

Original Article

Infection Control Practices among Dental Students in Sana'a, Yemen

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Abstract

Purpose: To assess the level of knowledge, attitude, and practice among Yemeni dental students towards standard infection control precautions in Sana'a, Yemen.

Methods: The study sample comprised 179 (40 males and 139 females) junior and senior dental students from a public dental college located in Sana'a city, Yemen. A self applied, closed ended questionnaire (response as 'yes' or 'no') was used to collect data. The questionnaire consisted of 15 items related to medical history taking, vaccination status, barrier techniques, and infection control practices.

Results: About 98 percent of dental students usually ask their patients about medical history, 65 percent were vaccinated against hepatitis B, 100 percent wear gloves and 99 percent change gloves during treatment and between patients, and 71 percent wear masks and 51 percent change masks during treatment and between patients. Most dental students (85 and 88 percent) reported that they changed extraction instruments and burs between patients respectively. Unfortunately dental students reported that only 64 percent they changed saliva ejectors between patients, and only 36 percent changed handpieces between patients. Approximately 27 percent (49/179) used autoclaves for sterilization, 13 percent (24/179) used plastic bags to wrap sterilized instruments, and only 26 percent (47/179) disinfected impressions before sending them to dental labs. Four percent used rubber dams in the clinics, and 71 percent had special containers for sharps disposal.

Conclusion: The undergraduate students at this dental college in Sana'a exhibited poor infection control practices. These findings show the need to change organizational and administrative procedures to enable dental students to follow a strict infection control protocol.

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Key words: infection, dental, students, programs, sterilization, Yemen

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Introduction

The oral cavity is a fertile environment for the transmission, inoculation and growth of various infectious agents. There are microorganisms in an individual that may not cause any harm to the particular host, but can be detrimental to others. Blood and saliva are the ideal means for transmitting such agents¹. Dental healthcare professionals (DHPs) are at risk of infections caused by various microorganisms such as *Mycobacterium tuberculosis*, hepatitis B and hepatitis C viruses, staphylococci, streptococci, herpes simplex virus types 1, human immunodeficiency virus (HIV), mumps, influenza, and rubella². In the dental setting, there are special circumstances and opportunities able to lead to transmission of such organisms to DHPs. For example, high-speed dental instruments can create aerosols of water, saliva, and potentially infectious droplets through the air/water irrigation systems which are necessary to prevent pulpal overheating during dental preparation.

There is an increase in occurrence of antimicrobial-resistant bacteria within hospital environment, which subsequently represent a growing healthcare problem³. Most exposures are accidental and can be avoided by adopting safety work practices and

following infection control guidelines. However, because some exposures are not preventable, immunization and appropriate post exposure management become key defense procedures. As healthcare students have increasing patient contact during their education and clinical training, they are at high risk for exposure to pathogens. It is the responsibility of academic institutions to facilitate appropriate preclinical immunization and provide infection control training to protect patients and students, and to educate the future healthcare professionals in safety work practices. Studies monitoring occupational injuries and infection control practices among students and healthcare workers are necessary to assess the efficacy of infection control training and help to develop educational interventions to improve adherence to guidelines and reduce injuries⁴.

The objective of this study was to determine the level of knowledge, attitude, and practice in regard to standard infection control precautions among dental students of College of Dentistry, Sana'a University, Yemen.

Methods

The sample was composed by 179 4th and 5th (final) year of undergraduate dental students of College of Dentistry, Sana'a University, Yemen, during the academic year 2010. All undergraduate students in their clinical years (fourth

and fifth year, e.g., junior and senior students, respectively) who were present on the days of the survey were included; no attempt was made to further invite the students absent during the survey days. The subjects who did not fill the questionnaires completely were excluded.

The college committee of the dental school was officially contacted by the researcher via consent letter, who informed the study purposes and the methodology to be employed.

A self-administrated questionnaire consisting of 15 close-ended items was used for data collection. All participants were given information on the survey distribution as well as the number and type of questions, topics covered and the assurance that the anonymity would be maintained. Although the questionnaire employed was not formally validated, a pilot study was previously carried out to test students' understanding of the instrument addressing attitudes and behavior regarding cross infection control. Ten students (not included in the main study) took part in this pilot phase. Their comments were helpful for improving the questionnaire.

A single investigator (AA) distributed the questionnaires, and the purpose of the study was communicated verbally. The student participation in the research was voluntary with no incentives declared. The instrument used in the present study was based on the self applied questionnaire used in a past survey⁶, which contained 15 closed ended items related to infection control practices; participants were asked to

answer each questionnaire item as "yes" or "no".

The questionnaire requested respondents to provide demographic data about age, gender, knowledge, and practice of infection control measures. Respondents were asked if they used each of the following infection control practices: wore and changed gloves and masks during and between patients; wore and changed masks; had been vaccinated against HBV; checked medical histories at the beginning of the treatment; disinfected impressions; used autoclaves for sterilization of handpieces; used sterilization wrappings; changed burs, handpieces, and extraction instruments between patients; used rubber dams; and used a sharps waste disposal system.

Dental students were considered compliant if they adhere to the complete list of infection control procedures included in the questionnaire. This list is shown in Table 1.

Results

All 179 questionnaires were completed and results analyzed. Of the total respondents, one hundred thirty nine (77.7 percent) were females, and forty (22.3 percent) were males. The age of the subjects ranged from 19 to 22 years (mean age of 20.08 ± 0.72 year-old) (Table 2).

Table 1 shows that one hundred seventy five dental students (98 percent) reported that they usually asked patients about their medical history at the beginning of the dental treatment and

that 65 percent (117/179) were vaccinated against hepatitis B. All dental students 100 percent (179/179) wore gloves and 99 percent of them (177/179) changed gloves during treatment and between patients; 71 percent (127/179) reported that they wore masks during treatment and 53 percent (94/179) changed masks between patients. Most of the dental students (85 percent and 88 percent) reported that they changed extraction instruments and burs between patients respectively. Unfortunately dental students reported that only 64 percent they changed saliva ejectors between patients, and only 36 percent changed handpieces between patients; the remaining cleaned them with a disinfectant. About 27 percent (49/179) reported that they used autoclaves for sterilization, 13 percent (24/179) used plastic bags to wrap sterilized instruments, and only 26 percent (47/179) disinfected impressions before sending to dental labs, 4 percent (7/179) used rubber dams in the dental teaching clinics, and 71 percent (127/179) had special containers for sharps disposal.

Discussion

The most susceptible people to infectious diseases in the work environment are healthcare professionals. The dental professional is repeatedly exposed to many microorganisms present in blood and saliva. As a consequence, the incidence of certain infectious diseases is higher among dental professionals than observed for the general population. Infection in the dental practice may

result from direct contact with blood, oral fluids, and other secretions or from indirect contact with contaminated instruments, operatory equipment, and environmental surfaces. It may even occur due to contact with airborne contaminants, droplets, splatter, and aerosols. Thus, dental professionals are at a greater risk of acquiring and spreading infections, which requires the implementation of infection control guidelines. Dental students are the future dental professionals, who will provide oral healthcare for the population. They tend to practice the infection control procedures they acquired during training at the dental school. Thus, the present study investigated the compliance with recommended infection control procedures by dental students pursuing their career at Sana'a University Dental College which is located in Sana'a city, Yemen. This survey also aimed to help the development of educational interventions to improve infection control practices at this institution.

The students at the present dental institution attend lectures on infection control during the third year of their undergraduate course. Practice guidelines are received in the fourth and fifth years during clinical training.

This study showed a generally poor adherence to standard cross infection control precautions among dental students of Sana'a. While the level of knowledge and attitude was acceptable, the compliance was poor. These results were also found in other studies^{5,6}. The discrepancy between knowledge and attitude could be due to inadequate

supply of personal protective equipment, carelessness, improper disposal of medical waste, and belief that practice of standard precautions may interfere with patient care^{7,8}.

This is the first study conducted to assess the compliance of dental students working in teaching dental clinics in Yemen with infection control procedures that are designed to reduce the risk of transmission of a variety of microorganisms to dental team and patients.

Inquiring about the medical history of all patients who seek dental treatment should be the first strategy before the start of the treatment. A thorough medical history can provide clues about what precautions, in addition to infection control procedures, are necessary because some patients may have medical problems that require premedications or laboratory investigations. In this study, about 98 percent of dental students asked about the medical history of their patients, this is approximately the same like what has been reported in a previous study¹⁰. Approximately three quarters of the dental students were vaccinated against Hepatitis B; this vaccination rate is similar to that reported among dentists in Saudi Arabia (63.5%)¹¹, but lower than the rates in Scotland (88%)¹² and in Canada (92.3%)¹³.

The highest level of compliance was found for wearing gloves (100%), which is similar to the frequency of 100% for gloves usage among dental faculty and dental nurses in Jordan¹⁴.

In this study, 70.9 percent (127/179) wore masks during treatment and 52.5

(94/179) changed masks between patients, in comparison to 75 percent in Kuwait¹⁵, 64.8 percent in New Zealand¹⁶, 74.8 percent in Canada¹³. Some dentists who participated in the study commented that wearing masks is not as critical as wearing gloves in dental treatment.

Despite the fact that all DHCW should change saliva ejectors between patients to prevent the transmission of infection to patients, only 63.7 percent of dental students in this study reported that they changed saliva ejectors between patients. This is lower than the rates in Jordan (100%)⁶ and approximately closed that in India (69.5%)¹⁰. This finding demonstrates the lack of awareness about cross infection.

Almost 88 percent changed burs and 85 percent changing extraction instruments between patients. Although these precautions should be standard procedure for dental students, there were still few dental students thought that cleaning burs and instruments with a disinfectant before providing dental treatment for other patients was satisfactory.

Recently, there have been several reports about the transmission of infection as a result of inadequate sterilization of handpieces^{17,18}. In our study, only 35.8 percent of dentists sterilized handpieces in contrast to other studies that found higher rates of sterilization^{15,17,18}. Many survey respondents who did not sterilize thought that sterilization by autoclaving could damage the handpieces. This agrees with the findings of a previous study¹⁹. Surface disinfection by wiping or soaking in liquid germicides is not an

acceptable method of reprocessing handpieces, as this method does not address internal contamination as retraction valves in dental unit water lines may cause aspiration of patient material back into the handpiece and water lines. Therefore, anti-retraction valves have been installed in new units that need a routine maintenance to ensure effectiveness²⁰.

In our study, only 27 percent of dental students reported that they use autoclaves for sterilization. About 13 percent of the sample population claimed to use plastic bags to wrap sterilized instruments.

If the recommended IC practices are used, the risk of occupationally acquired infection with bloodborne pathogens is limited to sharp injuries, which can be minimized if puncture-proof containers for sharps disposal are used. About 70.9 percent of the study subjects participating in this study maintained special containers for sharps disposal in contrast to 56.2 percent of Saudi dentists¹¹.

The general recommendation is that dental work, such as impressions, casts, dentures, and wax registration records, should be disinfected at the clinic prior to being sent to the laboratory. Contamination of the laboratory could occur if cross infection control is neglected. Indeed, occupational infection of dental laboratory technicians with HBV has been reported²¹. The results of this study revealed that as low as 26 percent of dentists used disinfectants for impressions before sending to dental laboratories. This is in contrast to 53.7 percent reported by Yengopal et al²².

The use of the rubber dam, in addition to improving safety and saliva control, significantly reduces bacterial contamination of the atmosphere during restorative procedures, particularly in the vicinity of the operator and dental assistant²³. The results of this study revealed that only 3.9 percent used rubber dams in their restorative procedures, compared to 30 percent among undergraduate students from a private dental school in India¹⁰.

Although this study investigated a limited range of items on infection control and has focused on barrier methods, HBV vaccination, and sterilization, more research is needed to provide comprehensive data on compliance with all recommended infection control programs by general dentists and specialists. In addition, new methodological techniques need to be introduced for the assessment of compliance of the dental team with ICPs. Inclusion of a greater observational element within the study design may help to reduce the socially desirable responses resulting from the questionnaire currently available¹¹.

The decision evaluating fourth and fifth (final)-year dental students was due to the fact that these students are attend clinical dental practice according to the undergraduate program and should therefore have a more complete theoretical and practical background regarding infection control in order to become dentists. Furthermore, assessments at this phase may be indicative of the capacity of dental courses in incorporating adequate

behavior regarding infection control among future dentists.

It is recommended that both students and professors be vaccinated in order to reduce the risk of infection. By doing so, they protect not only healthcare professionals, but also patients and relatives¹. Some students were vaccinated against hepatitis B. However, most students do not have knowledge regarding the test to determine seroconversion for HBV, despite the educational programs and specific material published for the dental community⁹. Biological risk is a concern for oral health professionals, as they run a 3-to-6-fold greater risk of infection than the general population.

Dental college should focus on strategies to ensure suitable attitudes and behavior concerning infection control procedures. Dental college could offer opportunities for students to analyze their own experiences in the dental clinic from the perspective of infection control.

Finally, these results lend support to the concept of mandatory continuing education that includes a specific component on infection control. With today's increasing concerns about the transmission of bloodborne pathogens and the rise in drug-resistant microorganisms, compliance with recommended infection control must improve side by side with legal requirements. A college and safety committee should visit teaching dental clinics to assess standards of infection control and be empowered to prohibit patient care by dental students who are not compliant.

Some limitations of the present study should be acknowledged. This survey was conducted in a single institution and thus the results cannot be generalized to all dental students in Yemen. However, these findings would be useful for planning additional educational interventions and improving the infection control protocol at this institution.

Conclusions

In conclusion, the dental undergraduate students at this public dental college in Yemen reported poor infection control practices, which require changes in organizational and administrative factors to enable students to follow a strict infection control protocol. Moreover, as the senior students reported low compliance to infection control guidelines, the dental curriculum and grade system should be revised to evaluate overall quality of care and not only quantity of patients treated per student.

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Table 1. Adherence to infection control procedures among dental students at college of dentistry Sana'a university, Yemen

Procedure	Number	Percentage
Asking about medical history	175	97.76
Vaccination for hepatitis B	117	65.36
Gloves		
Wearing	179	100
Changing after each patient	177	98.88
Face mask		
Wearing	127	70.94
Changing between patients	94	52.51
Changing instruments		
Extraction instruments	152	84.91
Handpieces	64	35.75
Saliva ejectors	114	63.68
Burs	158	88.26
Use of autoclave for sterilization of handpieces	49	27.37
Use of plastic wrappings for sterilized instruments	24	13.4
Disinfect impressions	47	26.25
Use of rubber dam	7	3.91
Use of special container for	127	70.94

Table 2. Gender distribution of the study sample in dental college in Sana'a university, Yemen

Gender	Female % (N)	Male % (N)
Fourth year	46.9 (84)	14.5(26)
Fifth year	30.7 (55)	7.8 (14)
Total	77.7 (139)	22.3 (40)