

Knowledge, Attitudes, and Practice of Infection Control among Dental Students at Sana'a University, Yemen

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Abstract:

Background: The aim of this study was to evaluate knowledge, attitudes, and practices regarding infection control procedures among senior dental students.

Materials and Methods: A questionnaire-based cross-sectional survey was conducted among 145 4th- and 5th-year dental students at the Faculty of Dentistry, Sana'a University, Yemen. The self-administered questionnaire was comprised of 20 open- and close-ended items regarding barrier techniques, vaccination status, infection control practices, and awareness. Data were analyzed with a Chi-square test. A $P \leq 0.05$ was considered significant.

Results: The response rate was 72% (145 out of 204 potential respondents). Overall, 71.7% of the students had been vaccinated for hepatitis B and only 9.5% were tested for post-hepatitis B virus immunization serology. While the vast majority (96.6%) reported always wearing gloves for all dental procedures, the use of face masks and eyewear were reported by only 53.8% and 14.0% of students, respectively, with no significant difference between genders and year of study ($P > 0.05$). A significantly higher percentage of 5th-year students (58.9%) showed positive attitudes toward the treatment of patients with infectious diseases, as compared to only 31.0% of 4th year students ($P < 0.01$). A great number of students (62%) reported non-sterile occupational percutaneous and mucous injuries while treating their patients.

Conclusions: These unsatisfactory findings highlight the necessity of continued infection control education in order to improve knowledge, attitudes, and practices regarding infection control among dental students at Sana'a University.

Key Words: Dental students, infection control, knowledge, practice, Yemen

Introduction

Cross-infection can be defined as the transmission of infectious agents between patients and staff within a clinical environment.¹ Dental health personnel (DHP) are at high risk of exposure to cross-infection with blood-borne pathogens, such as hepatitis B virus (HBV), hepatitis C virus, and human immunodeficiency virus (HIV), and *Mycobacterium tuberculosis*, streptococci, and other viruses and bacteria that colonize the oral cavity and the upper respiratory tract.^{2,3} This risk is enhanced by accidental injuries caused by dental instruments during patient treatment. Such infections can be prevented using safety precautions and implementing infection control guidelines in addition to vaccination and proper post-exposure management. Many dental patients may appear clinically healthy according to physical examination and medical history. Hence, risk management strategies or standard precautions should not be applied based on the patient's appearance.⁴

Dental schools are responsible for providing appropriate infection control measures, proper training of dental students to protect patients, and for the establishment of safer work conditions.⁴ In 2003, the Center for Disease Control and Prevention of the United States of America updated its guidelines on infection control in dental settings.⁵ These guidelines include standard precautions which aim to ensure a safe working environment and prevent the potential transmission of occupational and nosocomial infections among DHPs and their patients. Awareness and compliance with these recommendations are crucial for the prevention of occupational and nosocomial infections in healthcare workers, including dental healthcare professionals. Unfortunately, despite the considerable emphasis placed on standardized infection control procedures, it appears that only a few dentists adhered to these protocols in their dental practice.^{1,6,7} Moreover, several studies have shown that even dental students have not always properly adhered to these procedures.^{3,4,6,8,9} Dental education can play a significant role in the training of dentists by helping them to adopt adequate knowledge and attitudes related to infection control procedures. Data regarding infection control practices in dental health care in Yemen are lacking. The purpose of the present study, therefore, was to investigate the knowledge, attitudes, and practices regarding infection control measures among dental students in Sana'a city, Yemen.

Materials and Methods

This cross-sectional survey was conducted on senior undergraduate dental students, Faculty of Dentistry, Sana'a University, during the spring semester of 2014. As dental education is for 5 years in Yemen and dental students are involved in clinical training starting in their 4th year of education, the questionnaire was distributed among 4th- and 5th-year students. The questionnaire was adapted from a previous study conducted by Rahman *et al.*³ among dental students in the United Arab Emirates (UAE). Before distributing the questionnaire, a pilot study was performed on a random sample of students ($n = 20$), and the questionnaire was modified according to the feedback obtained. The anonymous self-administered questionnaire was comprised of 20 open- and close-ended questions related to hepatitis B vaccination and serology, the use of personal protective equipment, infection control practices and awareness, percutaneous and mucous membrane exposure, and attitudes toward the dental treatment of infected patients.

The dental students were asked to fill out the questionnaire in the lecture hall without discussion in 15 min. Students who agreed to participate in the study signed the consent form prior to answering the questionnaire.

Statistical analysis was conducted using frequency, Chi-square, and Fisher exact tests, with a 5% level of significance. Data analyses were performed using SPSS version 20.

Results

The response rate was 72% (145 out of 204). The mean age of the participants was 23.13 ± 1.68 , ranging from 20 to 32 years; 71.3% were females. The sample was comprised of an almost equal distribution of 4th- and 5th-year students (49% vs. 50.3%) (Table 1).

Table 2 shows the data related to hepatitis B immunization, the number of doses, and post-HBV immunization serology. Vaccination was completed by 71.7% of the students, with a significant difference between year 4 and year 5 students (54.2 vs. 89.0; $P < 0.001$). Though not statistically significant ($P = 0.071$), the vaccination rate was also higher among females (76.0%) than males (61.0%). Out of the vaccinated students, only 50.0% completed the required three doses. There was a statistically significant difference between the number of completed doses and gender ($P < 0.001$). There was not a statically significant difference between the number of completed doses and the year of study. Surprisingly, only 10 (9.5%) were tested for post-HBV immunization serology, with no significant differences according to gender or year of study ($P > 0.05$).

Table 3 illustrates students' self-reported use of protective barrier techniques. The vast majority (96.6%) of students reported wearing gloves, while only 53.8% reported wearing

Table 1: Distribution of the students according to gender and year of study.

	N	%
Gender		
Male	41	28.3
Female	104	71.7
Year of study		
Year 4	72	49.7
Year 5	73	50.3
Total	145	100.0

Table 2: Proportion of vaccination, number of doses and post-HBV serology.

Variable	4 th -year students (%)	5 th -year students (%)	Total (%)
Hepatitis B vaccination?*			
Yes	54.2	89.0	71.7
No	45.8	11.0	28.3
Number of doses			
3 doses	41.0	55.4	50.0
Less than 3 doses	51.3	36.9	42.3
More than 3 doses	2.6	4.6	3.8
Don't remember?	5.1	3.1	3.8
Post HBV serology?			
Yes	15.4	6.1	9.5
No	84.6	93.9	90.5

* $P < 0.001$. HBV: Hepatitis B virus

Table 3: Use of protective barrier techniques reported by dental students.

	4 th -year students (%)	5 th -year students (%)	Total (%)
Gloves			
Always	94.4	98.6	96.6
Sometimes	5.6	1.4	3.4
Never	0.0	0.0	0.0
Masks			
Always	52.8	54.8	53.8
Sometimes	45.8	45.2	45.5
Never	1.4	0.0	0.7
Eyewear			
Always	18.6	9.6	14.0
Sometimes	58.6	54.8	56.6
Never	22.9	29.4	29.4

Chi-square tests; $P > 0.05$

masks at all times, with no significant difference between 4th- and 5th-year students. With regards to eyewear, only 18.6% of 4th-year and 9.6% of 5th-year students always used protective eyewear, while the majority used it occasionally.

The majority (96.5%) of students reported changing gloves between patients and only 47% of them reported washing their hands after each gloves change, with no significant difference between 4th- and 5th-year students. In general, only 53.1% always remove their gloves upon leaving the immediate area of patient care. Around 87.5% reported changing their gowns/lab coats if they were visibly contaminated (Table 4).

Around 97.9% reported sterilizing instruments after each procedure and half of them reported that they did not remove

their watches or jewelry during dental care. In this study, around 32.4% of 4th-year and 61.6% of 5th-year dental students were keen to follow the same infection control procedures in their clinics after graduation (Table 4).

Most of the students, 95.8%, knew that dental clinics were more prone to the transmission of infectious diseases than other medical clinics (Table 4).

A significantly higher percentage of 5th-year students (58.9%) showed a positive attitude toward the treatment of patients with infectious diseases, as compared to only 31.0% of 4th-year students who did not mind treating patients with infectious diseases ($P < 0.01$). Likewise, there was a statistically significant difference between 4th- and 5th-year students regarding the number of patients treated with infectious diseases. Hepatitis B patients were the most treated patients (Graph 1).

Surprisingly, 62.8% of the students (59.7% of 4th- and 65.8% of 5th-year students,) reported non-sterile occupational percutaneous and mucous injuries, with no significant difference between students in different years of study ($P > 0.05$). Most of the reported injuries were caused by explorers (18.6%) and anesthesia needles (11.7%) (Graph 2).

Discussion

It is important for any hospital or dental clinic to set up its own measures to prevent the spread of infectious and transmissible diseases. For this purpose, it is important that dental health care professionals be aware of the risks and seriousness of infections. This survey was conducted to assess the level of knowledge, attitudes, and practices of dental students regarding infection control procedures among dental students at Sana'a University, Yemen. The Faculty of Dentistry of Sana'a University is the

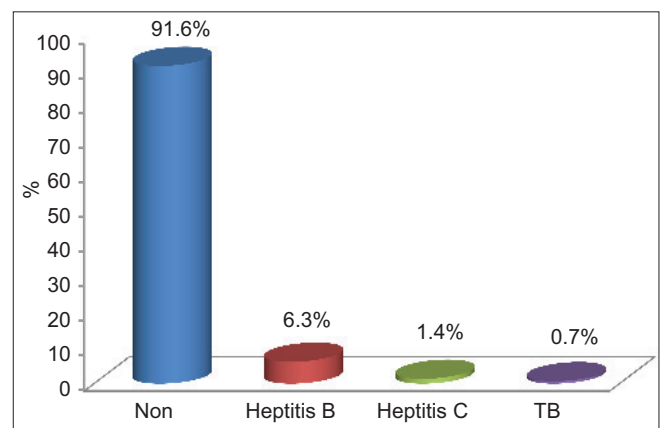
largest public dental school in Yemen and, therefore, we believe that our results can be generalized to other dental schools in the country.

The findings of the present study indicated a very low rate of HBV vaccination. Only 70.7% of the students were vaccinated against Hepatitis B. This rate is much lower than that reported by other studies in Brazil (90.8%), Canada (100%), and UAE (95.8%).^{3,4,10} However, this rate is much higher than that reported in India, where only 38% of students were found to be vaccinated.⁹ It should be noted that vaccination rates among dental health professionals vary considerably worldwide and have been reported to range from 33% to 97%.^{3,4,8,11-13} The present authors observed that women completed the immunization more frequently than men, which is in agreement with a previous study conducted by de Souza *et al.*⁴ This fact can be attributed to the historical concern of women regarding preventive measures, especially sexually transmitted diseases.⁴ Notably, only 50.0% of the vaccinated students had received the recommended 3 doses of vaccination. This percentage is very low compared with other findings reported by de Souza *et al.* (83.3%) and Rahman *et al.* (64.7%) among dental students in Brazil and the UAE, respectively.^{3,4} It is worth mentioning here that the vaccination against hepatitis B

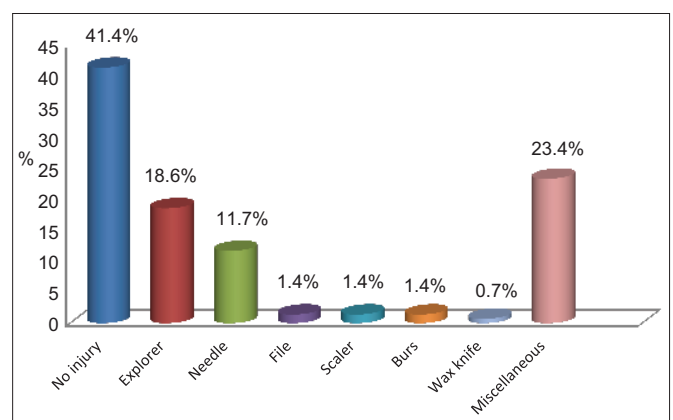
Table 4: Students' knowledge, practice, and attitude about infection control-related topics, by year of study.

Statement	4 th -year students (%)	5 th -year students (%)	Total (%)
Change of gloves between patients	95.7	97.3	96.5
Hand wash between each gloves change	36.6	49.3	43.0
Removal of gloves/mask while walking around	51.4	54.8	53.1
Change gown/lab coat if visibly contaminated	84.5	90.4	87.5
Dental clinics are more prone to infectious disease than other medical fields	95.8	95.9	95.8
Instruments sterilization after each dental procedure	95.8	100.0	97.9
Removal of watches and jewelry during procedures	52.2	37.7	44.9
Percutaneous injuries with a used instrument	59.7	65.8	62.8
Willingness to treat patients with infectious disease	31.0	58.9*	45.1

* $P < 0.05$



Graph 1: Type of infectious diseases treated by dental students.



Graph 2: Proportion of exposures caused by different instruments.

in Yemen is not considered a mandatory request by the dental and medical schools, which in turn explains the low vaccination rate uncovered in the present study. Furthermore, the cost of the vaccination and a lack of awareness about the importance of vaccination among dental students might also be contributing factors.

In our survey, only 9.5% of students who were immunized have reported post-HBV immunization serology, a percentage lower than that reported by other studies. In a survey of dental students, de Souza *et al.* found that 90.8% have been vaccinated.⁴ However, only 27.5% reported post-HBV immunization serology. In their study on senior dental students, Rahman *et al.* found that 50.4% were tested for post-immunization serology.³ It is likely that students do not check their HBs antibody level after completing the vaccination because they are not aware of the lack of immune system response probability. Several studies have reported that not all vaccinated individuals exhibit an immune response.^{14,15} Since dental students play a critical role in Yemen's health care system, periodic mandatory assessment of their vaccination and immunization status is highly recommended.

Despite the fact that there is evidence of improvement in compliance with barrier use in many countries, dentists' adherence to all infection control guidelines and standard precautions still needs further improvement. In the present study, although the compliance level for the use of gloves was high (96.6%), similar to previous studies conducted in Canada, Iran, the UK, the UAE, and Brazil,^{3,4,10,16,17} the frequency of face mask and protective eyewear use was very unsatisfactory. This poor utilization of eyewear and face masks may indicate a low level of awareness among students about the probability of disease transmission via aerosols and blood splashes. Dental students should be encouraged to wear masks and a protective eyewear equipment to minimize the chance of transmitting airborne infections.

Studies have shown that aerosol and splatter containing pathogens can contaminate clinical wear, targeting the chest and forearms, and remain alive for several days.^{18,19} In accordance with Raman's *et al.*³ study, the majority of students in our study reported changing their lab coats when they were visibly contaminated. It has been recommended that dental uniforms be worn only in dental clinics, and changed daily and immediately after a blood splatter to prevent cross-contamination.^{3,19}

Hand hygiene is considered the single most effective method for the prevention and control of healthcare-associated infections.²⁰ Compliance with hand hygiene procedures is essential as the hands of healthcare workers may serve as reservoirs for many pathogens.^{20,21} Unfortunately, only 43.0% of our sample reported washing their hands between each gloves change. This finding is consistent with earlier

studies conducted by Rahman *et al.*³ (47.9%) and de Amorim-Finzi²² (45%). This low compliance with regular hand washing necessitates stricter measures to remind the students of the importance of hand washing.

This survey reports that 62% of the students had non-sterile occupational injuries. This finding is lower than that uncovered by a similar study conducted in Canada, in which 82.0% reported occupational exposures.¹⁰ However, this rate is higher than that reported in various studies regarding dental students in Brazil (31.1%), Iran (48.5%), and the UAE.^{3,4,17} Consistent with findings obtained by Rahman *et al.*,³ we noted that 5th-year students had significantly higher exposure rates than 4th-year students, which can be attributed to their longer clinical exposure compared with 4th-year students. Sharp injuries are more likely to occur in the dental environment than in other health care settings,²³ usually due to the small operating field, frequent patient movements, and the variety of sharp dental instruments. Such injuries may pose the risk of transmission of blood-borne pathogens, especially hepatitis B, C, or HIV.^{4,6,10,23}

When the students were asked about their willingness to treat patients with infectious diseases, 5th-year students were more likely to exhibit it, whereas this quality was less common among students of lower academic years. Moreover, consistent with results reported by Alavian *et al.*,¹⁷ we found a correlation between gender and willingness to treat patients with infectious diseases, including HBV-infected individuals. This relative improvement in attitude toward patients with infectious diseases may suggest that theoretical and practical training in HBV and HIV protection can improve students' attitudes about treating these patients.

One of the limitations of this study is the fact that the responses were based on students' self-assessment rather than being provided under the supervision of the investigators in a clinical environment. Therefore, the responses might not have accurately reflected the true levels of knowledge, attitude, and behavior, and thus, the reported level of practice might be lower than the real level. Moreover, this number of questions cannot show the real knowledge and practice of the respondents. Nonetheless, the number of questions was kept to a minimum to improve the response rate and this approach appeared to work well.

In general, our study showed poor compliance with the recommended infection control practices among dental students of Sana'a University, though they had an acceptable attitude and level of knowledge. This discrepancy between knowledge and attitude could be due to an inadequate supply of personal protective equipment, carelessness, improper disposal of medical waste, and a lack of periodic educational programs. Therefore, continuous educational programs, as well as training workshops on infection control isolation precaution for dental students, and the required facilities to allow compliance with

infection control policies are urgently needed. Moreover, all the vaccinations, especially Hepatitis B vaccination, should be set as mandatory for students prior to admission to any dental institution. It is the responsibility of training institutions to ensure the safety of the students by requiring mandatory HBV vaccinations prior to exposure.

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