



Original article

Infection Control Attitude, Knowledge and Awareness Level Among Dental Students and Interns in the Removable Prosthodontic Department at the Faculty of Dentistry, University of Benghazi, Libya

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ABSTRACT

Background: Dental students have increased patient contact during their education and clinical practice, putting them, their patient population and Dental Health Care Workers (DHCW) at high risk of cross-infection. Awareness of infection control principles may help in preventing disease transmission; therefore, the purpose of this study was to evaluate the level of infection control knowledge, attitude, and practice among dental students and interns in a removable prosthodontic department at the Faculty of Dentistry, University of Benghazi, Libya.

Materials and Methods: In May 2023, we distributed questionnaires containing 33 items to interns, 3rd-year, and 4th-year dental students at the faculty. The questions covered topics such as hepatitis B vaccination, use of personal protective barriers, knowledge of infection control protocols, and practice in the removable prosthodontic department of the faculty. Descriptive statistics were recorded using frequency and percentages. Differences in proportions were assessed using the Chi-square and Fisher exact test. All statistical analyses were performed at a p -value less than 0.05.

Results: A total of four hundred and ten (410) participants responded to the questionnaire. Around 21.5% of the students had completed their hepatitis B vaccination, while 41.2% had never been vaccinated. Regarding the self-reported use of protective barriers, intern students showed a significantly higher score than did other study groups ($P < 0.001$). Moreover, the vast majority of 3rd year students reported never wearing eyewear, a face shield, or the head cap (73.2%), (81.1%), or (70.1%), respectively. About two-thirds of intern students (69.4%) showed positive attitudes toward the treatment of patients with infectious diseases.

Conclusion: This study showed moderate compliance to infection control procedures among the participants, they have limited orientation and knowledge of the infection control guidelines and policies. Despite a positive attitude toward infection control measures, proper infection control practices were not consistently followed. Consequently, it is essential to take action to ensure that students understand the critical importance of practicing cross-infection control. Higher education institutions should implement effective solutions to address this issue.

Key Words: *Dental students, Infection control, Prosthodontics, Cross infection.*

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INTRODUCTION

Infection control and prevention of cross-contamination in the dental field are essential to providing a proper environment for patients and DHCW. Transmission of infection during dental treatment includes direct contact with saliva, oral fluids, blood, airborne droplets containing infective agents, or indirect contact via contaminated objects

such as instruments, equipment, or environmental surfaces.¹ Several healthcare agencies and dental associations, like the Centers for Disease Control and Prevention in the United States of America (CDC), the Occupational Safety and Health Administration (OSHA), the American Dental Association (ADA), and others, updated their roles on infection control in dental clinics,^{2,3} which include several precautions including hand washing, proper injection practice, clean and sterile instruments and devices, clean and properly disinfected environmental surfaces, and the use of personal protective equipment.⁴

Despite the protocols that were placed to make the DHCW aware of recommended practices to control the transmission of infection in dental offices, the percentage of DHCW who followed those practices was

low.⁵⁻⁷ Dental students worldwide are at high risk of exposure to cross-infection with pathogens and need high-level knowledge and clinical skills in infection control.⁸ Dental schools play a crucial role in providing an appropriate educational program to train students, fostering an adequate attitude toward infection control measures for protecting themselves and patients.^{9,10} Although dental schools are the fundamental source of infection control education and responsible for providing proper training in infection control measures for future dental practitioners, research in Middle Eastern countries revealed low knowledge of infection control among dental students and some educating staff.¹¹⁻¹³

Prosthodontic clinics and laboratories need high attention regarding infection control measures. Dental impressions, record blocks, trials, and permanent dentures are subjected to contamination and can spread infectious agents to dental students, clinicians, other patients, and technicians.¹⁴ The objective of the present study was to investigate knowledge, attitudes and practices relative to infection control measures among dental students and interns.

MATERIALS AND METHODS

This questionnaire-based study was conducted among dental students (3rd and 4th year) and interns at the faculty in May 2023. The authors formed the questionnaire with input from field experts. The questionnaire was pretested on a random sample of 30 dental students, including all academic years, to evaluate and assess responses' practicability, readability, clarity, validity, and interpretation. The students involved in the pilot study were excluded from the final sample. The sample consisted of 410 subjects: 164 3rd -year dental students, 148 4th -year dental students, and 98 interns. The questionnaire was reviewed, and the study was ethically approved by the Ethics Committee of the Dental Faculty, Benghazi University. Additionally, approval was obtained from the head of the prosthodontic department. The participant's agreement to answer the questionnaire and return it was considered informed consent. Personal information was eliminated from the questionnaire to provide anonymity. The constructed questionnaire consisted of questions including different aspects of infection control practices:

- Demographic and academic background represents the distribution of students according to their gender and academic year.
- Level of implementation of basic infection control measures by dental students.

- Level of knowledge, attitude, and practice of infection control measures among dental students.
- Response of students toward infection control in the prosthodontic department.

Statistical analysis

The data was analyzed using Statistical Package for Social Science software (IBM SPSS ver. 24). Descriptive statistics were recorded using frequency and percentages. Differences in proportions were assessed using the Chi-square and Fisher exact test. All statistical analyses were performed at *p*-value less than 0.05.

RESULTS

A total of 410 completed questionnaires were received, of which the majority (72%) of the participants were females. The highest proportion of students was third-year (40%), followed by fourth-year students (36.1%) and interns (23.9%). Only one-fifth (21.5%) of students completed their hepatitis B vaccination, compared to two-fifths (41.2%) who had never been vaccinated and (37.3%) who had received an incomplete HBV vaccination course. (**Table 1** and **Figure 1**). One-third (33.9%) of males completed their hepatitis B vaccination, and nearly half (48.1%) of females had never been vaccinated, the difference was statistically highly significant (*p*<0.001, as shown in **Figure 2**).

Table 1: Distribution of the study participants

Variable	N (%)
Gender	
Male	115 (28.0%)
Female	295 (72.0%)
Year of Study	
Third-year	164 (40.0%)
Fourth-year	148 (36.1%)
Interns	98 (23.9%)
Hepatitis B Vaccination	
Completed (3 doses)	88 (21.5%)
Partial (1-2 doses)	153 (37.3%)
None	169 (41.2%)
Total	410 (100%)

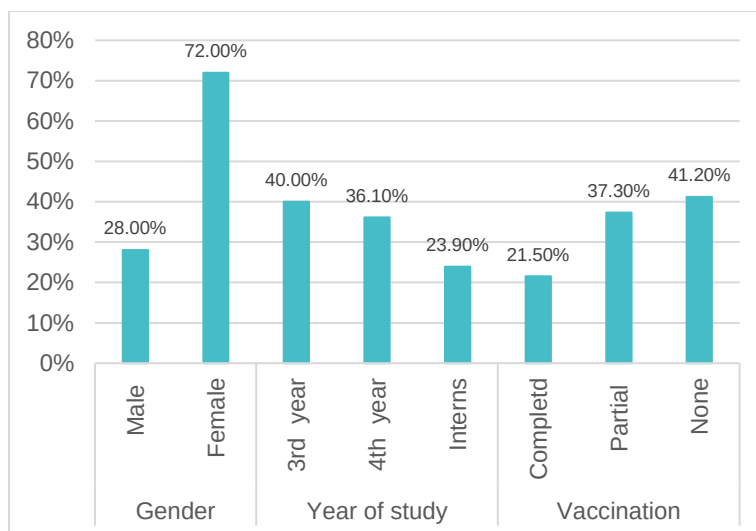


Figure 1: Distribution of the study participants

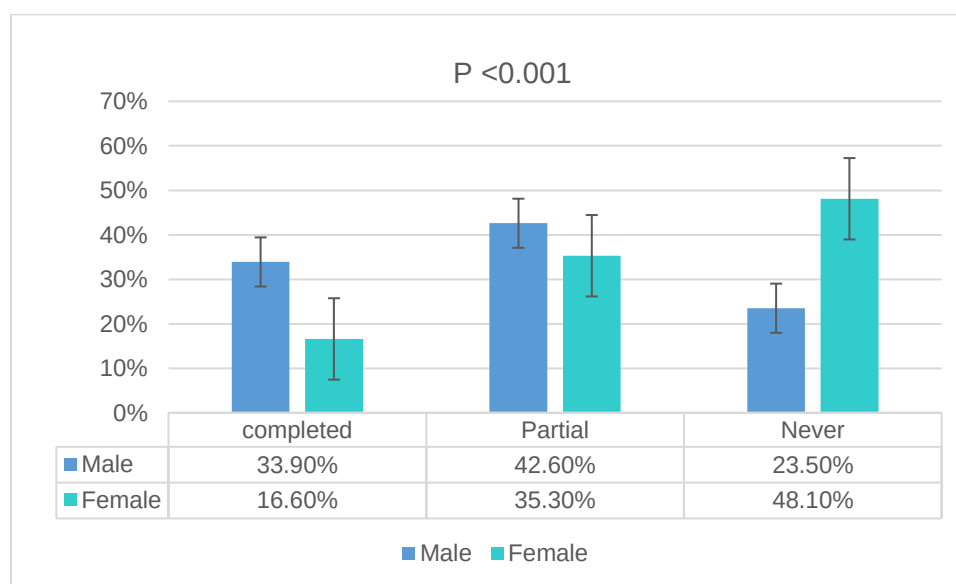


Figure 2: Comparison of vaccination status based on gender

Table 2 depicts the distributions of students based on their willingness to treat patients with infectious diseases. A significantly higher percentage of intern students (69.4%) reported their willingness to treat patients with infectious diseases, as compared to 47.0%, and 45.9 of the third-year and fourth-year students, respectively who did not mind treating

patients with infectious diseases ($p < 0.01$). The percentage of female students showed a positive attitude toward the treatment of patients with infectious diseases (71%) in comparison with male students (28.2%) However, no gender significant differences were found ($p = 0.531$).

Table 2: Willingness of dental students to treat patients with infectious diseases

Willingness to treat patients with infectious disease	Year of Study N (%)			p-value	Gender N (%)		p-value
	Third-year	Fourth-year	Interns		Male	Female	
No	7 (4.3)	15 (10.1)	2 (2)	0.001	5(20.8)	19(79.2)	0.531
Yes	77(47)	68 (45.9)	68 (69.4)		60(28.2)	153(71.8)	
Not sure	62 (37)	50(33.8)	23(23.5)		36(26.7)	99(73.3)	

The proportion of students' self-reported use of protective barriers based on the year of study and gender is presented in **Table 3**. A significantly higher percentage (98%) of intern students reported consistently wearing gloves and masks for all dental procedures ($p < 0.001$). The vast majority of 3rd-year

students reported never wearing eyewear, a face shield, or the head cap, while only 47.6% reported wearing the protective gown at all times, with no significant differences according to year of study or gender ($P > 0.05$).

Table 3: Use of protective barriers among dental students

		Year of Study N (%)			p-value	Gender N (%)		p-value
		Third-year	Fourth-year	Interns		Male	Female	
Gloves	Always	116 (70.7)	137 (92.6)	96 (98)	0.001	102 (29.2)	247 (70.8)	0.110
	Sometimes	42 (25.6)	11 (7.4)	2 (2)		10 (18.2)	45 (81.8)	
	Never	6 (3.7)	0 (0)	0 (0)		3 (50)	3 (50)	
Masks	Always	111 (67.7)	130 (87.8)	96 (98)	0.001	99 (29.4)	238 (70.6)	0.119
	Sometimes	47 (28.7)	18 (12.2)	2 (2)		13 (19.4)	54 (80.6)	
	Never	6 (3.7)	0 (0)	0 (0)		3 (50)	3 (50)	
Eyewear	Always	10 (6.1)	11 (7.4)	8 (8.2)	0.120	8 (27.6)	21 (72.4)	0.343
	Sometimes	34 (20.7)	44 (29.7)	33 (33.7)		37 (33.3)	74 (66.7)	
	Never	120 (73.2)	93 (62.8)	57 (58.2)		70 (25.9)	200 (74.1)	
Face shield	Always	11 (6.7)	7 (4.7)	7 (7.1)	0.212	8 (32)	17 (68)	0.476
	Sometimes	20 (12.2)	27 (18.2)	22 (22.4)		23 (33.3)	46 (66.7)	
	Never	133 (81.1)	114 (77)	69 (70.4)		84 (26.6)	232 (73.4)	
Protective gown	Always	78 (47.6)	62 (41.9)	35 (35.7)	0.370	40 (22.9)	135 (77.1)	0.130
	Sometimes	30 (18.3)	27 (18.2)	18 (18.4)		24 (32)	51 (68)	
	Never	56 (34.1)	59 (39.9)	45 (45.9)		51 (31.9)	109 (68.1)	
Head cap	Always	24 (14.6)	22 (14.9)	16 (16.3)	0.992	14 (22.6)	48 (77.4)	0.146
	Sometimes	25 (15.2)	21 (14.2)	15 (15.3)		23 (37.7)	38 (62.3)	
	Never	115 (70.1)	105 (70.9)	67 (68.4)		78 (27.2)	209 (72.8)	

Chi-square and Fisher exact test were used to compare proportions. $p < 0.05$.

Regarding students' self-reported practice of basic infection control protocol, It was revealed that changing gloves between patients and hand washing between each glove change was performed frequently by most of the study sample (95.9% and 78.6%, respectively) with no significant difference based on year of study or gender. Significantly higher proportions of fourth-year students reported more frequent change of facemasks between patients, use of

surface barrier, change of contaminated Gown/coat, and sterilized instruments after each procedure (49.3%, 80.4%, 68.2%, and 93.9%). However, females change face masks more frequently than males ($P<0.031$). More than two-thirds of intern students reported the removal of gloves and masks while walking around and the removal of watches, rings, and jewelry (75.5% and 81.6%), respectively ($p<0.05$) **Table 4)**

Table 4: Practice of basic infection control protocol among dental students

Practice of basic infection control protocol		Year of Study N (%)			p- value	Gender N (%)		p- value
		Third-year	Fourth-year	Interns		Male	Female	
Change gloves between patients	Always	149 (90.9)	142 (95.9)	94 (95.9)	0.144	105 (27.3)	280 (72.7)	0.352
	Sometimes	11 (6.7)	4 (2.7)	4 (4.1)		7 (36.8)	12 (63.2)	
	Never	4 (2.4)	2 (1.4)	0 (0)		3 (50)	3 (50)	
Hand wash between each glove change	Always	112 (68.3)	103 (69.6)	77 (78.6)	0.367	82 (28.1)	210 (71.9)	0.421
	Sometimes	42 (25.6)	39 (26.4)	17 (17.3)		25 (25.5)	73 (74.5)	
	Never	10 (6.1)	6 (4.1)	4 (4.1)		8 (40)	12 (60)	
Change of facemask between patients	Always	73 (44.5)	73 (49.3)	41 (41.8)	0.001	50 (26.7)	137 (73.3)	0.031
	Sometimes	62 (37.8)	60 (40.5)	23 (23.5)		34 (23.4)	111 (76.6)	
	Never	29 (17.7)	15 (10.1)	34 (34.7)		31 (39.7)	47 (60.3)	
Gloves /mask removal while around	Always	78 (47.6)	83 (56.1)	74 (75.5)	0.001	61 (26)	174 (74)	0.549
	Sometimes	66 (40.2)	56 (37.8)	20 (20.4)		44 (31)	98 (69)	
	Never	20 (12.2)	9 (6.1)	4 (4.1)		10 (30.3)	23 (69.7)	
Use of surface barrier	Always	120 (73.2)	119 (80.4)	78 (79.6)	0.025	86 (27.1)	231 (72.9)	0.697
	Sometimes	37 (22.6)	17 (11.5)	11 (11.2)		21 (32.3)	44 (67.7)	
	Never	7 (4.3)	12 (8.1)	9 (9.2)		8 (28.6)	20 (71.4)	
Change of contaminated Gown/coat	Always	97 (59.1)	101 (68.2)	55 (56.1)	0.001	68 (26.9)	185 (73.1)	0.180
	Sometimes	44 (26.8)	27 (18.2)	12 (12.2)		20 (24.1)	63 (75.9)	
	Never	23 (14)	20 (13.5)	31 (31.6)		27 (36.5)	47 (63.5)	
Watches, rings and jewellery removal	Always	112 (68.3)	114 (77)	80 (81.6)	0.041	88 (28.8)	218 (71.2)	0.702
	Sometimes	37 (22.6)	26 (17.6)	17 (17.3)		22 (27.5)	58 (72.5)	

	Never	15 (9.1)	8 (5.4)	1 (1)		5 (20.8)	19 (79.2)	
Instruments sterilization after each procedure	Always	143 (87.2)	139 (93.9)	66 (67.3)	0.001	92 (26.4)	256 (73.6)	0.089
	Sometimes	15 (9.1)	8 (5.4)	32 (32.7)		22 (40)	33 (60)	
	Never	6 (3.7)	1 (0.7)	0 (0)		1 (14.3)	6 (85.7)	

Chi-square and Fisher exact test were used to compare proportions. $P<0.05$.

Table 5 summarizes the practices of infection control among dental students in prosthodontic department. It was revealed that significantly higher proportions of fourth-year students generally reported more adherence to the recommended infection control practices than interns and third-year students ($P<0.001$). However, the results revealed highly significant values of intern students regarding the

disinfection of rubber bowls between patients and disinfection of impressions following rinsing with water in comparison with other study groups ($P<0.001$). Moreover, a significantly higher percentage of females (70.8%) were found to disinfect dental casts ($P<0.001$) and metal frameworks for partial dentures ($P<0.039$) before sending and receiving them from the dental laboratory.

Table 5: The practices of infection control in the prosthodontic department

Disinfection between patients		Year of Study N (%)			p-value	Gender N (%)		p-value
		Third-year	Fourth-year	Interns		Male	Female	
Rubber bowel	Always	92 (56.1)	95 (64.2)	65 (66.3)	0.001	66 (26.2)	186 (73.8)	0.284
	Sometimes	51 (31.1)	39 (26.4)	6 (6.1)		26 (27.1)	70 (72.9)	
	Never	21 (12.8)	13 (8.8)	27 (27.6)		23 (37.7)	38 (62.3)	
Alginate mixing spatula	Always	89 (54.3)	104 (70.3)	59 (60.2)	0.001	63 (25)	189 (75)	0.277
	Sometimes	57 (34.8)	33 (22.3)	9 (9.2)		32 (32.3)	67 (67.7)	
	Never	18 (11)	10 (6.8)	30 (30.6)		20 (34.5)	38 (65.5)	
Shade guide	Always	74 (45.1)	93 (62.8)	40 (40.8)	0.001	58 (28)	149 (72)	0.718
	Sometimes	63 (38.4)	39 (26.4)	31 (31.6)		35 (26.3)	98 (73.7)	
	Never	27 (16.5)	15 (10.1)	27 (27.6)		22 (31.9)	47 (68.1)	
Wax knives, carvers	Always	94 (57.3)	111 (75)	54 (55.1)	0.001	67 (25.9)	192 (74.1)	0.238
	Sometimes	48 (29.3)	34 (23)	17 (17.3)		28 (28.3)	71 (71.7)	
	Never	22 (13.4)	2 (1.4)	27 (27.6)		20 (39.2)	31 (60.8)	
Coping pencil	Always	72 (43.9)	99 (66.9)	48 (49)	0.001	57 (26)	162 (74)	0.606
	Sometimes	60 (36.6)	38 (25.7)	24 (24.5)		36 (29.5)	86 (70.5)	
	Never	32 (19.5)	10 (6.8)	26 (26.5)		22 (32.4)	46 (67.6)	

While taking impressions, do you?		Year of Study N (%)			p-value	Gender N (%)		p-value
		Third-year	Fourth-year	Interns		Male	Female	
Apply barrier /disinfect gun	Always	95 (57.9)	105 (70.9)	53 (54.1)	0.003	67 (26.5)	186 (73.5)	0.247
	Sometimes	51 (31.1)	29 (19.6)	41 (41.8)		41 (33.9)	80 (66.1)	
	Never	18 (11)	13 (8.8)	4 (4.1)		7 (20)	28 (80)	
Rinse the impression under tap water	Always	150 (91.5)	139 (93.9)	92 (93.9)	0.550	107 (28.1)	274 (71.9)	0.458
	Sometimes	10 (6.1)	6 (4.1)	5 (5.1)		6 (28.6)	15 (71.4)	
	Never	4 (2.4)	1 (0.7)	1 (1)		1 (16.7)	5 (83.3)	
Disinfect impression after rinsing	Always	131 (79.9)	139 (93.9)	93 (94.9)	0.001	102 (28.1)	261 (71.9)	0.671
	Sometimes	27 (16.5)	8 (5.4)	4 (4.1)		12 (30.8)	27 (69.2)	
	Never	6 (3.7)	0 (0)	1 (1)		1 (14.3)	6 (85.7)	
Disinfect before sending and after receiving from dental laboratory		Year of Study N (%)			p-value	Gender N (%)		p-value
		Third-year	Fourth-year	Interns		Male	Female	
Dental cast.	Always	108 (65.9)	111 (75)	48 (49)	0.011	58 (21.7)	209 (78.3)	0.001
	Sometimes	41 (25)	22 (14.9)	20 (20.4)		32 (38.6)	51 (61.4)	
	Never	15 (9.1)	14 (9.5)	5 (5.1%)		13 (38.2)	21 (61.8)	
Dental prosthesis	Always	121 (73.8)	128 (86.5)	54 (55.1)	0.001	79 (26.1)	224 (73.9)	0.176
	Sometimes	31 (18.9)	14 (9.5)	18 (18.4)		19 (30.2)	44 (69.8)	
	Never	12 (7.3)	5 (3.4)	1 (1)		5 (27.8)	13 (72.2)	
Metal framework for RPD /Trail	Always	106 (64.6)	114 (77)	55 (56.1)	0.001	71 (25.8)	204 (74.2)	0.039
	Sometimes	40 (24.4)	19 (12.8)	16 (16.3)		26 (34.7)	49 (65.3)	
	Never	18 (11)	14 (9.5)	2 (2)		6 (17.6)	28 (82.4)	
Bite registration or record block	Always	106 (64.6)	119 (80.4)	55 (56.1)	0.001	74 (26.4)	206 (73.6)	0.053
	Sometimes	41 (25)	20 (13.5)	16 (16.3)		25 (32.5)	52 (67.5)	
	Never	17 (10.4)	8 (5.4)	2 (2)		4 (14.8)	23 (85.2)	
Autoclave before being used with patients.		Year of Study N (%)			p-value	Gender N (%)		p-value
		Third-year	Fourth-year	Interns		Male	Female	
Impression tray	Always	112 (68.3)	123 (83.1)	74 (75.5)	0.023	89 (28.8)	220 (71.2)	0.791
	Sometimes	34 (20.7)	12 (8.1)	17 (17.3)		17 (27)	46 (73)	
	Never	18 (11)	12 (8.1)	7 (7.1)		9 (24.3)	28 (75.7)	
Facebow fork	Always	101 (61.6)	120 (81.1)	74 (75.5)	0.001	80 (27.1)	215 (72.9)	0.745

	Sometimes	41 (25)	20 (13.5)	22 (22.4)		26 (31.3)	57 (68.7)	
	Never	22 (13.4)	7 (4.7)	2 (2)		9 (29)	22 (71)	
Fox occlusal plane	Always	97 (59.1)	122 (82.4)	68 (69.4)	0.001	87 (30.3)	200 (69.7)	0.365
	Sometimes	38 (23.2)	20 (13.5)	20 (20.4)		17 (21.8)	61 (78.2)	
	Never	29 (17.7)	5 (3.4)	10 (10.2)		11 (25)	33 (75)	

DISCUSSION

Dental students in the prosthodontic department are at risk of acquiring infection directly from their patients during dental procedures or indirectly through exposure to contaminated surfaces and dental laboratory items such as impressions, dental casts, record blocks, trial dentures, and finished prosthetic appliances.

The presented study attempted to evaluate attitudes, knowledge, awareness, and practice of infection control policies related to prosthodontics in Benghazi's public dental sector. The targeted sample in this study was the public rather than the private sector because public dental schools include more students. The sample included 3rd and 4th year dental students and interns. By focusing on this group, the study provided insights into the adequacy of dental teaching programs in covering essential information and behaviors related to infection control measures for future dental practitioners. Notably, the study concentrated on common categories rather than evaluating all aspects of infection control. Almost two-thirds of respondents (72%) were females which could be attributed to the higher number of female interns and dental students compared to males.

The study revealed alarmingly low HBV vaccination rates among dental students. Only 21.0% of students completed their HBV vaccination, significantly lower than rates reported in other countries (e.g., Canada: 100%, UAE: 95.8%, Brazil: 98.8%, Yemen: 70.0%).^{11,13,15,16} Interestingly, male students were more likely to complete immunization doses, possibly due to easier access to vaccination centers. Lack of awareness about vaccine importance and the absence of mandatory vaccination requirements during dental school registration may contribute to this concerning drift.

The result of the presented study showed that female students are more likely to agree to treat a simulated patient with infectious disease in general compared with male students, which could be due to the fact that female students appear to follow infection-control measures more closely than their male colleagues.¹⁷ However, generally, the mean percentage of willingness of dental students to treat patients with

infectious diseases in our sample was 54.1%, which could be due to a lack of confidence and knowledge among students in their ability and preparedness to manage infectious cases. Unfortunately, this negative attitude could lead patients infected with HIV or HBV to withhold their condition from dentists due to fear of denial of treatment. To address this, strict adherence to infection-control protocols is essential for every patient encounter. Incorporating dental management of patients with infectious diseases into educational and continuous training programs is crucial. Such programs can enrich both students' and dentists' knowledge and practical skills related to disease processes and transmission risks. By doing so, we can foster an improved attitude toward treating these patients effectively.

When evaluating the practice of basic infection control protocol among dental students, most of them (90%–95%) were wearing and changing gloves between patients; however, the frequency of changing other protective barriers such as face masks, protective eyewear, face shields, and head caps was very unsatisfactory, which may indicate a low level of students' awareness about the possibility of disease transmission through blood splashes and aerosols. This result is comparable to previous studies^{18,19} in which using head caps and protective glasses was low. To address this, dental students should be educated about the importance of wearing masks and other necessary protective barriers to minimize the risk of infection transmission. Additionally, emphasizing proper hand hygiene is crucial, as hands can serve as reservoirs for various pathogens.²⁰ Unfortunately, only 68.3%–78.6% of students in our sample reported hand washing between glove changes.

In our study, nearly half of the students reported changing their coats. It has been recommended that medical coats worn in dental clinics be changed daily and immediately following a blood splatter or when they are clearly contaminated to avoid cross-contamination.¹³ A large number of pathogenic microorganisms have been isolated under watches and rings. The majority of students in this study reported removing their watches and jewelry while performing

dental procedures. However, the difference between the different groups involved in this study was significant ($p = 0.041$).

On the other hand, the evaluation of students' awareness and attitude toward infection control measures in the prosthodontic department is about the disinfection of items used regularly in the prosthodontic department, such as rubber bowels, shade guides, alginate mixing spatulas, wax knives, and coping pencils. The results presented a lack of commitment of students, especially 3rd year and intern students, toward the disinfection of such items (40.8%–66.3%). While making an impression, the majority of the students informed us that they rinsed the impressions under tap water and disinfected them with proper disinfectant immediately following their removal from the patient's mouth.

The risk of a cycle of cross-contamination, which may involve dental laboratory technicians, dental practitioners, patients, and auxiliary personnel through blood, mucus, or saliva, has been well-documented.²¹ Therefore, items exposed to contamination should be disinfected both before being sent to the laboratory and immediately upon receiving them back from the lab.²² Regarding the infection control protocol between the dental clinic and the dental laboratory, a few questions were included to assess the disinfection of some items sent or received from the dental laboratory, such as dental impressions, dental casts, metal frameworks, record blocks, and finished dental prostheses. The majority of 4th-year students (75%–86%) are disinfecting those items before sending and receiving them from the dental laboratory. However, the percentage of 3rd-year students who disinfected those items was statistically lower than that of 4th-year students. The probable reason could be that 3rd-year students have less work experience.

Generally, the findings of this study showed inadequate compliance with ideal infection control procedures among the participants, which could be due to an insufficient supply of protective equipment and a lack of continuous, periodic educational programs and refreshing training courses to support infection control measures. Furthermore, hepatitis B vaccination should be made mandatory before registration at any dental training institution to protect the students prior to exposure.

The findings could alert educators regarding the importance of instructing and teaching their students about infection control measures. Infection control measures can be written on a poster to be as a reminder for students to raise their knowledge and improve their practice in this field. Formal classes and evaluations could improve knowledge and clinical practice of dental students.

Some limitations of the present study should be acknowledged. The responses might not truly reflect the real level of attitude and knowledge of participants because they depended on participant self-assessment without the supervision of an investigator in a clinical environment. Moreover, because this study was conducted in a single public institution, the results did not reflect the attitudes, knowledge, and practices of the students in other dental institutions. However, the results could help plan a survey that includes other private and public sectors across Benghazi city and the whole country.

CONCLUSION

In this study, participants demonstrated moderate compliance with infection control procedures. However, their knowledge of infection control guidelines was limited. Despite a positive attitude toward infection control measures, greater emphasis on compliance with HBV vaccination is essential. Efforts should focus on providing comprehensive training in ideal infection control practices for undergraduate students, and continuing education courses for dentists in this field are recommended.

REFERENCES

1. Kohn WG, Collins AS, Cleveland JL, Harte JA, Eklund KJ, and Malvitz, DM. CDC centers for disease control and prevention guidelines for infection control in dental health care settings, MMWR Recommendations and Reports. 2003; 52: 1-61.
2. OSHA Occupational Safety and Health Administration, OSHA instruction blood borne pathogens exposure control plan and guidance on post-exposure evaluations for federal OSHA personnel, Directive no. CPL 02-02-077, 2010.
3. American Dental Association, ADA Guidelines for Infection Control, ADA Science Institute, 2016.
4. Ajantha H, Kumar B. Infection control in the dental office-A review. *Ind J Dental Adv.* 2011;3: 577-82.
5. Shaghaghian S, Pardis S, Mansoori Z. Knowledge, attitude and practice of dentists towards prophylaxis after exposure to blood and body fluids. *Int J Occup Environ Med.* 2014; 5:146-54.
6. Dahiya P, Kamal R, Sharma V, Kaur S. "Hepatitis" – Prevention and management in dental practice. *J Educ Health Promot.* 2015; 4:33.
7. Wu L, Yin YL, Song JL, Chen Y, Wu YF, Zhao L. Knowledge, attitudes and practices surrounding occupational blood-borne pathogen exposure amongst students in two Chinese dental schools. *Eur J Dent Educ.* 2016; 20 :206-12.

8. Milward MR, Cooper PR. Competency assessment for infection control in the undergraduate dental curriculum. *Eur J Dent Educ.* 2007;11: 148-54.
9. Alolah L, AlSaadoun D, AlHazza'a H, AlJubair A, Alenazi B, AlShammery D, AlGhamdi W. Awareness and Practice of infection control among selected sample of dental students in Saudi Arabia. *Int J Innov Res Med Sci.* 2017; 2: 8.
10. Al-Essa NA, AlMutairi MA. To what extent do dental students comply with infection control practices? *Saudi J Den Res.* 2017; 8: 67-72.
11. Halboub ES, Al-Maweri SA, Al-Jamaei AA, Tarakji B, Al-Soneidar WA. Knowledge, Attitudes, and Practice of Infection Control among Dental Students at Sana'a University, Yemen. *J Int Oral Health.* 2015; 7, 15-19
12. Mohammad, EL.-AN.; Eman, OK.; Salwa, H. Hand hygiene knowledge and practice among dentists in Mansoura Faculty of Dentistry, Egypt. *Ann Med Biomed Sci* 2015; 2: 9-14.
13. Rahman B, Abraham SB, Alsalami 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: 15-9.
14. Matalon S, Eini A, Gorfil C, Ben-Amar A, Slutzky H. Do dental impression materials play a role in cross contamination? *Quintessence Int.* 2011; 42: 124-30.
15. Mc Carthy GM, Britton JE. A survey of final-year dental, medical and nursing students: Occupational injuries and infection control. *J Can Dent Assoc.* 2000;66: 561. 1.
16. 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: 282-4.
17. Kateeb E, Amer R and Musa Bajali M. Factors related to the willingness of Palestinian dentists to treat patients with blood-borne diseases. *Int Dent J.* 2015; 65: 103-9.
18. Alshiddi IF. Attitude and Awareness of Dental Students and Interns toward Infection Control Measures in Prosthodontic Clinics. *J Inter Oral Health.* 2015; 7:10-5.
19. Freire DN, Pordeus IA, Paixão HH. Observing the behavior of senior dental students in relation to infection control practices. *J Dent Educ.* 2000; 64:352-6.
20. Qureshi UM, Siddiqui S, Macfarlane TV. Cross infection: How do dentists change into a clean set of clinical clothing? *Health Educ J.* 2005; 64:101-9.
21. Salvia AC, Matilde Fdos S, Rosa FC, Kimpara ET, Jorge AO, Balducci I, et al. Disinfection protocols to prevent cross-contamination between dental offices and prosthetic laboratories. *J Infect Public Health.* 2013; 6:377-82.
22. AL-Makramani BMA. Infection Control in Dental Clinics: Prosthodontics Perspectives. Review. *J Contemp Dent Practice.* 2022,23: 953-61.