ORIGINAL ARTICLE

CROSS-INFECTION CONTROL PRACTICES IN PROSTHODONTICS AMONG UNDEGRADUATE STUDENTS, GRADUATES AND POST-GRADUATE STUDENTS: A CROSS-SECTIONAL STUDY

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ABSTRACT

The aim of this study was to determine practices of cross infection control in prosthodontics among undergraduate students, graduates and post-graduate students. A cross-sectional study was conducted among dental undergraduate students, graduates and post-graduate students in in the Department of Prosthodontics, Khyber College of dentistry, Peshawar, over a period of three months i.e. from March to May 2018. A close- ended questionnaire was administered to a sample of 217 participants. The response showed that protective devices (PPDs) like gloves and masks were used by most of the participants. Students were highly aware of standard infection control measures (82.5%). However, individuals never washed their hands before putting on gloves (33.6%) and dental impressions (72.8%), casts (80.6%), prostheses (56.2%), shade tabs (71.9%) and prosthetic instruments (58.1 %) were never disinfected / sterilized by subjects prior to their use. Individuals were not immunized against infectious diseases like Hepatitis-B in 29.5% of the reported sample. This study will help us to focus on areas of deficiencies and to cover the gap between knowledge and infection control practice by motivating the students to strictly adhere to infection control measures.

Key Words: *Cross-infection control, Practice, Prosthetic instruments, Sterilization, Knowledge.*

INTRODUCTION

Almost all the clinical procedures in dentistry involve exposure to saliva, blood or other infectious agents which are the potential routes of transmission and are the potential "vectors of infection". It has been reported that one milliliter of saliva contains 750 million micro organisms. Cross infection control helps to prevent the transmission of pathogenic micro-organisms from patient to patient, practitioner to patient and patient to practitioner.[1,2] Therefore, the use of effective infection control procedures and standard precautions in the clinical and laboratory setup will prevent the spread of infection to all dental health care professionals including staff and patients. For this purpose the Center for Disease Control and Prevention (CDC) and American Dental Association (ADA) had issued precautions and guidelines. Each dental practitioner is responsible for implementing these guidelines. Despite of all these, cross infection control measures in clinical and laboratory area are still substandard which highlights the need for more strictly following these measures especially in the department of Prosthodontics.

All patients must be considered as potentially infectious and a risk of cross infection. Dental care professionals are at high risk of cross infection from different diseases, like Hepatitis B, while treating patients as compared to general population. Therefore, it was recommended that all dental personnel having patient contact directly or indirectly must be immunized to protect from a potentially fatal disease. Protection from emerging infections like Methicillin-resistant Staphylococcus Aureus (MRSA) and Transmissible spongiform Encephalopathies (TSE) also demands the use of universal precautions.[3,4,5,6] Therefore medical history is of utmost importance in identifying patients that are at high risk of receiving and transmitting infections.[7,8]

Use of personal protective devices (PPDs), like apron, face mask/shield, eye wear and glove are mandatory in the control of cross contamination and spread of micro-organisms in prosthodontics whenever there is exposure to aerosols and splatters. Mask must be used to protect the nose and mouth from airborne diseases. A protective eye wear protects the mucous membrane of the eyes.[2] It was reported that use of PPDs was significantly high with 98.7% students always wearing

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gloves and 97 % changing gloves for each patient and immediately when they are torn. Masks and gowns were always changed in more than 90 % of cases. However protective eyewear was utilized by only 22 % of the students showing that they might be at risk of cross-infection.[9] Despite of the protective nature of the gloves, it also provides a warm, moist environment for the proliferation of micro-organisms. So pre-gloving washing/disinfection of hands with a disinfectant hand wash is recommended which possesses strong antimicrobial properties on the internal surface of the gloves. Similarly hand hygiene after glove removal is also recommended.[6,10] Hand Hygiene Australia (HHA) protocol must be followed. Hands should be washed in designated clean sinks using non-touch taps or aseptic non-touch techniques as a standard precaution wherever possible. In case of touch taps, taps are turned on and off with a paper towel.[5] Removal of jewelry (rings, bangles or watches) before treatment achieves more effective reduction of micro-organisms by hand washing as large number of bacteria are present under these and without their removal, effective hand hygiene cannot achieved. Removal of accessories like rings, watches etc is practiced in more than 80% of the subjects.[11] All touch and splash surfaces like dental operatory lights, spittoons, instruments tray, handles, saliva ejectors should be disinfected with a recommended ADA or EPA registered disinfectants. Also, before starting treatment, a pre-procedural mouth rinse with chlorhexidine gluconate 0.12 % is recommended for each patient.[12]

Disposable instruments should be used whenever possible. All non-disposable stuff should be thoroughly cleaned before sterilization in an autoclave. Instruments that are at risk of damaging in autoclave are disinfected e.g. shade guides, wax knives, occlusal plane indicators, articulators, facebows, mixing spatulas, polishing/finishing wheels, disks, dental stones and burs, etc. Similar criterion is followed for hand pieces and dental burs like carbide, diamond or steel burs. Similarly, decontamination, of record bases, occlusion rims/wax bite, prostheses, casts, etc., to reduce the number of pathogenic micro-organisms on their surface, is essential in prosthodontic practice as they all can transmit pathogens from clinical to laboratory area and vice versa as well as to the clinician, patients or other laboratory staff. A study showed that 67 % of materials sent to laboratories were contaminated with pathogenic bacteria.

All plastic impression trays must be discarded or disinfected and metal impression trays sterilized prior to its use. Impressions also must be disinfected prior to pouring casts. Casts poured from contaminated impressions also harbor infectious agents that can spread to the entire laboratory area by trimming. Since casts are the most difficult prosthodontic material to be disinfected without causing damage, it is preferable to disinfect the impressions so that the resulting cast will not have to be disinfected. But sometimes disinfection is necessary. It was reported that 17 % of the students regularly disinfected casts before sending them to laboratory. Contaminated waste must be disposed off in appropriately marked containers and sealed, impervious black and yellow bags. [13,14,15,16,17]

Previous studies conducted on infection control in general dentistry practice didn't cover some of the important areas in infection control in Prosthodontics. The aim of this study was to determine practices of cross infection control in Prosthodontics among undergraduate students, graduates and post-graduate studentsof Khyber College of Dentistry, Peshawar.

MATERIALS AND METHODS

A Cross-sectional study was carried out in the Department of Prosthodontics, Khyber College of Dentistry, Peshawar, over a period of three months, i.e., from 01-03-2018 to 31-05-2018. The data included 217 undergraduate students (who had attended Prosthodontic department in their clinical rotation), graduates and post-graduate students in Prosthodontics. However, this study excluded those undergraduate students who had not attended Prosthodontics department in their clinical rotation and post-graduate students from other departments as well as subjects who did not answer all of the questions in the questionnaire.

A questionnaire in English-language consisting of 14 close-ended questions had been developed in the light of previous researches on the relevant topic in different countries. The participants were exempted from revealing their names because of the possibility of fear of being evaluated for answers. The questionnaire was distributed amongst participants. In order to reduce the chances of induced errors, the participants were asked to answer all of the questions voluntarily. The respondents were asked about the use of PPDs and pre-procedural mouth rinses for the patient, hand washing method and techniques, disinfection of impression, operatory area, dental casts, impression trays, other laboratory tools like facebow, articulators, wax knives, etc, taking medical history and screening of the patient, vaccination status of the individuals, waste disposal system and knowledge related to infection control measures and protocol to be followed after exposure.

The data was coded, entered and analyzed using SPSS version 22. Descriptive statistics like mean and median, were calculated for age. Frequencies and percentages were calculated for all questions concerned. Data is presented in tabulated form.

RESULTS

The form was distributed to all participants, response rate was 100 %. Mean age recorded was 24.4^{+}-2.52. Out of 217 subjects, 39.2% (n=85) were males and 60.8% (132) females. Undergraduate students were 30.4% (66), 52.1% (113) were graduates and 17.5% (38) post-graduate students.

Subjects wore gloves for each patient in 100% of cases (n=217) and 98.2 % (213) of the individuals changed them for every patient. Similarly 92.6% (201)

wore face masks as a personal protective device. However the use of doctor's apron/gown (49.3%, n=107) and eye wear (25.3%, n=55) was reportedly less. Out of 217 participants, 96.8% (n=210) of the students responded that they don't have a non-touch tap for washing hands. Routine screening of the patients was done by most of the participants (98.2%, n=213) and 29.5% (64) of the participants were not vaccinated for hepatitis-B virus. Those who were vaccinated, only 31.8% (69) completed the recommended three doses. The rest took one dose (13.4%, n=29), two doses (9.2%, n=20) and booster doses (16.1%, n=35).

Impressions were never disinfected by 72.8% (158) of the participants prior to pouring or sending them to laboratory. Medical history of the patients was taken by 85.7% (186) of students before starting treatment. Most of the participants preferred to sterilize hand pieces by autoclave (72.4%, n=157) whereas others preferred disinfectants like hypochlorite (21.2%, n=46), alcohol (3.7%, n=8) and chemical vapors (2.8%, n=6) for this purpose. (see table 1 & 2)

DISCUSSION

Investigation of all infection control measures was not possible as it would involve an increase in the number of questions which might reduce the accuracy of the study/response.

Medical history prior to commencement of treatment was taken by 90%[7] and 97 %[8] of the subjects in different studies which were much higher than the results of our study where 85% of the participants took medical history. Rings, bangles and watches were removed by 80% of the participants prior to treating patients.[11] However, our students rarely followed this practice in their routine (26%).

The high compliance with the use of gloves (100%) and masks (92.6%) in this study was comparable to other studies in which 100% and 90 % of the students used face masks and gloves respectively. Gloves were changed for each patient in 100 % of cases in some studies,[7,8,14] our students changed them in 98% of the cases. In contrast to studies where 73%[11] and 52%[8] of the students used protective eye wear, present study showed that only 25% of the participants followed this standard protocol during procedures which was much lower. In one study 75% [11] and 81% [8] of the students followed hand hygiene before putting on gloves or starting any dental procedure.This is much higher than our study where 33% of the subjects never washed their hands before putting on gloves and only 7% practiced them in their routine. Only 45 % of the students complied with hand hygiene as reported in one study. [12] The low compliance of the participants with regular hand wash before or after putting on gloves demands strict measures to highlight the importance of hand hygiene. Our participants never used pre-procedural mouth rinses (81.6%). The results are much lower than other studies where 61.3% [18] and 37% [2] of the subjects claimed the use of pre-procedural mouth rinses.

ADA guidelines and Federation Dentaire Internationale (FDI) recommends that impressions should be rinsed to remove saliva, blood or debris followed by disinfection prior to pouring casts.[16] Disinfection of impressions was performed in 96% of the cases in one study.[15] Different studies showed that prosthetic instruments like facebows, articulators, etc were disinfected in more than 70% of the cases. Similarly, wax bites and occlusion rims were disinfected in 65 % and shade tabs in 57% of the cases before its use. Other prosthetic instruments like prostheses, facebow, wax bites etc were disinfected by 68 % and dental cast by 17% of the study sample.[15] In our study 72.8% of students mentioned that they never disinfect impressions prior to its pouring. The low percentage of respondents regarding disinfection of impressions, casts and record bases, record rims and wax bites, prosthesis, shade guides/tabs, cutting and finishing dental stones and burrs, rag wheels/mops and other prosthetic instruments like wax knife, face bow, articulator, etc. reflects a lack of commitment towards such important areas of prosthodontics. Participants of current study didn't practice the infection control measures in these areas which highlight that such areas must be addressed in future. Sterilization of metal stock trays was carried out by 87% of the study sample in one study [14] whereas 80% of the dentists preferred disinfection over autoclave as a method for sterilizing handpiece. This was much lower than the results of a study where sterilization of handpiece by autoclaving was performed by 94% of the dentists. [19] Only 50 % of our participants sterilized metal stock trays in routine practice. Most of the participants in our study sterilized handpiece by autoclaving

TABLE 1: INFECTION CONTROL PRACTICE

Q.NO.	QUESTIONS	Yes N (%)	No N (%)
1.	Do you touch areas other than those that had cleaned/disinfected after putting on gloves?	111(51.2%)	106 (48.8%)
2.	Do you have proper waste (critical & non-critical, clinical & non-clinical) disposal system in your clinic/department and waste disposed off in specified bags/bins?	98 (45.2%)	119 (54.8%)
3.	Do you know about any standard protocol/infection control measures like personal protection equipment, hand hygiene, disposal of sharps and waste, sterilization and disinfection etc?	179 (82.5%)	38 (17.5%)

TABLE 2: CONT'D; INFECTION CONTROL PRACTICE

Q. No.	Question		Never	Rarely	Sometimes	Often	Routinely
4.	Do you remove your rings/ bangles/ watches before starting treatment?		63(29%)	22(10.1%)	54(24.9%)	21(9.7%)	57(26.3%)
5.	Do you wash your hands before putting on gloves?		73(33.6%)	49(22.6%)	57(26.3%)	22(10.1%)	16(7.4%)
6.	Do you use Pre-procedural Mouth Rinses for the Patient?		177(81.6%)	30(13.8%)	7 (3.2%)	3(1.4%)	0 (0%)
7.	Do you follow surface disinfection procedures, like cleaning, disinfection and surface covering with a disposable sheath, for instrument tray, operating light, spittoon, etc?		74(34.1%)	45(20.7%)	41(18.9%)	31(14.3%)	26(12%)
8.	Do you sterilize/ disinfect the following:	Impressions	158(72.8%)	28(12.9%)	15(6.9%)	6(2.8%)	10(4.6%)
		Impression trays	28(12.9%)	15(6.9%)	32(14.7%)	33(15.2%)	109(50.2%)
		Casts record bases occlusion rims	175(80.6%)	23(10.6%)	9(4.1%)	5(2.3%)	5(2.3%)
		Prostheses	122(56.2%)	38(17.5%)	30(13.8%)	12(5.5%)	15(6.9%)
		Cutting/Finishing/ Dental stones & burrs, Rag wheels,	132(60.8%)	29(13.4%)	23(10.6%)	12(5.5%)	21(9.7%)
		Shade guide/tabs	156(71.9%)	36(16.6%)	12(5.5%)	9(4.1%)	4(1.8%)
		Prosthetic instruments: Wax knives Face bows Articulators etc.	126(58.1%)	39(18.0%)	30(13.8%)	10(4.6%)	12(5.5%)

(72.4%). As compared to 66.2% of the participants who followed proper waste management for waste disposal, most of our subjects (54.8%) mentioned that they don't have a proper waste disposal system in the department of Prosthodontics.

A study showed that almost 89% of the interns were vaccinated for hepatitis B virus.[9] Only 31.8% of the individuals had completed the recommended three doses of the total 70.5% of the participants being vaccinated for hepatitis B in our study. This is much lower as compared to studies where 84%[2] and 95% of the students were immunized for hepatitis B with 61% completing the recommended three doses.[11] High immunization rate (96.7%) of dental practitioners was reported in a public sector of Karachi.[20] However, the routine screening of the patients, in 98.2% of the cases was performed by students in our set up for hepatitis B, C and other infectious agents. Increased awareness level of our participants regarding infection control measures (82.5%), shows a gap between knowledge and practice and a lack of commitment by students, graduates and post-graduates to such measures, which demands a habitual implantation and strict adherence to cross-infection control measures and practices.

The results of this study demonstrate that cross infection control practice in prosthodontics was below the standards of care. A study shows that only 9.9% of the subjects in a private dental institute in India adhered to all infection control measures.[7] The participants in present study showed higher compliance in basic infection control practices like PPD and medical history etc which reflects that other areas of infection control can be improved with some extra effort. Implementation of new infection control practices like designating an infection control co-ordinator who will monitor all infection control activities is the need of the day.[21] As a major government dental college in the province, there are certain challenges in the control of cross-infection in this department like shortage of time, work overload, man power and resources available. Since these areas are not addressed in present study, the deficiencies in infection control procedures cannot be properly highlighted. There is a lot of room for improvement which might require changes in only organizational and administrative factors. Conducting programs on infection control measures as part of continuing dental education, incorporating it as a mandatory part of curriculum, and strict implementation of safe and realistic infection control practice might close

the gap between knowledge and practice. Without the compliance of whole dental team it will not be possible. Furthermore in the light of this study, specific strategies and assessment of current infection control practices, in terms of new technologies, equipment and data, must allow flexibility in order to accommodate the changes in infection control procedures. In future studies from the same center might be conducted that will re-evaluate the possible improvements/disprovements in infection control measures.

CONCLUSION

Within the limitations of the current study it was concluded that most of the respondents didn't practice the infection control measures in routine which highlights the need for strict adherence to these guidelines. However, this study is helpful in planning about how to motivate, effectively communicate and to develop attitudes of students on the use of cross-infection control measures.

Limitations of this study

Questionnaire used in this study did not include questions related to the resources/facilities available in the hospital for cross infection control practice. It also didn't take into consideration the role of supporting staff (dental technicians and assistants) in control of cross-infection. Further studies should be planned in these areas. Moreover, this study was conducted in a single institute and so it cannot be generalized to the students of other dental institutess.

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3 Shafi Ullah Khan:	Helped in literature search, writing discussion and reference citation.
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