

Compliance with Infection Control Practices among Dental Interns in Alexandria, Egypt

Hashem Hassouna¹, Mervat El Saygh², Gihan EL Batouti³

¹Department of Oral Maxillofacial Surgery, Faculty of Dentistry, Pharos University in Alexandria, Alexandria, Egypt.

²Microbiology and Immunology Laboratory, Alexandria Main University Hospital, Alexandria, Egypt.

³Department of Microbiology and Immunology, Faculty of Pharmacy, Pharos University in Alexandria, Alexandria, Egypt.

Corresponding Author: Gihan EL Batouti

ABSTRACT

Background: Dental settings pose a crucial risk for the transmission of infections for both dental healthcare providers and their patients. The risk of occupational exposure includes parenteral and respiratory droplet transmission. In order to minimize the risk of cross infection in dental settings, standard infection control precautions should be followed. This study aimed to assess the compliance with infection control practices among dental interns in Alexandria, Egypt.

Methods: The study included 220 dental interns (122 males and 98 females) from different dental settings in Alexandria. A questionnaire was distributed to public and private sectors.

Results: Regarding compliance to personal protective equipment, a 100% adherence to wearing gloves was found. Moreover, 54.3% of males and 45.7% of females always wore masks, but only 27.7% of them wore eye protection during dental procedures. The majority performed hand hygiene after doffing gloves, 69.5% but only 19.1% performed both before donning and after doffing gloves. The occurrence of needle stick injuries was 46.4% from surgical procedures and 36.4% from non-surgical procedures. A 90.0% properly disposed of sharps, while only 24.5% used the scoop technique for recapping. Only 43.2% interns completed their Hepatitis B vaccination schedule, from which 52.6% undergone antibody testing.

Conclusion: Our study showed that the overall practice of infection-control measures among dental interns in Alexandria was good. Sharps safety regulations, completing HBV vaccination, and antibody post testing need more emphasis. Continuous educational training programs and follow up assessments should be implemented to maximize the compliance of dental healthcare providers.

Key Words: Dental interns, Hepatitis B virus Immunization, infection control practices, needles stick injuries, personal protective equipment.

INTRODUCTION

Dental settings pose a crucial risk for the transmission of infections [1, 2]. The risk of occupational exposure is based mainly upon the prevalence of blood borne viruses in patients, the direct and indirect contact with blood and body fluids including parenteral routes of transmission as well as the inhalation of droplet or airborne pathogens [3]. These pathogens include cytomegalovirus, hepatitis- B and C virus

(HBV and HCV), Herpes simplex virus types 1 and 2, human immunodeficiency virus (HIV), Mycobacterium tuberculosis, streptococci, and severe acute respiratory syndrome (SARS) virus [1,3].

Dental healthcare personnel (DHCP) may contract blood borne infections via accidental needle stick injuries during surgical procedures or anesthesia injections. On the other hand DHCP have the potential to transmit infection to their

patients and thereby to others in the community [4].

In order to minimize the risk of cross infection in dental settings the Centers for Disease and Control (CDC) issued specific guidelines that provide recommendations to ensure the safety of DHCP and their patients [1]. These recommendations include the implementation of standard precautions with emphasis on hand hygiene, the use of barrier techniques as personnel protective equipment (PPE), sterilization of dental instruments, environmental cleaning and disinfection as well as immunization against HBV [1, 2]. This study aimed to assess the compliance with infection control practices among dental interns in Alexandria, Egypt.

MATERIAL AND METHODS

Questionnaire

A questionnaire based cross-sectional study was adopted. The study included 220 dental interns (122 males and 98 females) with ages ranging from 22- 26 years (mean age of 24). A questionnaire was distributed to dental interns in different dental settings in Alexandria, Egypt for a 3 months period during the COVID-19 pandemic in 2020.

The questionnaire comprised of 16 closed ended questions regarding gender, age, hand hygiene, personal protective equipment (PPE), sharps safety and immunization data. Participation in this study was entirely voluntary and it was

emphasized that confidentiality would be maintained.

HBV antibody testing

HBV antibody testing was performed for the dental interns that had completed their three dosage vaccination and agreed to undergo the test. HBV antibody testing was conducted according to manufacturer's instructions using Human Anti-HBV surface Antigen Antibody (Anti-HBV) ELISA Kit (MyBioSource, MBS9304959). It is a sandwich enzyme-linked immunosorbent assay (ELISA) that detects Anti-HBVSAg in human serum [5].

Statistical Analysis

The collected data was statistically analyzed using IBM SPSS software package Version 20.0 (Armonk, N.Y, USA: IBM Corp). The Kolmogorov- Smirnov was used to verify the normality of distribution of variables. Comparisons between groups for categorical variables were assessed using Chi-square test (Fisher's Exact correction). Significance of the obtained results was judged at the 5% level.

RESULTS

A total of 220 dental interns participated in this study; 122 males and 98 females whose ages ranged from 22 to 26 years. The compliance to using PPE was reported for, gloves, masks, and goggles or face shield (Table1).

Table 1: Compliance to Using PPE Among Dental Interns

PPE Used	Male No. (%)	Female No. (%)	Total No. (%)	χ^2	p
Gloves					
Always	122 (55.5)	98 (44.5)	220 (100)	-	-
Occasionally	0 (0)	0 (0)	0 (0)		
Never	0 (0)	0 (0)	0 (0)		
Masks					
Always	114 (54.3)	96 (45.7)	210 (100)	2.555	FE: p=0.191
Occasionally	8 (80)	2(20)	10 (100)		
Never	0 (0)	0 (0)	0 (0)		
Goggles/ Face shield					
Always	16 (26.2)	45 (73.8)	61 (100)	29.377	<0.001*
Occasionally	68 (68.0)	32 (32.0)	100 (100)		
Never	38 (64.4)	21 (35.6)	59 (100)		

χ^2 : Chi square test FE: Fisher Exact
 p: p value for comparing between Male and Female
 *: Statistically significant at $p \leq 0.05$

A 100% adherence to wearing gloves during dental procedures was

recorded in both males and females. A total of 210 dental interns;114 males (54.3%) and

96 females (45.7%) always wore masks, while only 10 dental interns (80.0% males and 20.0% females) wore them occasionally. As for goggles or face shields; a significant statistical difference was recorded for wearing eye protection where 61 dental interns always wore them (26.2% of males and 73.8% of females), 100 occasionally wore them (68.0% of males and 32.0% of females) and 59 dental interns who never wore eye protection. (64.4% of males and 35.6% of females).

The number of dental interns that complied to hand hygiene before donning gloves was only 25(11.4%), while the majority performed hand hygiene after doffing gloves, 153 (69.5%) and 42 (19.1%) both before donning and after doffing gloves. Moreover, 171 (77.7%) changed gloves between patients, while 49 (22.3%) did not. A total of 214 (97.3%) reported to

have properly disposed of their contaminated PPE in biohazard labelled waste bags, and only 6 (2.7%) discarded them in non- biohazard regular waste.

Regarding sharps safety, the occurrence of needle stick injuries among the total 220 dental interns was 102 (46.4%) from surgical procedures and 80(36.4%) from non- surgical procedures. The difference between these results were found to be statistically significant with a $p < 0.033$ (Table2).

As for sharps disposal; 198 (90.0%) properly disposed of used needles in the designated puncture-proof sharp boxes, while 22(10.0%) did not. Recapping of anesthesia needle was improperly performed using both hands by the majority of interns comprising 166 (75.5%), while 54 (24.5%) used the one hand –scoop technique for recapping sharps.

Table 2: Occurrence of Needle stick Injuries Among the 220 Dental Interns According to the Dental Procedures

Dental Procedures	Needle stick injuries No. (%)	No Needle stick injuries No. (%)	Total No. (%)	χ^2	p
Non- Surgical Procedures	80 (36.4)	140 (63.6)	220(100)	4.535*	0.033*
Surgical Procedures	102 (46.4)	118 (53.6)			
Total No. (%)	182 (41.4)	258 (58.6)			

χ^2 : Chi square test

p: p value for comparing between Needle stick injuries and No Needle stick injuries

*: Statistically significant at $p \leq 0.05$

All dental interns were vaccinated against HBV (Table 3). However, only 95 (43.2 %) interns completed their vaccination schedule of 3 doses; divided as 48 (39.3 %) males to 47 (48.0%) females. Out of the 48 males whom completed their vaccination

schedules, only 16(33.3 %) had undergone post- vaccination testing for HBV surface antibody levels. On the other hand, from the 47 females, 34 (72.3%) had undergone testing (Table 4). These results were found to be statistically significant, $p < 0.001$.

Table 3: Vaccination with Hepatitis B Virus (HBV) Vaccine Among Dental Interns

Gender	Completed Doses with HBV vaccine No. (%)	Did not Complete Doses with HBV vaccine No. (%)	Total No. (%)	χ^2	P
Male	48 (39.3)	74 (60.7)	122 (100)	1.644	0.200
Female	47 (48.0)	51 (52.0)	98 (100)		
Total No. (%)	95 (43.2)	125 (56.8)	220 (100)		

χ^2 : Chi square test, p: p value for comparing between vaccination and incomplete vaccination

Table 4: Hepatitis B Surface Antibody Testing Among the 95 Dental Interns that Completed their Vaccination

Gender	Test done No. (%)	Test not done No. (%)	Total No. (%)	χ^2	p
Male	16 (33.3)	32 (66.7)	48 (100)	14.493*	<0.001*
Female	34 (72.3)	13 (27.7)	47 (100)		
Total No. (%)	50 (52.6)	45 (47.4)	95(100)		

χ^2 : Chi square test, FE: Fisher Exact

p: p value for comparing between Test done and Test not done

*: Statistically significant at $p \leq 0.05$

DISCUSSION

Infection prevention is a priority in dental practice. Infections can be transmitted by direct and indirect contact in addition to respiratory droplets. Direct contact may be with blood, body secretions and saliva. Indirect contact is through the surrounding contaminated environmental surfaces, devices or instruments [6]. It is therefore essential to comply to standard precautions and recommended guidelines in order to prevent cross-infection among dental health-care providers and patients as well as between patients themselves [1,2].

This study aimed to assess the compliance of dental interns to infection control practices as hand hygiene, use of PPE, sharps safety and immunization. Our study included 220 dental interns; 122 males and 98 females from both public and private sectors (institutions and clinics) in Alexandria, Egypt during the COVID -19 pandemic in 2020.

Respiratory droplets and the generation of aerosols of water, saliva, blood, and the presence of microorganisms are common during dental procedures. These droplets may remain suspended in the air for a long time or settle on surfaces or equipment posing as a major source of infection to the surrounding environment in any dental healthcare setting [7,8]. In order to minimize the transmission and susceptibility to airborne and blood born infections; it is mandatory that dental care providers always use PPE as gloves, protective gowns, mask, goggles or face shields during any dental procedure [2,9].

In general, the compliance to wearing PPE was very high among both male and female dental interns. A 100.0% adherence to always wearing gloves, 90.0% to always wearing masks and only 27.7% compliance to wearing eye protection or goggles was recorded. Males were found to be more compliant in always wearing gloves and masks, but females showed a much higher percentage of compliance to wearing eye protection (73.8% females to 26.2% males). Lower percentages were observed

by Mehasnah *et al*, [10] (87.9% and 78.9%) and Yadav BK, *et al* [11] (90.0%), regarding the adherence to always wearing gloves and masks respectively. However, Mehasnah *et al*, [10] reported a higher percentage of compliance to changing gloves between patients (89.5%) in comparison with our findings; only 77.7%. The majority of dental interns properly disposed of PPE in the designated biohazard labelled bags (97.3%), indicating their awareness and practice of proper disposal of biohazardous waste.

Hand hygiene is a crucial practice that prevents the transmission spread of infections any healthcare setting [12,13]. We reported that 69.5% of dental interns performed hand hygiene after doffing gloves, only 11.4% before donning and 19.1% both before donning and after doffing. These findings reflect lack the awareness of the importance of performing hand hygiene before donning gloves to prevent its possible contamination and thereby preventing the spread of infection to patients. Much higher percentages were revealed by Ch AN [6] *et al* in Pakistan showed that 79.0% of the dentists performed hand hygiene before and after contacting patients, while in Saudia Arabia, AlAhdal A, *et al* [14] reported that 96.7% and 89.4% of the dentists performed hand hygiene before and after contacting patients, respectively.

Many dental instruments used in both surgical and non surgical dental procedures could cause needlestick injuries and hence could be a potential source of infection. These procedures include normal extraction, surgical extraction of remaining roots, odonectomy of impacted teeth, and accidental punctures from dental needles during injection of local anaesthesia [15,16]. Sharps safety practices and proper biohazard waste management disposal should be strictly implemented and followed. A total of 182 (41.4%) of dental interns were exposed to needlestick injuries, from which the higher percentage was acquired from surgical procedures (46.4%).

Regarding the proper disposal of sharps; 90.0% of interns properly disposed of used needles in the designated puncture-proof sharp boxes. Similar findings were reported by Mehasnah *et al.*,^[10] (88.4%) and 99.2% by AlAhdal *et al.*^[14]. Recapping of sharps is one of the most important causes of needle stick injuries in healthcare providers. [Only 24.5% used one hand technique for necessary recapping of sharps in our study. The practice of recapping is prohibited according to standard precautions and sharp safety measures. However, procedures as the reuse of local anaesthesia injection for the same patient are sometimes mandatory. In this case sharp safety guidelines recommend the use of the one hand –scoop technique for recapping sharps^[17-19].

HBV is a well-recognized occupational bloodborne biohazard risk for dental care providers. It can be transmitted by their exposure to blood and body fluids of an infected person^[10]. In Egypt HBV immunization is obligatory for newborns in their vaccination schedule. It has also become mandatory for all healthcare providers including dentists in public and private institutions and settings. In our study all dental interns were vaccinated against HBV. However, only 95 (43.2 %) interns completed their vaccination schedule of 3 doses. Incomplete dose administration indicates inadequate HBV antibody formation and coverage. Out of the 95 compliant interns; females represented a higher percentage of compliance to taking the 3 doses compared to males; 48.0% to 39.3% respectively. Comparable percentages for complete HBV vaccination were found in other studies; in Jordan (82.1%)^[10], Pakistan^[6] (71.6%), New Zealand^[20] (94.2%), and Saudi Arabia^[14] (90.6%).

Post-vaccination HBV antibody level testing is very important to ensure the presence of a protective antibody level^[21]. Out of the 95 interns that completed their three vaccination doses, 52.6% had undergone HBV antibody level testing, from

which the majority were females comparing 73.3%. All were found to be responders with an adequate antibody response and coverage.

CONCLUSION

Our study showed that the overall practice of infection-control measures among dental interns in Alexandria was good and acceptable. The majority of the participants followed the Infection Control Guidelines for Dental Healthcare settings regarding the use of PPE, proper disposal of sharps and biohazard waste and vaccination against HBV. However, there exists a the lack of knowledge and implementation regarding sharps safety as recapping needles and completing HBV vaccination schedule and antibody level post testing. This issue must be well emphasised to ensure occupational safety and prevent the transmission of infection to dentists and their patients in any dental healthcare setting. Continuous educational training programs and follow up assessments should be implemented to maximize the compliance of dental healthcare providers.

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