure: 23% During the procedure: 9%	Preparing for procedure: 29% During the procedure: 24% Cleaning up after procedure: 13% Other: 3%	.000

	Cleaning up after procedure: 13% Other: 4% None: 51%	None: 31%	
Did you report your injury to the clinic supervisor?	Yes: 27% No: 31% Not applicable: 42%	Yes: 33% No: 43% Not applicable: 6%	.026
Will you treat patients with infectious disease?	No Statistically Significant Association		.087
Number of infectious patients treated?	0: 76% <5: 18% >5: 6%	0: 57% <5: 30% >5: 13%	.000
What type of infectious disease have you treated?	Nil: 53% Hep B: 14% Non hep B: 33%	Nil: 47% Hep B: 26% Non hep B: 27%	.002
Do you remove accessories during a dental procedure?	No Statistically Significant Association		.064
All patients must be considered HIV positive	Strongly Agree: 60% Agree: 20% Neutral: 14% Disagree: 4% Strongly disagree: 2%	Strongly Agree: 57% Agree: 19% Neutral: 14% Disagree: 2% Strongly disagree: 7%	.048
All patients must be considered HBV carriers	No Statistically Significant Association		.138
I object to treating patients with HIV	No Statistically Significant Association		.307
I object to treating patients who had hepatitis B	Strongly Agree: 49% Agree: 14% Neutral: 22% Disagree: 9% Strongly disagree: 6%	Strongly Agree: 43% Agree: 20% Neutral: 15% Disagree: 11% Strongly disagree: 11%	.018
If I found out that my longtime patient had HIV or hepatitis, I would stop treating him.	No Statistically Significant Association		.522
Dentists should have the opportunity to refuse to treat patients with HIV or hepatitis.	Strongly Agree: 46% Agree: 16% Neutral: 23% Disagree: 11% Strongly disagree: 4%	Strongly Agree: 44% Agree: 20% Neutral: 19% Disagree: 7% Strongly disagree: 10%	.031
Can HIV be transmitted through air or water?	Yes: 33% No: 56% Don't know: 11%	Yes: 35% No: 48% Don't know: 18%	.043
Can HIV be transmitted through saliva?	No Statistically Significant Association		.912
Can HIV be transmitted through blood or semen?	No Statistically Significant Association		.133
Can HIV be completely cured with antiretroviral therapy?	No Statistically Significant Association		.169
In health care professionals, hepatitis B can be transmitted through blood splashing into mucous membranes of the eye or mouth	No Statistically Significant Association		.484
Is a hepatitis C vaccine available?	No Statistically Significant Association		.380
Should individuals with hepatitis B or C infection receive dental treatment in the hospital?	No Statistically Significant Association		.539
Are you familiar with the procedure in case of a needlestick injury?	No Statistically Significant Association		.183

**Table 3: Comparison of survey responses on the basis of dentistry year**

Survey Questions	4 <sup>th</sup> year	5 <sup>th</sup> year	6 <sup>th</sup> year	p-value
Hep B vaccination done?	Yes: 87% No: 13%	Yes: 50% No: 50%	Yes: 62% No: 38%	.000
Number of doses	3: 0% Less than 3: 19% More than 3: 66% Don't remember: 4% None: 11%	3: 0% Less than 3: 38% More than 3: 25% Don't remember: 6% None: 31%	3: 0% Less than 3: 22% More than 3: 30% Don't remember: 7% None: 41%	.000
Post HBV serology	Yes: 75% No: 25%	Yes: 22% No: 78%	Yes: 21% No: 79%	.000
At least one bloodborne pathogen exposure	Yes: 75% No: 25%	Yes: 33% No: 67%	Yes: 32% No: 68%	.000
Number of previous exposures	0: 75% 1: 7% 2: 11% 3-5: 5% >5: 2%	0: 45% 1: 33% 2: 12% 3-5: 6% >5: 4%	0: 72% 1: 13% 2: 5% 3-5: 6% >5: 4%	.000
Timing of exposure	<6 months ago: 63% 6-12 months: 10% 1-3 years: 7% >3years ago: 3% None: 18%	<6 months ago: 19% 6-12 months: 31% 1-3 years: 10% >3years ago: 3% None: 37%	<6 months ago: 11% 6-12 months: 12% 1-3 years: 9% >3years ago: 4% None: 65%	.000
Nature of injury	Percutaneous, with needle: 59% Percutaneous, with sharp object: 14% Mucous membrane exposure: 7% Non-intact skin exposure: 5% None: 15%	Percutaneous, with needle: 20% Percutaneous, with sharp object: 26% Mucous membrane exposure: 12% Non-intact skin exposure: 1% None: 40%	Percutaneous, with needle: 13% Percutaneous, with sharp object: 13% Mucous membrane exposure: 3% Non-intact skin exposure: 4% None: 68%	.000
Stage of procedure	Preparing for procedure: 63% During the procedure: 13% Cleaning up after procedure: 7% Other: 2% None: 15%	Preparing for procedure: 14% During the procedure: 27% Cleaning up after procedure: 22% Other: 4% None: 33%	Preparing for procedure: 7% During the procedure: 10% Cleaning up after procedure: 11% Other: 4% None: 68%	.000
Did you report your injury to the clinic supervisor?	Yes: 64% No: 17% Not applicable: 19%	Yes: 15% No: 53% Not applicable: 32%	Yes: 14% No: 33% Not applicable: 53%	.000
Will you treat patients with infectious disease?	Yes: 77% No: 23%	Yes: 40% No: 60%	Yes: 44% No: 56%	.000
Number of infectious patients treated?	0: 71% <5: 23% >5: 6%	0: 53% <5: 32% >5: 15%	0: 75% <5: 18% >5: 7%	.000
What type of infectious disease have you treated?	Nil: 68% Hep B: 18% Non hep B: 14%	Nil: 27% Hep B: 35% Non hep B: 38%	Nil: 53% Hep B: 10% Non hep B: 37%	.000
Do you remove accessories during a dental procedure?	No time: 68% Negative patient reaction: 10% Confidentiality issues: 13% Negative faculty reaction: 3% Felt there was little or no risk: 3% Unaware of reporting	No time: 52% Negative patient reaction: 24% Confidentiality issues: 11% Negative faculty reaction: 4% Felt there was little or no risk: 6% Unaware of reporting	No time: 63% Negative patient reaction: 11% Confidentiality issues: 5% Negative faculty reaction: 4% Felt there was little or no risk: 4% Unaware of reporting	.000

	protocol: 4%	protocol: 4%	protocol: 14%	
All patients must be considered HIV positive	Strongly Agree: 75% Agree: 10% Neutral: 10% Disagree: 3% Strongly disagree: 3%	Strongly Agree: 36% Agree: 28% Neutral: 24% Disagree: 5% Strongly disagree: 6%	Strongly Agree: 62% Agree: 20% Neutral: 11% Disagree: 3% Strongly disagree: 5%	.000
All patients must be considered HBV carriers	Strongly Agree: 76% Agree: 12% Neutral: 7% Disagree: 4% Strongly disagree: 1%	Strongly Agree: 33% Agree: 28% Neutral: 28% Disagree: 5% Strongly disagree: 7%	Strongly Agree: 57% Agree: 19% Neutral: 16% Disagree: 4% Strongly disagree: 4%	.000
I object to treating patients with HIV	Strongly Agree: 65% Agree: 7% Neutral: 13% Disagree: 9% Strongly disagree: 6%	Strongly Agree: 28% Agree: 28% Neutral: 26% Disagree: 12% Strongly disagree: 7%	Strongly Agree: 46% Agree: 18% Neutral: 17% Disagree: 11% Strongly disagree: 7%	.000
I object to treating patients who had hepatitis B	Strongly Agree: 64% Agree: 10% Neutral: 12% Disagree: 7% Strongly disagree: 7%	Strongly Agree: 26% Agree: 27% Neutral: 29% Disagree: 11% Strongly disagree: 7%	Strongly Agree: 46% Agree: 14% Neutral: 18% Disagree: 11% Strongly disagree: 10%	.000
If I found out that my longtime patient had HIV or hepatitis, I would stop treating him.	Strongly Agree: 68% Agree: 10% Neutral: 9% Disagree: 11% Strongly disagree: 3%	Strongly Agree: 30% Agree: 24% Neutral: 28% Disagree: 12% Strongly disagree: 7%	Strongly Agree: 40% Agree: 16% Neutral: 21% Disagree: 11% Strongly disagree: 13%	.000
Dentists should have the opportunity to refuse to treat patients with HIV or hepatitis.	Strongly Agree: 65% Agree: 10% Neutral: 17% Disagree: 5% Strongly disagree: 3%	Strongly Agree: 29% Agree: 23% Neutral: 31% Disagree: 10% Strongly disagree: 7%	Strongly Agree: 42% Agree: 19% Neutral: 19% Disagree: 11% Strongly disagree: 9%	.000
Can HIV be transmitted through air or water?	Yes: 67% No: 21% Don't know: 13%	Yes: 20% No: 64% Don't know: 15%	Yes: 19% No: 68% Don't know: 13%	.000
Can HIV be transmitted through saliva?	Yes: 73% No: 17% Don't know: 10%	Yes: 28% No: 59% Don't know: 13%	Yes: 41% No: 44% Don't know: 16%	.000
Can HIV be transmitted through blood or semen?	Yes: 80% No: 12% Don't know: 8%	Yes: 47% No: 36% Don't know: 16%	Yes: 71% No: 18% Don't know: 11%	.000
Can HIV be completely cured with antiretroviral therapy?	Yes: 64% No: 23% Don't know: 14%	Yes: 20% No: 61% Don't know: 20%	Yes: 22% No: 60% Don't know: 19%	.000
In health care professionals, hepatitis B can be transmitted through blood splashing into mucous membranes of the eye or mouth	Yes: 73% No: 16% Don't know: 11%	Yes: 43% No: 40% Don't know: 17%	Yes: 63% No: 17% Don't know: 20%	.000
Is a hepatitis C vaccine available?	Yes: 67% No: 23% Don't know: 11%	Yes: 20% No: 56% Don't know: 24%	Yes: 23% No: 52% Don't know: 25%	.000
Should individuals with hepatitis B or C infection receive dental treatment in the hospital?	Yes: 75% No: 13% Don't know: 12%	Yes: 47% No: 40% Don't know: 13%	Yes: 62% No: 17% Don't know: 21%	.000
Are you familiar with the procedure in case of a needlestick injury?	Yes: 76% No: 11% Don't know: 13%	Yes: 49% No: 42% Don't know: 9%	Yes: 62% No: 26% Don't know: 12%	.000

## DISCUSSION

This study aimed to assess the knowledge and attitude of dental students in their clinical levels/years regarding the exposure, reporting, knowledge, and

attitude towards the bloodborne pathogens. Students from both genders and three clinical years participated in this study. A similar study conducted among US based dental students reported that the prevalence of



bloodborne pathogen exposure (BBPE) was 19.1 percent. Percutaneous injuries occurred in 87.5 percent of those exposed. 8.2 percent of the respondents acknowledged an unwillingness to perform procedures on patients with HIV (Myers *et al.*, 2012). As far as our findings were concerned, 34.5% of our study participants had BBPE, which is higher than the US based study. 6.7% of our subjects reported to have strongly disagreed to treat patients with HIV, which is lower than the US based study. It can be argued that the US based study was not conducted during the recent times and attitudes tend to change over the period of time, which can be observed in our study.

Another study conducted among the dental students of Sindh, Pakistan reported that 63% of them had experienced BBPE during their clinical training, with majority of the incidents occurring during the preparation of treatment such as providing local anaesthesia or re-capping (Ali *et al.*, 2019). Whereas our study findings revealed having 45.2% students with at least one BBPE during their clinical training, which is lower as compared to the above-mentioned study. However, the stage of procedure which was most common during this incident was similar to the Pakistani study (preparation for procedure).

An Iranian based study among the dental students reported that no statistically significant association was found when compared the gender with the overall knowledge and attitude of students towards BBPE. However, there was a significant association observed when compared the level of students (Gilavand, Shooriabi & Malakootian, 2018). Similar results were obtained when our data was analysed as gender had no association with the attitude of students with bloodborne pathogens. Whereas the dentistry levels were highly associated with the knowledge, experience, and attitude towards BBPE.

A Jazan based similar study assessed the attitudes of dental students regarding bloodborne pathogens, which reported that less than half the subjects (47.6%) were confident on their ability to safely treat HIV/AIDS patients and only 28.8% of the study population believed that their knowledge about infection control is enough to treat HIV/AIDS patients. Males and 4th year students had significantly greater HIV/AIDS related knowledge and attitudes than their comparative counterparts (Kumar *et al.*, 2018). When compared these findings with our study, it was noted that only 17.4% students were prepared and agreed to treat patients with HIV, no statistically significant difference between genders was determined, whereas final year students were more ready to treat such patients.

The overall knowledge and attitude of senior dental students was observed to be better as compared to the junior students, which reveals the fact that

clinical exposure and empathy plays an important role in decision making when it comes to the treatment of infectious patients. Also, there is a need of educating the students about the reporting protocol of BBPE as it was observed to be low when analysed our study findings.

## CONCLUSIONS

- The overall students' attitude to treat infectious patients was on the lower side.
- Knowledge seemed adequate but the attitude and reporting protocol was lacking.
- No significant difference among genders was reported when analyzed the attitudes.
- Senior dental students showed better levels of knowledge and attitude as compared to juniors.

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