

KNOWLEDGE, ATTITUDE, AND PRACTICES REGARDING INFECTION CONTROL AMONG UNDERGRADUATE DENTAL STUDENTS

SANTHOSH KUMAR MP*

Department of Oral and Maxillofacial Surgery, Saveetha Dental College and Hospital, Chennai - 600 077, Tamil Nadu, India.

Email: santhoshsurgeon@gmail.com

Received: 21 May 2016, Revised and Accepted: 26 May 2016

ABSTRACT**Objective:** To assess the level of knowledge, attitudes, and practices regarding infection control procedures among undergraduate dental students.**Methods:** A validated questionnaire of 23 questions regarding the basic knowledge, attitude, and practices regarding infection control in dental clinics was distributed among 150 students randomly belonging to third year, final year, and internship (fifth year trainee) of undergraduate dental program in Saveetha Dental College and Hospital, Saveetha University, Chennai. The data extracted were tabulated, statistically analyzed, and results obtained. Results were calculated on the basis of frequency and percentages using SPSS.**Results:** Nearly, 81.3% of students agreed that disinfection of dental clinic is important to prevent cross-infection among patients and dental personnel. 94.6% of dental students agreed that proper isolation during treatment is important for infection control in dentistry. 92% were aware of post-exposure prophylaxis against hepatitis B virus (HBV). 53.3% of them answered that HBV infection has the highest risk of transmission in the dental setting. 88% of students use gloves, face mask, head cap, gown always. 65.3% of dental students were willing to treat patients with infectious diseases after following universal/standard precautions.**Conclusion:** Dental students in this study have a good level of knowledge and positive attitudes about infection control. However, the knowledge acquired must be transferred into daily practice. Continuing education programs and refreshing courses regarding cross infection control procedures are necessary to update the knowledge of dental practitioners.**Keywords:** Infection control, Knowledge, Dental students, Dental safety, Practices, Hepatitis B virus.**INTRODUCTION**

Cross infection can be defined as the transmission of infectious agents between patients and staff in a clinical setting. In dental practice, transfer of infections from one person to another or from object to person can take place through various ways. Direct transmission of pathogens to host can occur during examining of the oral cavity with bare hands and when contact is made with blood/serum of infected patients. Indirect transmission can occur through contact with contaminated needle, dental units, surfaces, or improperly sterilized instruments. Transmission can also occur via blood, serum or airborne droplets if protective measures like wearing masks, gloves, and protective eye wears are not undertaken [1,2].

Infection transmission can easily occur in routine dental practice. Therefore, protection from cross infection in the dental setup is a critical aspect of dental practice [3]. Dentists are supposed to perform measures for preventing cross infection when they are practicing. In 2003, the Center for Disease Control and Prevention of the United States of America (CDC) updated their guidelines for infection control in dental settings. These guidelines include standard precautions which intend to make sure a safe working atmosphere along with preventing potential transmission of professional and nosocomial infections among dentists, dental health-care professionals and their patients [4]. Universal precautions consider that all patients have to be accepted as an infectious patient and apply these precautions to all patients.

Dental institutes are responsible for providing appropriate training of dental students toward infection control measures [5]. Although adequate emphasis is placed on the importance of adherence to these protocols, studies have shown that few dentists actually adhere to the standardized infection control procedures in their daily practice [6-9]. Several studies worldwide have investigated undergraduate dental

students' knowledge and attitudes regarding infection control, finding very poor compliance with infection control guidelines and indicating the need to improve the knowledge and attitudes regarding infection control [3,10-12]. Therefore, this study was aimed to assess the knowledge, attitude, and practices regarding infection control among undergraduate dental students of our institution.

METHODS

A cross-sectional study was conducted during the academic year in March 2016 among the undergraduate dental students of Saveetha Dental College, Saveetha University, Chennai. 150 students were randomly enrolled in the study including third year, final year, and intern students. All students in the study, voluntarily completed a questionnaire consisting of 23 close-ended questions.

The questionnaire was selected from previous research on relevant topic and few amendments in the questionnaire were made with the help of professionals. The questions in the questionnaire were designed to assess their basic knowledge, attitude, and practices toward infection control in dental clinics. Data collected and statistical analyses for knowledge, attitude and practice descriptive statistics were computed and results obtained. Data management and statistical analysis were performed using the statistical software SPSS version 20.0. Frequencies and percentages were obtained for categorical data.

RESULTS

Among 150 dental students and interns, 54 males (36%) and 96 females (64%) filled the questionnaire. Table 1 gives the number of participants in each year of study. Table 2 shows the level of knowledge and practices regarding infection control among dental students.

Table 1: Participants year-wise

| Year of study | Frequency (%) |
|---------------|---------------|
| Third year | 26 (17.3) |
| Fourth year | 56 (37.3) |
| Interns | 68 (45.3) |

About 32% of dental students were not immunized against hepatitis B virus (HBV). Among them who received vaccination, 77.2% of them had completed the three recommended doses. 48% of students have not been tested for post-HBV immunization. 81.3% of students agreed that disinfection of dental clinic is important to prevent cross-infection among patients and dental personnel. 48.6% of students replied that HBV infection is most frequently acquired from infected patients while 38.6% answered that human immunodeficiency virus (HIV) is commonly acquired by dental personnel on treating patients if infection control protocol is not maintained. 53.3% of them answered that HBV infection has the highest risk of transmission in the dental setting followed by HIV and HCV with 37.3% and 7.3%, respectively.

Around 40.6% of dental students were unaware of the universal/standard precautions and use of personal protective equipment and 68.6% agreed that all patients are to be treated as potentially infectious. 94.6% of dental students agreed that proper isolation during treatment is important for infection control in dentistry. A thorough history of the patient to rule out HIV/HBV status is taken by almost 78% of undergraduate dental students and interns. 88% of students always use glove, face mask, head cap, gown and only 42.6% use eye protection wear all the time while doing dental procedures. Only 59.3% change their glove always between patients, and only 34% wash their hands always before and after examining patients.

About 82% of dental students had non-sterile occupational percutaneous injury and blood/saliva splashes to their eyes. Among them, 54.6% of the students reported that needles were the cause for the occupational injury. 92% of undergraduate dental students and interns were aware of post-exposure prophylaxis (PEP). 67.3% of students bent used needles before disposal and 78% of students followed proper biomedical waste disposal methods. 65.3% of dental students were willing to treat patients with infectious diseases after following universal/standard precautions. 86% of dental students and interns felt there should be more emphasis and training on infection control during dental curriculum and almost 98% of students were willing to implement and follow the same infection control procedures which were taught in college in their private practice.

DISCUSSION

Dentists are at high risk of infection by blood-borne pathogens, as they are continually exposed to blood and saliva mixed with blood, and may even suffer needle punctures [13]. The key to reducing or preventing the transmission of a variety of micro-organisms to dentists lies in strict adherence to infection control practices. This study evaluated the attitudes and awareness of dental students and interns toward infection control measures in Saveetha Dental College and Hospital. It also assessed their education and provided self-assessment to their basic knowledge and implementation of infection control policy.

Proper hepatitis B vaccination is the best way of providing protection to dentists against contagious transmission of pathogens during dental treatments [5]. The prevalence of hepatitis B vaccination among dental health workers varies from 38% to 100% [11-15]. In our study, only 68% reported having been vaccinated against HBV. Among them, 77.2% of students had completed the three recommended doses, which is similar to that reported in other studies by de Souza *et al.* [5], Alavian *et al.* [14], and Kramer *et al.* [16] in

which more than 80% of students received the required three doses of HBV vaccination. 32% of dental students were not vaccinated against HBV which makes them susceptible to the infection from patients while practicing.

The efficacy of HBV vaccination can be assessed by post-immunization HB titer level. Unfortunately, only 52% of students who were immunized reported post-HBV immunization serology, a finding similar to the results obtained in studies by de Souza *et al.* [5], McCarthy and Britton [11]. Periodic monitoring and serological testing among health care workers (HCWs) should be encouraged to reduce the risk of acquiring hepatitis B following an occupational exposure.

Another important issue to be considered is the awareness about PEP. Hepatitis B immunization and postexposure management are integral components of a complete program to prevent infection following blood borne pathogen exposure [17]. In our study, only 8% were unaware about PEP. In a study conducted at Armed Forces Hospital, Sarourah, 93% HCW were unaware about PEP [18]. Only 10% of HCW were aware of PEP, according to the study by Siddique *et al.* [19]. This reflects that our students have a good knowledge and awareness about management protocols of HBV and HIV infections.

The risk of transmission after exposure to HIV-infected blood in one of the studies has been highlighted to be about 0.3%, whereas it is estimated to be up to 100 times greater for HBV (30%) and could be as high as 10% for hepatitis C virus [20]. Many students were aware that hepatitis B and C and HIV can spread in the dental setting.

Awareness related to infection control policies, i.e., universal/standard precaution guidelines, in this study was found to be 59.3% which is in accordance to the survey at Armed Forces Hospital, Sarourah, in which 61% HCWs were aware about the Universal precaution guidelines [18]. In a study by Shah *et al.* [21], 81% HCWs knew about universal precaution guidelines. In contrast, only 21.6% were aware of universal precaution guidelines in the survey conducted by Siddique *et al.* [19].

These CDC guidelines pay firm emphasis on wearing face masks and gloves on each and every patient, changing face mask and gloves after completing the individual patient, wearing protective clothes and protective eyewear which should be properly disinfected or sterilized before reuse. After each and every patient hands must be thoroughly washed with an antimicrobial solution followed by drying of the hands [4,22].

The practice of standard precautions including the use of barrier techniques has been shown to be the best prevention strategy against occupational transmission of infectious diseases in health-care settings. In this study, there was high compliance with glove and mask use, similar to previous studies conducted in Canada, Germany, the UK, Iran, and UAE [13,14,16,23]. Nonetheless, compliance with protective eyewear was very low; only 43% reported using protective eyewear at all times. The same results are reflected in many other studies in the UK, UAE, Germany and Nigeria, which have also shown that a majority of dental students did not use eye protection most of the time [10,12,16]. The poor utilization of eyewear may indicate a low level of awareness among students and dentists about the probability of disease transmission via aerosols and blood splashes. In our study, 82% of dental students had blood/saliva splashes to their eyes. Hence, dental students should be encouraged to wear masks and protective eyewear to minimize the chance of transmitting airborne infections.

The transmission of pathogens from the hands of dental personnel to patients is of major concern for infection control. Hand hygiene is considered the single most effective method for the prevention and control of healthcare-associated infections [13]. Compliance with hand hygiene procedures is essential, as the hands of healthcare workers

Table 2: Knowledge, attitude, and practices regarding infection control

| Questions | Answers | Frequency (%) |
|--|----------------------------------|---------------|
| Have you been vaccinated against HBV? | Yes | 102 (68) |
| | No | 48 (32) |
| If yes, how many doses of hepatitis B vaccination you had? | <3 doses | 24 (16) |
| | 3 doses | 10 (6.6) |
| | 3 doses followed by booster dose | 106 (70.6) |
| | Don't remember | 10 (6.6) |
| Have you been tested for post-HBV immunization? | Yes | 78 (52) |
| | No | 72 (48) |
| Do you think hepatitis B vaccination is mandatory for all dental practitioners? | Yes | 138 (92) |
| | No | 12 (8) |
| Do you think disinfection of dental clinic is important to prevent cross-infection among patients and dental personnel? | Yes | 122 (81.3) |
| | No | 28 (18.6) |
| Dentists are at risk of acquiring which of the following diseases while treating patients? | HIV | 58 (38.6) |
| | HBV | 73 (48.6) |
| | HCV | 2 (1.3) |
| | STD | 1 (0.6) |
| | Tuberculosis | 1 (0.6) |
| | All of the above | 15 (10) |
| Which of the following diseases has the highest risk of transmission in the dental setting? | HIV | 56 (37.3) |
| | HBV | 80 (53.3) |
| | HCV | 11 (7.3) |
| | STD | 3 (2) |
| Are you aware of the universal/standard precautions and use of personal protective equipment? | Yes | 89 (59.3) |
| | No | 61 (40.6) |
| Do you agree that all patients to be treated as potentially infectious? | Yes | 103 (68.6) |
| | No | 47 (31.3) |
| Do you think proper isolation during treatment is important for infection control in dentistry? | Yes | 142 (94.6) |
| | No | 8 (5.3) |
| Do you take a thorough history of the patient to rule out HIV/HBV status? | Yes | 117 (78) |
| | No | 33 (22) |
| Do you use gloves, face mask, head cap, gown? | Always | 132 (88) |
| | Sometimes | 11 (7.3) |
| | Never | 7 (4.6) |
| Do you use eye protection wear? | Always | 64 (42.6) |
| | Sometimes | 40 (26.6) |
| | Never | 46 (30.6) |
| Do you change your glove between patients? | Always | 89 (59.3) |
| | Sometimes | 42 (28) |
| | Never | 19 (12.6) |
| Do you wash your hands before and after examining patients? | Always | 51 (34) |
| | Sometimes | 60 (40) |
| | Never | 39 (26) |
| Did you have any non-sterile occupational percutaneous injury? | Yes | 123 (82) |
| | No | 27 (18) |
| If yes what was the cause? | Needle | 82 (54.6) |
| | Bur | 23 (15.3) |
| | File or reamer | 14 (9.3) |
| | Wire | 12 (8) |
| | Elevators | 6 (4) |
| | Others | 13 (8.6) |
| Are you aware of PEP? | Yes | 138 (92) |
| | No | 12 (8) |
| Did you have any blood/saliva splashes to your eyes? | Yes | 123 (82) |
| | No | 27 (18) |
| Do you bend used needles before disposal? | Yes | 101 (67.3) |
| | No | 49 (32.6) |
| Do you follow proper biomedical waste disposal methods? (Color coded dustbins) | Yes | 117 (78) |
| | No | 33 (22) |
| Are you willing to treat patients with infectious diseases? | Yes | 98 (65.3) |
| | No | 52 (34.6) |
| Do you think there should be more emphasis and training on infection control during dental curriculum and continuing dental education program on the same should be conducted? | Yes | 129 (86) |
| | No | 21 (14) |
| Are you willing to implement and follow the same infection control procedures which are taught in your college in your private practice? | Yes | 147 (98) |
| | No | 3 (2) |

HBV: Hepatitis B virus, HIV: Human immunodeficiency virus, HCV: Hepatitis C virus, STD: Sexually transmitted disease, PEP: Post-exposure prophylaxis

may serve as reservoirs for many pathogens [24,25]. In this study, however, compliance with hand hygiene procedures was unsatisfactory, as only 34% of our students reported washing their hands after each

glove change. This finding is consistent with earlier studies conducted by Rahman *et al.* [10], de Amorim-Finzi *et al.* [26], Kramer *et al.* [16], Mutters *et al.* [13] and Al-Maweri *et al.* [15]. This low compliance with

regular hand disinfection necessitates stricter measures to remind the students of the importance of hand disinfection.

About 82% of the students mentioned that they had non-sterile occupational injuries which are in accordance to that reported among dental students in Canada, in which over 80% of students reported certain types of injuries [11]. Whereas, in similar studies conducted among dental students in Brazil this prevalence rate was only 30% [5]. Furthermore, consistent with the findings of other authors, the anesthetic needle was the major source of accidental injuries in our survey [10,11,27]. Sharp injuries are more likely to occur in the dental environment than in other health-care settings, 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. This emphasizes the importance of making all vaccinations, especially hepatitis B, mandatory for students before granting admission to any dental institution.

Two-thirds of students showed a more positive attitude toward treating patients with infectious diseases. 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. All the students were willing to implement and follow the same infection control procedures which are taught in college in their private practice.

The purpose of infection control measures is to break the chain by consistently practicing standard protocols which would prevent the infection. Almost all dental students believe that proper isolation during treatment prevents the transmission of hazardous infections. The majority of study population considered disinfection of dental chair, surfaces, and dental clinic is mandatory along with sterilization of instruments. Most of them were practicing proper biomedical waste disposal methods. The study results demonstrate that practices of standard protocols are better among dental students.

This study shows that knowledge of infection control measure is adequate among dental students but needs some improvement towards developing a firm attitude. This attitude can be improved by refreshing and upgrading their knowledge by providing continuous education of universal infection control measures through arranging sessions or lectures for students of each professional year [28-30]. It may be recommended to focus on strategies to motivate dental students to implement infection control measures with their routine use. Moreover, dental schools could offer opportunities for students to analyze their own experiences in the dental clinic from the perspective of infection control.

CONCLUSION

Dental students in this study have a good level of knowledge and positive attitudes about infection control. However, the knowledge acquired must be transferred into daily practice. With all infection control protocols already implemented in dental schools, improving compliance with infection control recommendations remains a challenge. Continuing education programs and refreshing courses regarding cross infection control procedures are necessary to update the knowledge of dental practitioners [30].

REFERENCES

- Mousa AA, Mahmoud NM, El-Din AM. Knowledge and attitudes of dental patients towards cross-infection. *East Mediterr Health J* 1997;3(2):263-73.
- Harrel SK, Molinari J. Aerosols and splatter in dentistry: A brief review of the literature and infection control implications. *J Am Dent Assoc* 2004;135(4):429-37.
- Singh A, Purohit BM, Bhambal A, Saxena S, Singh A, Gupta A. Knowledge, attitudes, and practice regarding infection control measures among dental students in Central India. *J Dent Educ* 2011;75(3):421-7.

- Kohn WG, Collins AS, Cleveland JL, Harte JA, Eklund KJ, Malwitz DM; Centers for Disease Control and Prevention (CDC). Guidelines for infection control in dental health-care settings--2003. *MMWR Recomm Rep* 2003;52(RR-17):1-61.
- de Souza RA, Namen FM, Galan J Jr, Vieira C, Sedano HO. Infection control measures among senior dental students in Rio de Janeiro State, Brazil. *J Public Health Dent* 2006;66(4):282-4.
- Yüzbaşıoğlu E, Saraç D, Canbaz S, Saraç YS, Cengiz S. A survey of cross-infection control procedures: Knowledge and attitudes of Turkish dentists. *J Appl Oral Sci* 2009;17(6):565-9.
- Askarian M, Assadian O. Infection control practices among dental professionals in Shiraz Dentistry School, Iran. *Arch Iran Med* 2009;12(1):48-51.
- Jain M, Sawla L, Mathur A, Nihlani T, Ayair U, Prabu D, *et al.* Knowledge, attitude and practice towards droplet and airborne isolation precautions among dental health care professionals in India. *Med Oral Patol Oral Cir Bucal* 2010;15(6):e957-61.
- Su J, Deng XH, Sun Z. A 10-year survey of compliance with recommended procedures for infection control by dentists in Beijing. *Int Dent J* 2012;62(3):148-53.
- Rahman B, Abraham SB, Alsalamy AM, Alkhaja FE, Najem SI. Attitudes and practices of infection control among senior dental students at college of dentistry, university of Sharjah in the United Arab Emirates. *Eur J Dent* 2013;7 Suppl 1:S15-9.
- McCarthy GM, Britton JE. A survey of final-year dental, medical and nursing students: Occupational injuries and infection control. *J Can Dent Assoc* 2000;66(10):561.
- Sofola OO, Folayan MO, Denloye OO, Okeigbemen SA. Occupational exposure to bloodborne pathogens and management of exposure incidents in Nigerian dental schools. *J Dent Educ* 2007;71(6):832-7.
- Mutters NT, Hägele U, Hagenfeld D, Hellwig E, Frank U. Compliance with infection control practices in an university hospital dental clinic. *GMS Hyg Infect Control* 2014;9(3):Doc18.
- Alavian SM, Mahboobi N, Mahboobi N, Savadruddari MM, Azar PS, Daneshvar S. Iranian dental students' knowledge of hepatitis B virus infection and its control practices. *J Dent Educ* 2011;75(12):1627-34.
- Al-Maweri SA, Tarakji B, Shugaa-Addin B, Al-Shamiri HM, Alaizari NA, AlMasri O. Infection control: Knowledge and compliance among Saudi undergraduate dental students. *GMS Hyg Infect Control* 2015;10:Doc10.
- Kramer A, Meyer G, Ertzinger S, Kietz K, Schrader O, Martiny H. Multicenter study on the realization of selected hygiene measures in 331 dental practices. *Hyg Med* 2008;33(3):64-73.
- Occupational exposure to bloodborne pathogens-OSHA. Final rule. *Fed Regist* 1991;56:64004-182.
- Alam M. Knowledge, attitude and practices among health care workers on needle-stick injuries. *Ann Saudi Med* 2002;22(5-6):396-9.
- Siddique K, Mirza S, Tauqir SF, Anwar I, Malik AZ. Knowledge attitude and practices regarding needle stick injuries amongst healthcare providers. *Pak J Surg* 2008;24(4):243-8.
- Needlestick Injuries. Diseases, Disorders and Injuries. Available from: http://www.ccohs.ca/oshanswers/diseases/needlestick_injuries.html. [Last accessed on 2008].
- Shah R, Mehta HK, Fancy M, Nayak S, Bhavesh N, Donga K. Knowledge and awareness regarding needle stick injuries among health care workers in tertiary care hospital in Ahmedabad, Gujarat. *Natl J Community Med* 2010;1(2):93-6.
- Harte JA. Looking inside the 2003 CDC dental infection control guidelines. *J Calif Dent Assoc* 2004;32(11):919-30.
- Stewardson DA, Palenik CJ, McHugh ES, Burke FJ. Occupational exposures occurring in students in a UK dental school. *Eur J Dent Educ* 2002;6(3):104-13.
- Cook HA, Cimiotti JP, Della-Latta P, Saiman L, Larson EL. Antimicrobial resistance patterns of colonizing flora on nurses' hands in the neonatal intensive care unit. *Am J Infect Control* 2007;35(4):231-6.
- Kampf G, Kramer A. Epidemiologic background of hand hygiene and evaluation of the most important agents for scrubs and rubs. *Clin Microbiol Rev* 2004;17(4):863-93.
- de Amorim-Finzi MB, Cury MV, Costa CR, Dos Santos AC, de Melo GB. Rate of compliance with hand hygiene by dental healthcare personnel (DHCP) within a dentistry healthcare first aid facility. *Eur J Dent* 2010;4(3):233-7.
- Younai FS, Murphy DC, Kotelchuck D. Occupational exposures to blood in a dental teaching environment: Results of a ten-year surveillance study. *J Dent Educ* 2001;65(5):436-48.

28. Ali MF, Hussain A, Maqsood A. Knowledge, attitude and practice concerning infection control measures among dental health care providers of Dow University of Health Sciences. *Pak Oral Dent J* 2014;34(3):452-6.
29. Ehsani M, Tabarsi B, Mesgarani A, Mohammadi M. Knowledge and attitude of dental students towards Infection control in babol dental school. *J Dentomaxillofacial Radiol Pathol Surg* 2013;2(3):21-5.
30. Moradi Khanghahi B, Jamali Z, Pournaghi Azar F, Naghavi Behzad M, Azami-Aghdash S. Knowledge, Attitude, Practice, and Status of Infection Control among Iranian Dentists and Dental Students: A Systematic Review. *J Dent Res Dent Clin Dent Prospects* 2013;7(2):55-60.