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Survey Of The Basic Knowledge, Attitude And Practice Of Infection Control For Dental Health Care Clinics In Jeddah, Saudi Arabia

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ABSTRACT
The concern for implementation of infection control procedures in dental clinics is world-wide. Objective: The main objective of this study was to improve the knowledge, modify the attitude and practice of dental health clinics towards infection control procedures in Jeddah, Saudi Arabia. Method: A randomized survey involving dental students from Faculty of Dentistry, King Abdulaziz University, Jeddah, Saudi Arabia was evaluated by means of self-reported questionnaires. The questionnaire collected data on sociodemographic characteristics, knowledge and practice of infection control procedures, sterilization, wearing of gloves, mask, use of rubber dam, method of storing instruments and disposal methods of contaminated material. Questionnaire data was entered into a computer and analyzed by SPSS statistical software. Results: From the 150 dental students to whom the questionnaires were submitted. The overall responses to the questionnaire showed that the dentists had moderate level knowledge of infection control procedures. Conclusion: Our findings indicate that there is moderate of understanding of the basics of infection control and the prevention of transmission of communicable infectious diseases not only in a large percentage of our dental students, but also in graduate and semi-graduate students who took part in this study.

1.1 Background

Saudi Arabian healthcare has always existed at an elevated standard in the Middle East, and healthcare in Jeddah is no exception, with many facilities in the Red Sea port being among the best in the region. Both public and private facilities are available, and both options offer a high standard of care. Nevertheless, most expats prefer to access private healthcare in Jeddah and there are a few hospitals in the city that cater specifically to the expat community. These hospitals are often staffed by expats or local practitioners who have trained overseas, and thus mirror Western practice. Private healthcare can be expensive and expats working in Jeddah are, by law, required to have health insurance.

The dental clinic is an environment where disease transmission occurs easily. Prevention of cross infection in the dental clinic is therefore a crucial aspect of dental practice, and dental clinic workers must adopt certain basic routines while practicing (Singh, Purohit et al. 2014).

Dental health care providers are a 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 rubella. Infections may be transmitted in the dental operatory through several routes, including direct contact with blood, oral fluids, or other secretions; indirect contact with contaminated instruments, operatory equipment, or environmental surfaces; or contact with airborne contaminants present in either droplet splatter or aerosols of oral and respiratory fluids (Singh, Purohit et al. 2014).

Infection control is defined as "Measure practice by health care personnel to reduce the risk of transmission of infectious agents to patient and employee" (e.g. proper hand hygiene, scrupulous work practice, use of personal protective equipment such as masks, gloves gowns and eye protection).

Infection control, which is one of the most discussed topics in dentistry, has become such an integral part of the practice to the extent that dental health workers no longer question its necessity. Dental care professionals are at an increased risk of cross infection while treating patients. This occupational potential for disease transmission becomes evident when one realizes that most human microbial pathogens have been isolated from oral secretion. In addition, a majority of carriers of infectious diseases cannot be easily identified (Al-Rabeah and Mohamed 2002).

Infections may be transmitted in the dental operatory through several routes (Shetty, Verma et al. 2011):

a) Direct contact with blood, or fluids or other infected materials.
b) Indirect contact with contaminated objects (e.g. instruments, equipments or environment surfaces).
c) Contact of conjunctival, nasal or oral mucosa with droplets (e.g. spatter, maintaining microorganisms generated from infected person and propelled a short distance by coughing, sneezing or talking).
d) Inhalation of airborne microorganisms that can remain suspended in the air for long periods.

1.2 Problem Statement

There is evidence to suggest that many infected patients are unaware of their status because of long incubation periods and post-infection window period during which antibodies cannot be detected. Many studies have shown that dental personnel have a five- to ten-fold chance of acquiring hepatitis B infection than the general population. Researchers (Al-Sohaibani, Al-Sheikh et al. 1995), have distributed 206 questionnaires and concluded that the occupational risk of hepatitis B virus (HBV), hepatitis B and C infection to Saudi physicians is quite high, and recommended that to take a medical history of each patient that vaccinated against HBV before the treatment.

Infection control practices in developing countries have not been widely documented. Most hospitals have no integrated infection control programs due to the lack of awareness of the problem or absence of properly trained personnel.

Currently, there are no standard instructions or protocols on infection control practice in private dental clinics in Saudi Arabia. The objective of this study was to assess the infection control practice in this dental sector in Jeddah.

1.3 Research Objectives

The main objectives of this research are as follow:

[1]. To analyze the knowledge, attitudes, and practice regarding infection control measures among dental students in Jeddah, Saudi Arabia
[2]. To assess the infection control practice in the private dental sector in Jeddah, Saudi Arabia

[3]. To conduct a survey that determines the level of knowledge, attitude, and practice in regard to infection control among dentistry students of Faculty of Dentistry, King Abdulaziz University, Jeddah, Saudi Arabia.

1.4 Literature Review

Numbers of survey studies have been conducted to determine the level of knowledge, attitude, and practice in regard to infection control among dental clinics. The summarizations of some of these studies are as follow:

A survey by (Maryem, et al 2013), the number of returned questionnaires are 102 samples distributed to the final year students of knowledge and attitude towards infection control were (48) are male and (54) are female. Their result concluded that only 38.2% (39 students) were gained low scores of knowledge, 28.4% (29 students) were gained moderate scores of knowledge, 20.5% (21 students) gave negative answers towards attitude questions, 61.7% (62 students) had no idea and 17.6% (18 students) agreed with the attitude questions towards infection control. Their results summarized that knowledge and attitude towards infection control at Babol Dental School is not adequate and recommended more training is required.

Morris et al. have distributed 240 questionnaires samples, (215) from the dentists' doctors, (12) from health of the mouth and teeth technicians from the Kuwait Health Ministry and (12) from final years students and their result showed that 94% of dentists in Kuwait used autoclave to sterilize hand-pieces (Morris, Hassan et al. 1996). In 1997, Kurdy and Fontaine (Kurdy and Fontaine 1997), conducted a survey that have been distributed to the final years student from King Saud University were (67%) are female and (33%) are male, their results showed that 30% of dentists in PHCs in Saudi Arabia had sterilized hand-pieces with autoclave, and 90% of them autoclaved their instruments at the end the day. The present study showed that only 37.9% of the studied dentists used autoclave for sterilizing hand-pieces. The most common reason for not sterilizing hand-pieces is the fear of damage to the equipment. The advantage of packaging cleaned instruments in an appropriate wrapping material before sterilization is the protection of the processed instruments from environmental contamination.

A survey by (Dtmh 2009) showed that only having knowledge of infection control measures and a positive attitude towards them does not guaranty adherence to the guidelines. The results demonstrated that practice of standard isolation precautions is poor among dental health care professionals (DHPs) in the Shiraz University of Medical Sciences. An educational program on infection control isolation precaution for all healthcare workers, especially DHPs and supplying the facilities to allow compliance with infection control policies are necessary to reduce infectious hazards among not only DHPs but also their patients. Their results demonstrated that Iranian dental health care personnel (DHCP) working in governmental dental health care centers in present study had a low knowledge of infection control, but used good infection control practices. Educational programs and regulatory efforts are necessary to promote infection control policies. Especially recommend education on infection control for dental practitioners with fewer years of practice and lower educational levels.

A survey by (Al-Rabeah and Mohamed 2002) shows that the overall compliance with infection control procedures was only 8.4% among dental practitioners in the private dental sector in Riyadh. A higher rate of compliance in some private clinics shown by this study may be attributed to repeated visits of officers from dental licensing offices to these clinics. In their study, dentists aged more than 40 years were more compliant than those in the younger age group. This may be due to more experience and knowledge acquired. Experience means more exposure to sources of knowledge and perhaps familiarity with previous infections in colleagues.

A survey by (Ebrahimi, Ajami et al. 2012), shows that the dental practitioners in Mashad, Iran had a low level of infection control knowledge. Dental personnel with a higher educational level had significantly

greater knowledge than those with less education. Additionally, dental personnel who had more years of practice had a greater knowledge of infection control.

The results from another studies from different countries such as USA (Angelillo et al., 2001), Italy (Akeredolu et al., 2006), Nigeria (Banks et al., 1994) and England (Daniel et al., 1996) also shows low level of dentists' knowledge and attitude towards infection control.

Table 1 highlighted the summary of the literature review of basic knowledge, attitude and practice towards infection control among dental health care clinics. The work's title, author and year, place, work done, type of infection and participants have been discussed. The discussions and differentiations between our study and this study are well discussed in Chapter 4.

Table 1: Literature Review Summary

Title	Author and Year	Type of Infection	Participants	Work Done
Occupational risk of hepatitis B and C infections in Saudi medical staff	Al-Sohaibani, Al-Sheikh et al. 1995	Hepatitis B Virus (HBV)	Saudi physicians	The occupational risk of HBV infection to Saudi physicians is quite high
Knowledge and practices in Kuwait: a survey on oral health care workers.	Morris, Hassan et al. 1996	Autoclave	Dentists' doctor and final year students	Showed that 94% of dentists in Kuwait used autoclave to sterilize hand-pieces
Survey on infection control in MOH dental clinics	Kurdy and Fontaine 1997	Autoclave	Final year students	Showed that 30% of dentists in Saudi Arabia had sterilized hand-pieces with autoclave, and 90% of them autoclaved their instruments at the end the day.
Infection control in the private dental sector in Riyadh	Al-Rabeah and Mohamed 2002	All the procedures of infection control	Private dental workers	Shows that the overall compliance with infection control procedures was only 8.4% among dental practitioners in the private dental sector in Riyadh.
Infection control practices among dental professionals in Shiraz Dentistry School, Iran	Dtmh 2009	Infection control isolation	Governmental dental health care centers	Showed that only having knowledge of infection control measures and a positive attitude towards them does not guaranty adherence to the guidelines
Response of dental professionals in Saudi Arabia towards hepatitis B vaccine and glove wearing	Ebrahimi, Ajami et al. 2012	Infection control knowledge	Final year students	Shows that the dental practitioners had a low level of infection control knowledge. Dental personnel with a higher educational level had significantly greater knowledge than those with less education. Additionally,

				dental personnel who had more years of practice had a greater knowledge of infection control.

1.5 Scope of the Study

The scope of this research is to study the improve the knowledge in dental clinic, modify the attitude in dental clinic, modify the practice in dental clinic as well as to control the infection in dental clinic in Jeddah.

1.6 Research Organization

The results obtained from this study are presented into five chapters. This thesis is organized as follows:

Chapter 1 gives a general introduction of health care, dental clinic and infection control. Beside, presents the problem statement, objectives scope of the study and organization.

Chapter 2 continues with a material and method and the evaluation strategies and the data set used are also discussed.

Chapter 3 presents the results of our study. Chapter 4 presents the discussion of results. In Chapter 5, the study is ended up with conclusion and recommendation.

MATERIALS & METHODS

2.1 Introduction

This chapter presents the material and method used. This study shall be carried out in three steps as performing a review of the previous studies, conducting the survey (questionnaire) and study evaluation.

2.2 Methodology Steps

The discussion of the proposed steps as follow:

2.2.1 Step 1 - Performing a Review of the Previous Studies

This step is involving the reviewing the existing studies regarding the knowledge, attitude and practice of infection control of dental clinic, Jeddah to ensure that our study could achieve its mission statement (discussed in section 1.4 chapter 1).

2.2.2 Step 2 - Conducting the Survey (Questionnaire)

A cross-sectional survey was conducted and distributed among 200 dental students any only 150 survey are retrieved (those who enrolled in the fourth, fifth, or sixth year of the undergraduate dentistry program at the Faculty of Dentistry, King Abdulaziz University in Jeddah). The questionnaire was pretested on a random sample of dental students to ensure practicability, validity, and interpretation of responses. The sample was comprised of eighty-six third-year dental students, eighty-two final-year students, and seventy-seven interns. Interns are graduates from the same faculty, with postings equally distributed in various departments during the stipulated one year and other students from different universities in Jeddah. Training in infection control is mainly provided in the first, second, and third years of dental faculty. The study population of 150 dental students voluntarily completed a questionnaire consisting of twenty two questions (more details in Appendix A).

The questions aimed to evaluate four aspects: participants profile (2 questions), Knowledge, attitude and practice evaluation in dental clinic (10 questions), Infection control evaluation in dental clinic (4 questions) and Rating the knowledge, attitude, practice evaluation and infection control evaluation of dental clinic in Jeddah (5 questions).

Participants profile questions has two main questions (faculty member and experience) and has the first question has two possible answers (staff or student), since the participants are only students so the answers should be (3ed year, 4th year of final year student). The possible answers of the experience question between less than 1 year or more than 10 year (more details in Appendix A).

Knowledge, attitude and practice evaluation assessment questions had four possible answers (yes, no, I don't know and correct answer). One point was given for each correct answer. For all other responses, zero points were assigned. Therefore, the score for knowledge, attitude and practice ranged between zero (no correct answers) and nine (all answers correct).

Infection control evaluation assessment questions had three possible answers (yes, no, and I don't know). One point was given for each correct answer. For all other responses, zero points were assigned. Therefore, the score for infection control ranged between zero (no correct answers) and nine (all answers correct).

Rating the knowledge, attitude, practice evaluation and infection control evaluation of dental clinic in Jeddah assessment questions had five possible answers (poor, fair, satisfactory, very good and excellent). Where the answer "excellent" was given five points and "poor" received one point. Therefore, the total score ranged from nine (all questions regarded as "poor") to 45 (all questions regarded as "excellent"). For categorical analysis, an answer of "very good" or "excellent" was regarded as a positive attitude.

2.2.3 Step 3 – Survey Evaluation

The statistical package of SPSS (Version 11.5, Chicago, IL, USA) was used for data analysis. Data were collected and analyzed in tables and charts using tendency parameters and dispersion measures, including the t-test and one-way analysis of variance (ANOVA).

2.3 Summary

This study is carried out in three steps. In step 1, the existing previous studies are reviewed. The questionnaire organization is discussed in step 2. In step 3, the way of the survey analysis is highlighted. The material, method and data set are discussed as well in this chapter.

RESULTS

3.1 Introduction

This chapter discussed the result obtained from the survey. The Questionnaire data was entered into a computer and analyzed by SPSS statistical software.

3.2 Results Obtained From the Study

From the 200 dentists' students to whom the questionnaires were submitted, 150 actually participated in the study, which corresponds to an overall response rate of 100%. One hundred fifty (100%) of the respondents were female.

For approximately one hundred forty two of the studied students, their individual years of experience ranged from 1 to 5 years (97.4%), while only four students their individual years of experience is less than one year (2.6%) as shown in Table 2 and illustrated in Figure 1 below.

Table 2: Participant Profile of Faculty Member and Years of Experience Score

Question No	Question	Selection	Number	Percentage %
Q1	Faculty member	Student	0	0%
		Staff	150	100%
Q2	Student	3ed year	0	0%
		4th year	46	30.6%
		Final year	104	69.4%
Q3	How long have you been working in dentistry?	Less than 1 year	4	2.6%
		1 to 5 years	146	97.4%
		6 to 10 years	0	0%
		More than 10 years	0	0%

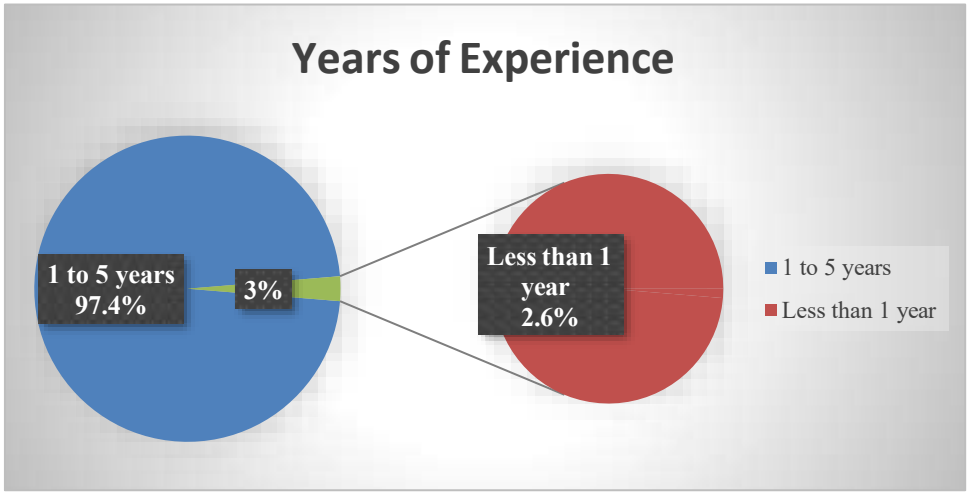

Figure 1: Years of Experience

Table 3 shows the percentage of knowledge, attitude and practice evaluation score, the first question shows that 92% of dentist asked about "which disease is considered to be highest risk for a dentist", that 8% had been vaccinated against hepatitis B. The second question shows that the dentist asked about "which methods could be used for disinfection/sterilization", that 14.6% had been vaccinated against alcohol, 54.8% had been vaccinated against microten and 30.6% had been vaccinated against oven as illustrated in Figure 2 below. The third question shows that the dentist asked about "what protective measures you consider to prevent yourself from injury", that 100% had been agreed about the best answers consist of all the face mask, gloves, eyewear and protective clothing. The forth question shows that the dentist asked about "after use of gloves for a patient, what do you do with them", that 100% had been agreed about the best answers is dispose of them. The fifth question shows that the dentist asked about "do you wash your hands before and after patient examination", that 93.3% had been agreed about to wash hands before and after patient examination. The question six shows that the dentist asked about "If you wash hands before and after patient examination, with what do you wash your hands", that 17.3% preferred to use plain soap and 82,7% preferred to use antiseptic solution. The question seven shows that the dentist asked about "do you prefer to order oral mouth rinse before commencement of any treatment procedure", the 67.4% of the dentists agreed against to order oral mouth rinse before commencement of any treatment procedure. The question eight shows that the dentist asked about "which of the following do you use to sterilize instruments in dental

clinic", the 100% of the dentists agreed to use the autoclave. The question nine shows that the dentist asked about "minimum time required for sterilization in autoclave", the 100% of the dentists agreed that 15 minutes are enough of the sterilization in autoclave. The question ten shows that the dentist asked about "how much is the temperature for sterilization in the autoclave", the 72% of the dentists chooses the correct answer of the temperature for sterilization in the autoclave is 150° C.

Table 3: Knowledge, Attitude and Practice Evaluation Score

Question No	Question	Selection	Number	Percentage %
Q1	Which of the following is considered to be highest risk for a dentist?	Tuberculosis	0	0%
		HIV	0	0%
		Hepatitis B	12	8%
		Tuberculosis & HIV	0	0%
		all of the above	138	92%
Q2	Which of the following methods could be used for disinfection/sterilization?	Water and soap,	0	0%
		Alcohol	22	14.6%
		Microten	82	54.8%
		Oven	46	30.6%
Q3	As a clinician, what protective measures do you consider to prevent yourself from injury?	Face mask and gloves	0	0%
		Eyewear	0	0%
		Protective clothing	0	0%
		All the above	150	100%
Q4	After use of gloves for a patient, what do you do with them?	Dispose of them	150	100%
		Reuse them after wash	0	0%
		Reuse them after sterilization	0	0%
Q5	Do you wash your hands before and after patient examination?	Yes	140	93.3%
		No	10	6.7%
Q6	If yes, with what do you wash your hands?	Plain soap	26	17.3%
		Detergent	0	0%
		Antiseptic solution	124	82.7%
Q7	Do you prefer to order oral mouth rinse before commencement of any treatment procedure?	Yes	49	32.6%
		No	101	67.4%
Q8	Which of the following do you use to sterilize instruments in dental clinic?	Autoclave	150	100%
		Boiling	0	0%
		Washing	0	0%
Q9	Minimum time required for sterilization in autoclave?	5 min	0	0%
		10 min	0	0%
		15 min	150	100%
Q10	How much is the temperature for sterilization in the autoclave?	100° C	11	7.4%
		120° C	31	20.6%
		150° C	108	72%

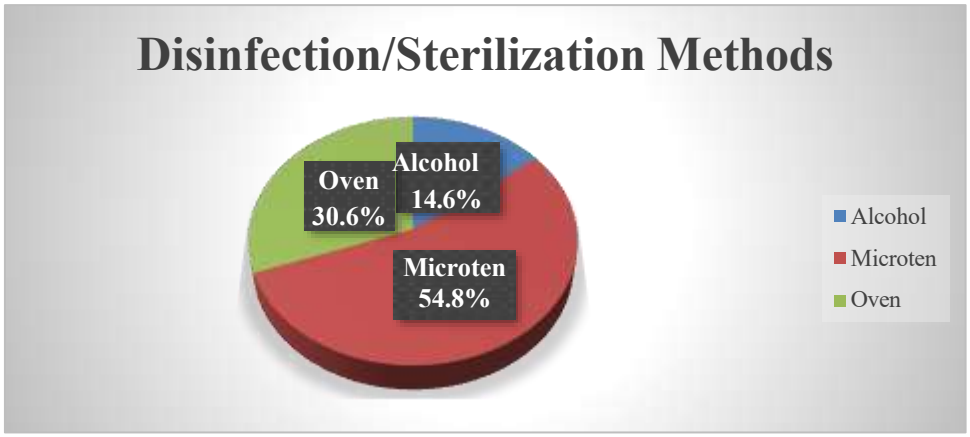

Figure 2: Disinfection/Sterilization Methods

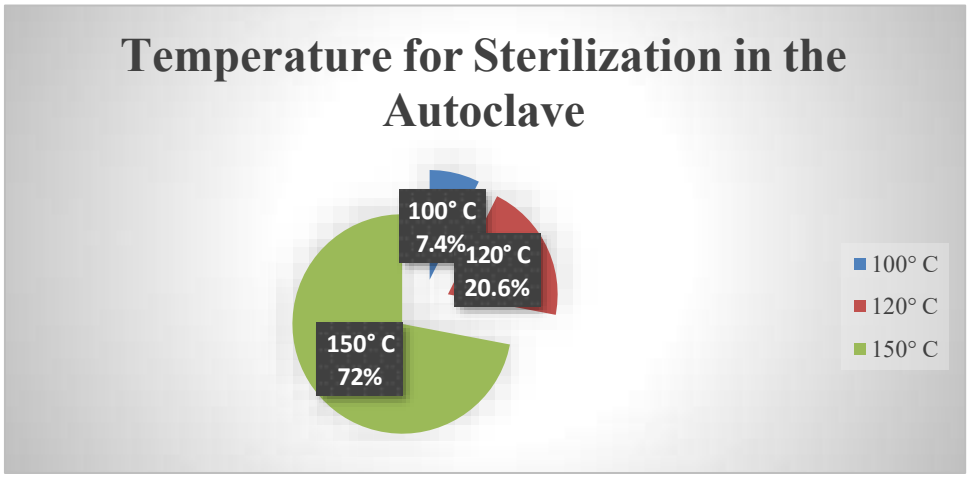

Figure 3: Temperature for Sterilization in the Autoclave

Table 4 shows the percentage of infection control evaluation score, the question eleven shows that the dentist asked about "do you think isolation is important in infection control", the 100% of the dentists considered the importance of isolation in infection control. The question twelve shows that the dentist asked about "ineffective sterilization during clinical practice can transmit infection from one patient to another", the 100% of the dentists confirmed that ineffective sterilization during clinical practice can transmit infection from one patient to another. The Q13 shows that the dentist asked about "ineffective sterilization during clinical practice can transmit infection from clinician or patient", the 100% of the dentists confirmed that ineffective sterilization during clinical practice can transmit infection from clinician or patient. The Q14 shows that the dentist asked about "apart from instrument sterilization, disinfection of dental chair, clinic, dental office is required", the 100% of the dentists confirmed that chair, clinic, dental office is required from instrument sterilization/disinfection.

Table 4: Infection control evaluation score

Question No	Question	Selection	Number	Percentage %
Q11		Yes	150	100%

	Do you think isolation is important in infection control?	No	0	0%
Q12	Ineffective sterilization during clinical practice can transmit infection from one patient to another?	Yes	150	100%
		No	0	0%
		Don't Know	0	0%
Q13	Ineffective sterilization during clinical practice can transmit infection from clinician or patient?	Yes	150	100%
		No	0	0%
		Don't Know	0	0%
Q14	Apart from instrument sterilization, disinfection of dental chair, clinic, dental office is required?	Yes	150	100%
		No	0	0%

Table 5 shows the knowledge, attitude, practice evaluation and infection control evaluation in Jeddah score; The Q15 shows that the dentist asked about "how would you rate the personal health in Jeddah", the 78.8% of the students agreed that the personal health in Jeddah is "Fair" as illustrated in Figure 4 below. The Q16 shows that the dentist asked about "how would you rate the cleaning status of dental clinic in Jeddah", the 75.4% of the students agreed that the cleaning status of dental clinic in Jeddah is "Fair" as illustrated in Figure 5 below. The Q17 shows that the dentist asked about "how would you rate the personal instruments that used for each patient of dental clinic in Jeddah", the 71.4% of the students agreed that the personal instruments that used for each patient of dental clinic in Jeddah is "Fair" as illustrated in Figure 6 below. The Q18 shows that the dentist asked about "how would you rate the overall practice evaluation of dental clinic in Jeddah", the 74.7% of the students agreed that the overall practice evaluation of dental clinic in Jeddah is "Very Good" as illustrated in Figure 7 below. The Q19 shows that the dentist asked about "how would you rate the infection control evaluation of dental control in Jeddah", the 64% of the students agreed that the infection control evaluation of dental control in Jeddah is "Very Good" as illustrated in Figure 8 below.

Table 5: Knowledge, attitude, practice evaluation and infection control evaluation score

Question No	Question	Selection	Number	Percentage %
Q15	How would you rate the personal health in Jeddah?	Poor	7	4.6%
		Fair	118	78.8%
		Satisfactory	12	8%
		Very Good	13	8.6%
		Excellent	0	0%
Q16	How would you rate the cleaning status of dental clinic in Jeddah?	Poor	0	0%
		Fair	113	75.4%
		Satisfactory	17	11.3%
		Very Good	20	13.3%
		Excellent	0	0%
Q17	How would you rate the personal instruments that used for each patient of dental clinic in Jeddah?	Poor	0	0%
		Fair	107	71.4%
		Satisfactory	19	12.6%
		Very Good	24	16%
		Excellent	0	0%
Q18		Poor	0	0%
		Fair	15	10%

	How would you rate the overall practice evaluation of dental clinic in Jeddah?	Satisfactory	23	15.3%
		Very Good	112	74.7%
		Excellent	0	0%
Q19	How would you rate the infection control evaluation of dental control in Jeddah?	Poor	0	0%
		Fair	33	22%
		Satisfactory	21	14%
		Very Good	96	64%
		Excellent	0	0%

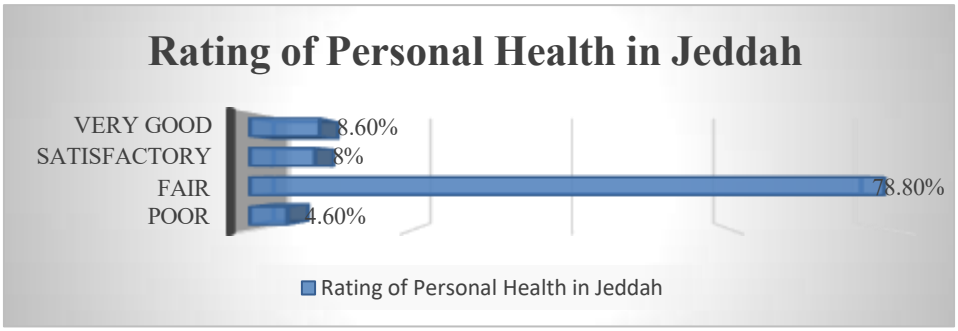

Figure 4: Rating of Personal Health in Jeddah

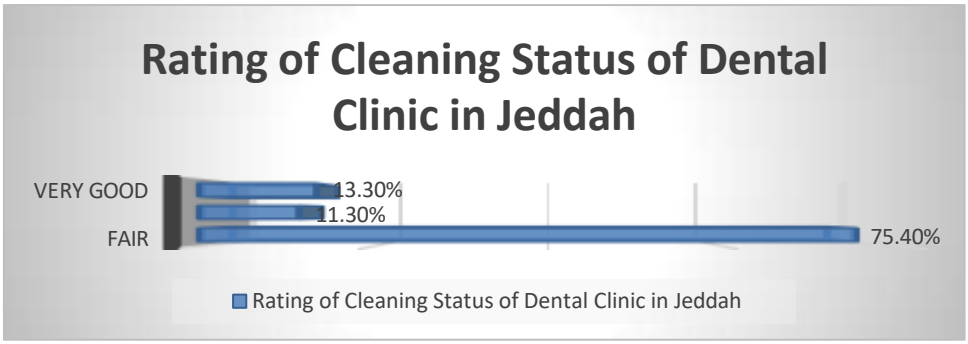

Figure 5: Rating of Cleaning Status of Dental Clinic in Jeddah

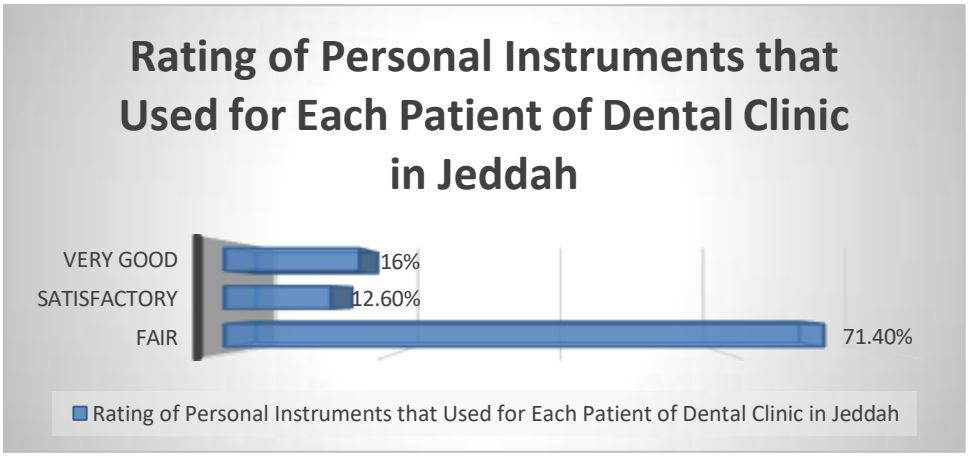

Figure 6: Rating of Personal Instruments that Used for Each Patient of Dental Clinic in Jeddah

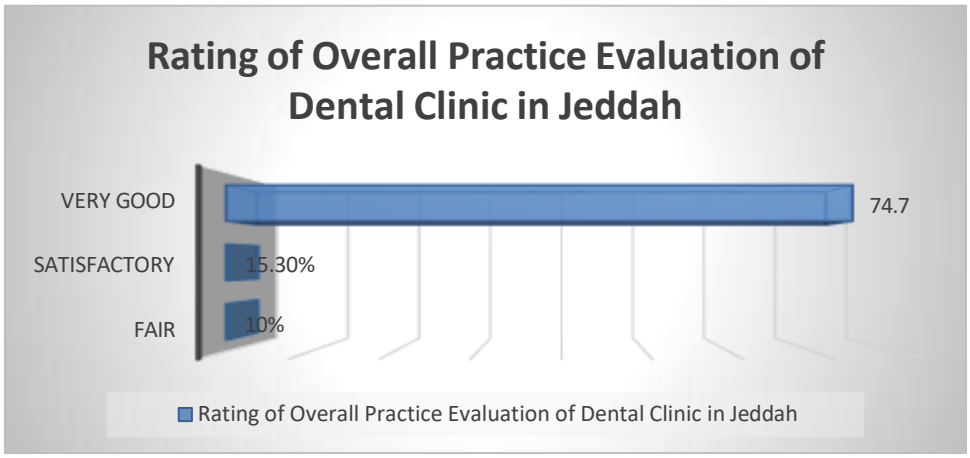

Figure 7: Rating of Overall Practice Evaluation of Dental Clinic in Jeddah

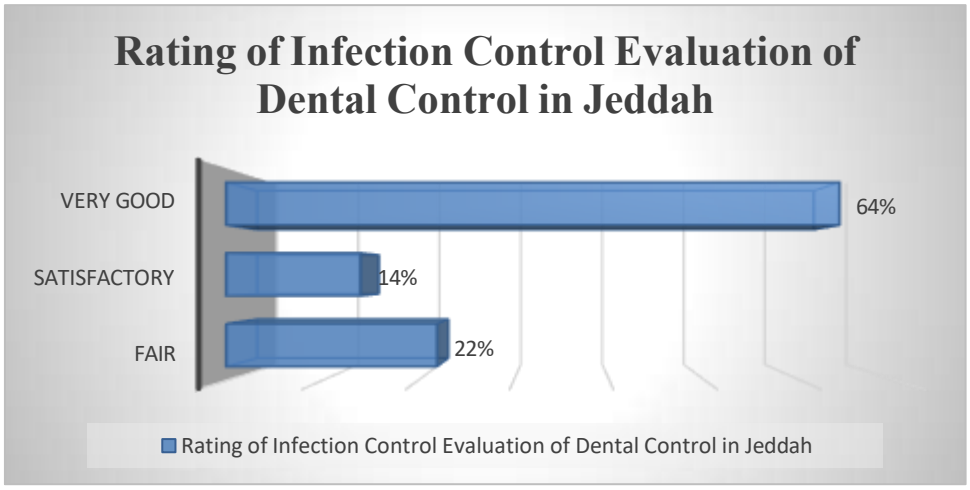

Figure 8: Rating of Infection Control Evaluation of Dental Control in Jeddah

3.3 Summary

This chapter illustrated the results that obtained in this study. The dental students in King Abdulaziz University in Jeddah had a moderate level of infection control knowledge. Dental personnel with a higher educational level "final year" had significantly greater knowledge than those with less education. Additionally, dental personnel who had more years of practice had a greater knowledge of infection control.

DISCUSSION

4.1 Introduction

This chapter discussed the finding that obtained in this study. The comparisons between our study and previous studies have been discussed.

4.2 Discussion of the Results

A variety of bacterial, viral, fungal, and protozoan microbes present hazards to the dental team and patients. They may be exposed to these microbes through direct contact with a patient's tissues such as blood, skin,

and other secretions, or by indirect contact like injuries caused by sharp contaminated instruments or by droplet infection from aerosols and spatter.

There are two reasons why dental health care workers must wear operating gloves: 1) to prevent transmission of infection from the operator's hands to the patients; and 2) to prevent contact of blood and saliva with the operator's hands. Our study showed that all the dentists 100% had been agreed about the best answers consist of all the face mask, gloves, eyewear and protective clothing. In 1991, a study by Al Ruhaimi (Al-Ruhaimi 1991) showed that between 2%-4% of dental professionals in Saudi Arabia never wore gloves when treating patients. Another study by Morris et al. (Morris, Hassan et al. 1996) showed that about 90% of dentists in Kuwait wore gloves, 75% wore masks and 52% wore eyeglasses. From New Zealand, Treasure et al. (Treasure and Treasure 1994) showed in their study that 42% of dentists wore gloves, 64.8% wore masks and 66.4% wore eye protection. In 1994, McCarthy et al. (McCarthy and MacDonald 1997) showed that 91.8% of dentists in Ontario, Canada, always wore gloves, 74.8% always wore masks and 83.6% always wore eye protection. In our study, the practice score was better than the knowledge score, which may be due to a number of factors. One possibility is the discrepancy in results from compulsory rules in dental governmental sectors that necessitates the use of gloves and masks. Previous reports showed that dentist's students with knowledge of infection control and suitable facilities still used poor cross-infection control measures.

Prospective studies have estimated the risk of infection from hepatitis B and hepatitis C virus infection in health care workers to be 6%-30% and 10%, respectively, after needlestick exposure. The prevalence of hepatitis B antigen carriers in Saudi Arabia is estimated to be 8.3% for the entire population. This means that dentists and their assistants in Saudi Arabia are at a high risk of exposure to hepatitis B antigen. Therefore, there should be 100% hepatitis B vaccination coverage of all dentists and dental workers, rather than the 8% found in this study. Similar to the present study, a survey completed in government primary health care (PHC) dental clinics on vaccination against hepatitis B found that only 70% of dentists had been vaccinated. The study by McCarthy et al. (McCarthy and MacDonald 1997) showed that 92.3% of dentists in Ontario, Canada, had received HBV vaccine, while Gore et al. (Shalhoub and Al-Bagieh 1991) showed that 88% of dentists in Scotland had completed a course of hepatitis B vaccination. Regulations in Saudi Arabia require vaccination against hepatitis B for dentists working in hospital dental clinics only. These regulations need to be extended to cover private dental centers and clinics. The vaccine is cheap and readily available, and universal vaccination of the dentists is possible at minimal extra cost.

Many authors have emphasized the hazard of cross infection by the use of dental instruments. Morris et al. (Morris, Hassan et al. 1996) showed that 94% of dentists in Kuwait used autoclave to sterilize hand-pieces. Kurdy and Fontaine (Kurdy and Fontaine 1997) showed that 30% of dentists in PHCs in Saudi Arabia had sterilized hand-pieces with autoclave, and 90% of them autoclaved their instruments at the end the day. The present study showed that 100% of the studied dentists used autoclave for sterilizing hand-pieces. All students (100%) in our study used an autoclave to sterilize instruments. Henrique et al. (Abreu, Lopes-Terra et al. 2009) conducted a ten-year study to assess attitudes and behavior of dental students concerning infection control rules. In 1995, most students used an autoclave to sterilize instruments (83.8%), and this percentage increased in 2005 (95.9%). No student could describe the correct pressure, temperature, and sterilization time in either 1995 or 2005. However, in our study, 72% and 100% of the students answered correctly about temperature and sterilization time, respectively. The high percentage of correct answers to questions about sterilization procedure revealed a good knowledge. The advantage of packaging cleaned instruments in an appropriate wrapping material before sterilization is the protection of the processed instruments from environmental contamination.

The majority (100%) believed in the importance of isolation in infection control. Also, 100% of the students thought that disinfection of the dental chair, clinic, and dental office is required apart from instrument sterilization. With respect to attitudes towards adherence to infection control measures, the majority of the

respondents believed infection control measures to be necessary. Viewing the responses indicates that dental students in the study have a positive attitude towards infection control measures.

All sharp instruments used in dental clinics should be safely disposed of. It is a well-defined hospital policy that such instruments should be disposed of in safe containers, and that these containers should be puncture proof. The study by Kurdy and Fontaine (Kurdy and Fontaine 1997) showed that 72% of dental clinics in PHC centers had containers for disposable needles and sharp instruments. In our study, 100% of studied dentists had special containers for sharp objects.

In our study dentists student experience between 1 to 5 years (97.4%) and only 4 students have less than 1 year of experience (2.6%). Experience means more exposure to sources of knowledge and perhaps familiarity with previous infections in colleagues. Morris et al. (Morris, Hassan et al. 1996) in Kuwait showed that respondents with 10 or more years of experience were significantly more knowledgeable than the student dentists. As well, McCarthy and MacDonald (McCarthy and MacDonald 1997) showed that dentists over 40 years of age were more likely to use recommended infection. Our study demonstrates that infection control knowledge and practices are significantly higher in practitioners with more years of experience.

Means of knowledge, attitudes, and practice scores were 75.3%, 71.8% and 69.9%, respectively. Significant differences between the groups (third year, fourth year, and final year) were noted for knowledge and practice scores. This was a reflection of students' forgetting material over time. The finding suggests the importance and need of rigorous infection control training prior to graduation. The topic of infection control requires a proactive approach throughout the course.

In many countries, infection control practices are inadequate, and there is a limited understanding of the current recommendations. In addition, it was reported that there was low compliance with infection control guidelines in Asian dentists. In our study, we observed that Saudi Arabian dental practitioners studying in King Abdulaziz University in Jeddah had a great knowledge of infection control, which was comparable to previous studies. Therefore, increasing their knowledge regarding infection control seems necessary.

4.3 Summary

This chapter discussed the discussion of the obtained results in this study. The comparisons to other existing studies are also discussed. All the data in the study were self-reported, and it is pertinent to be cautious in interpreting and generalizing the findings. The observation that very few respondents have followed the full requirements of infection control practice developed by American Dental Association (ADA) and Centers for Disease Control and Prevention (CDC), however, is significant.

CONCLUSIONS & RECOMMENDATIONS

5.1 Conclusions

Our findings indicate a moderate level of understanding of the basics of infection control knowledge and the prevention of transmission of communicable infectious diseases not only in a large percentage of our dentists' students, but also in graduate and semi-graduate students who took part in this study.

5.2 Recommendations

Since dental students studying in King Abdulaziz University, Jeddah with fewer years of experience and less educational level had a low level of infection control knowledge; we recommend a continuing educational program for this group and dental nurses.

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