

Infection Control Knowledge, Attitudes, and Practices among Dental Students at Al-Ahram Canadian University

*Hamida Abobakr Adel**

Abstract:

Introduction: Exposure to blood-borne pathogens poses a serious risk to health care providers . Healthcare workers are three to six times more likely than the general public to catch bloodborne viruses. Dental health-care providers are under significant risk, since the treatment usually requires intrusive procedures. So, poor adherence to standard precautions, represent the main causes that pose a critical risk of infection in dental practice. Despite the fact that universities are the primary source of infection control instruction for future dentists, research in the Middle East has revealed that awareness of infection control among dental students as well as some of the teaching staff is poor. In Egypt, Researches discussing Knowledge, attitudes and practice of infection control among students don't cover all aspects. So that This study was performed at faculty of dentistry Al Ahram Canadian University (ACU). **Materials and methods:** A questionnaire was developed to probe the knowledge, attitude and practice (KAP) of infection control. The pre-structured self-administered online questionnaire was sent to level 4 and 5 students (749) using Microsoft Teams. Data management and statistical analysis were performed using spss v. 18. P-values ≤ 0.05 were considered significant.

Results: Responders to the questionnaire were 98 students in level 4 and 172 students in level 5 with a total of 270 students (36% response level). Regarding the total score for all Knowledge questions, level 4 recorded a slightly higher mean value (21.28 ± 5.44), in comparison to level 5 (20.02 ± 5.47), with no significant difference between groups ($p=0.069$). Regarding the total score for the 24 practice questions, level 4 recorded a slightly higher mean value (21.28 ± 5.44), in comparison to level 5 (20.02 ± 5.47), with no significant difference between groups ($p=0.069$). Regarding the total score for the 5 attitude questions, level 4 recorded a slightly higher mean value (4.60 ± 1.03), in comparison to level 5 (4.46 ± 1.19), with no significant difference between groups ($p=0.32$).

Conclusion: from the results of the study, we can conclude that students at level 4 showed slightly higher knowledge, attitude, and dental practice than their colleagues at 5 level. However, knowledge is low for both levels except for hand hygiene among students at level 4. Students' attitudes are satisfactory for both groups, except their attitudes toward the cost-effectiveness of infection control. While instruments processing and personal protective equipments practices are generally acceptable for both levels

Recommendation: 1- infection control workshops must be done periodically for students at clinical levels. 2- Refresher training before graduation must focus on injury prevention and post-exposure protocols. 3- Students must be encouraged to participate in surveys whether direct or indirect, by explaining the importance of the survey for their field. 4- Introducing safer products and clinical procedures are highly recommended to minimize the risk of injuries during clinical practice for dental students.

Key words: infection control, dental students, knowledge, attitude, practice, surv

*Professor of Dental Public Health & Preventive Dentistry, Ahram Canadian University.

Introduction

Exposure to blood-borne pathogens poses a serious risk to health care providers (HCPs), such as hepatitis B and C and human immunodeficiency virus, as transmission occurs through bodily fluids, and it became more serious as the transmission may even occur from a HCP to a patient or from a patient to another patient. ^(1,2) Healthcare workers are three to six times more likely than the public to catch bloodborne viruses. ^(3,4) Furthermore, healthcare providers in developing nations are often more susceptible. According to a report from 2002 by World Health Organization (WHO), hepatitis B and C account for 40% of the global burden of chronic diseases linked to occupational exposure among healthcare workers, while HIV accounts for 2.5 %. ⁽⁵⁾ Around 90% of these exposures are related to developing nations. ⁽⁶⁾

The WHO estimates that 4.3 million people in the region are infected with HBV and 800,000 with HCV each year. The majority of these infections are acquired during health care delivery. Around 17 million people in the Region are thought to have chronic HCV infection. ^(7,8)

Egypt, among these countries, is seeing an alarming outbreak of blood-borne contagious diseases, particularly HCV, which is among the world's worst. According to studies conducted in Egypt in 2013 and 2015, The prevalence of hepatitis C virus (HCV) infection in Egypt is the highest in the world, and it was as high as 55% in some communities. ^(9,10) In the other hand the prevalence of the HBV and HIV are much lower as it was 1.3%-1.5% for HBV, and less than 0.1% for HIV in the general population. ^(11,12) Now days Egypt has showed great progress in fighting these infections through a national control strategy by screening, testing, vaccination, and treatment.

⁽¹⁾ On the side lines of activities of the first African medical conference (African Health ExCon), The Ministry of health stated that

Egypt submitted a request to WHO to be declared as a state free of hepatitis C for 2022 reports updates. ⁽¹⁴⁾

In dental practice, Dental health-care providers are under significant risk, since the treatment usually requires intrusive procedures that leads to contamination by microorganisms from blood or saliva through a visible spray, which is created during the use of rotary dental and surgical instruments (e.g., handpieces, ultrasonic scalers) and air-water syringes. This spray contains particle spatter of water, blood, microorganisms, and other debris. It only travels for short distances, and settles out quickly, but it also may contain some aerosol (not typically visible to the naked eye). Aerosols can remain airborne for extended periods and may be inhaled. ^(1, 15, 16, 17) So, poor adherence to standard precautions, sidestep the national guidelines, and lack of HBV immunisation represent the main causes that pose a critical risk of infection in dental practice. ^(15, 16, 17) It was reported in different studies that infection control measures in developing countries are much lower than that in developed countries, developing countries may have infection control programs and committees on paper, in practice, they barely exist. ⁽¹⁸⁻¹⁹⁾ Despite the fact that universities are the primary source of infection control instruction for future dentists, research in the Middle East has revealed that awareness of infection control among dental students as well as some of the teaching staff is poor. ^(20_21_22_23,24)

In Egypt, Researches discussing this topic don't cover all aspects of infection control knowledge, attitudes, and practices among students, and even all of them revealed inadequate levels of knowledge, attitude, and practices toward infection control. ⁽²⁵⁾

We anticipated that ineffective infection control practices were linked to a lack of knowledge and negative attitudes toward infection control and, as a result, increased

student exposure to needle and sharps injuries during clinical training.

The study was performed at Ahram Canadian University (ACU), to evaluate the students, since the dentistry school clinics provide dental care services for all different socio-economic status, even low-income populations and rural populations with a particular risk of infectious diseases, especially HCV. The study was conducted on dental students, in the last 2 years before graduation from the faculty of Oral and Dental Medicine.

Aim of the study: Aim of the study is to assess Infection Control Knowledge, Attitudes, and Practices among Dental Students at faculty of dentistry Al Ahram Canadian University (ACU).

Materials and methods:

A questionnaire was developed to probe the knowledge, attitude, and practice (KAP) of infection control. Work plan was created to include a list of activities, the time in which it should be completed and the person who is responsible for completing it. Each question was designed to support the objective of the survey and focused on one aspect of infection control without any leading questions. The questionnaire was pretested to find out how the questions were understood by dental students. The questionnaire was disseminated to a small number (12 students) who were not included in the final sample. Researchers announced for the survey to the students and presented the advantage of participation in the survey to the community and dental profession. Sample size was 255 students as calculated with confidence level of 80% and margin of error at 0.05. The pre-structured self-administered online questionnaire was sent to level 4 and 5 students (749) using Microsoft Teams. Data management and statistical analysis were performed using the Statistical Package for Social Sciences (SPSS) version 18. Numerical data were summarized using means and standard deviations and were compared

between both levels (level 4 and 5) using independent t test. Categorical data were expressed as percentages and were compared between levels using chi square test. All p-values are two-sided. P-values ≤ 0.05 were considered significant.

Knowledge categories

I-a- General information

Q=Are standards precautions including personal protective barriers, aseptic technique, instrument reprocessing, waste management, and immunization?

Q=Is transmission of infection the only occupational hazards in dental clinics?

Q-What is the main purpose for taking infection control measures?

Q-Is the route of infection in dental clinics?

Q-According to the risk of infection transmission, organize the following dental procedures (by matching a, b, c, d with a for the highest risk)

I-b-Personal protective equipment (PPE)

Q=Do you consider manufacturers instruction regarding the chemical compatibility of glove material and dental materials?

Q-Has the use of latex gloves resulted in increased latex allergy among dentists?

Q=Is there an alternative to latex material?

I-c Instruments' processing

Q=Does sterilization and disinfection mean the same?

Q=Is it essential to dry instruments before loading into sterilizer?

Q=Do you know what is meant by critical, semi-critical and non-critical dental equipment?

Q-What is the most reliable sterilization method?

I-d-Postexposure prophylaxis

Q=Do you know what would you do if you had needle prick?

I-e-Hand hygiene

Q=Is hand hygiene the most important procedure in prevention of health care associated infection?

I-f-Dental unit waterline

Q=Do you know how to avoid transmission of infection via dental unit waterlines?

Attitude categories

Q- Should standard precautions be used for all patients and during all dental procedures?

Q- In your opinion, transmission of infection in dental clinics is serious?

Q- Do you think HBV vaccination is important?

Q- Do you think that maintaining infection control measures is cost-effective procedure (i.e., worth spending money)?

Q- Do you consider waterline of dental unit a source for health care associated infection?

Practice categories

II-a- General practice

Q-Have you received infection control training?

Q-Do you touch unwrapped light handles, unit switches, instrument case, and work sheet while working?

Q-What do you use for environmental surface disinfection?

Q-What do you use to reduce aerosol and splatter during patient treatment?

Q-What are the items you use for each patient?

II-b-Personal protective equipment

Q-Do you use protective personal equipment (using protective clothing, mask, medical gloves, and protective face shields) ?

Q-Do you wear hand jewellery when wearing gloves?

Q-When do you clean protective eye wear/ face shield?

Q-When do you change the mask?

Q--when do you change protective clothing?

Q-when do you change medical gloves during working hours?

II-c- Instrument processing

Q-Do you use appropriate utility gloves when cleaning instruments?

Q-Do you clean dental instruments before sterilization?

Q-Do you use indicator during sterilization?

Q-In your practice, after using un-disposable instruments you soak, clean, ...?

Q-The way of your instrument cleaning is manual,?

Q- The indicator you use to check sterilization is ...?

Q--How do you store critical dental instruments?

II-d Hand hygiene

Q-Do you perform hand hygiene?

Q-To wash hands during convectional dental treatment, you use non antimicrobial soap, ...?

Q-To dry hands, you use paper towel, ...?

Q-When do you perform hand hygiene?

II-e- Disposal of sharps

Q-During recapping of used dental syringe needles, what is the way you do it?

Q-In your practice, used sharp instruments are disposed in?

Results:

Responders to the questionnaire were 98 students in level 4 and 172 students in level 5 with a total of 270 students (36% response level). Fig (1)

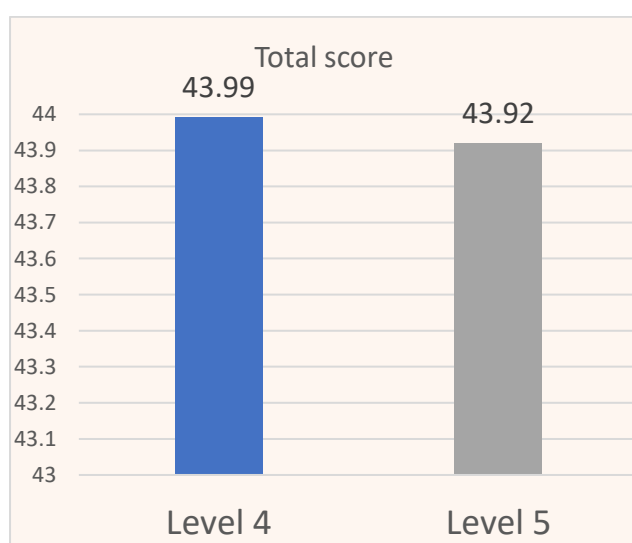


Fig. (1) Bar chart illustrating percentages of response among level 4 and level 5 students

I-Knowledge

Scores for knowledge, Practice and attitude questions are presented in Table 1 and in Fig. (2)

In addition to calculating the total score for knowledge questions, most of the questions were categorized into general information, personal protective equipment (PPE), instrument processing, postexposure prophylaxis (PEP), hand hygiene, dental unit water line. The score for Questions in different categories was also calculated and compared between both levels.

Selected questions in different categories are listed in Table (1). Summary of responses and comparisons between groups are presented in Fig. (2)

Comparison of response to knowledge questions between groups

Comparing general knowledge, knowledge about personal protective equipment (PPE), instruments processing, hand hygiene, Postexposure prophylaxis and Dental unit waterline revealed slightly higher mean scores in level 4. This difference didn't reach the level of statistical significance between levels ($p=0.79$; 0.38; 0.95; 0.31; 0.25 and 0.26 for general knowledge, knowledge about personal protective equipment (PPE), instruments processing, hand hygiene, Postexposure prophylaxis and Dental unit waterline respectively (Table 1, Fig.2)

Table (1) Descriptive statistics and comparisons of response for knowledge questions in Level 4& level 5

Item	Level 4 (n=98)	Level 5 (n=172)	P value
	Mean ±SD	Mean ±SD	
General information	4.87±1.56	4.82±1.45	0.79 ns
PPE	2.68±0.79	2.59±0.82	0.38 ns
Instruments' processing	3.89±1.16	3.88±1.17	0.95 ns
Hand hygiene	0.92±0.28 Correct: 92% wrong: 8%	0.88± 0.33 Correct: 87.2% wrong: 12.8%	0.31 ns
Postexposure prophylaxis	0.84±0.4 Correct: 83.7% wrong: 16.3%	0.78±0.42 Correct: 77.9% wrong: 22.1%	0.25 ns
Dental unit waterline	0.89±0.32 Correct: 88.8% wrong: 11.2%	0.84±0.36 Correct: 84.3% wrong: 15.7%	0.26 ns

Significance level $p \leq 0.05$, ns=non-significant

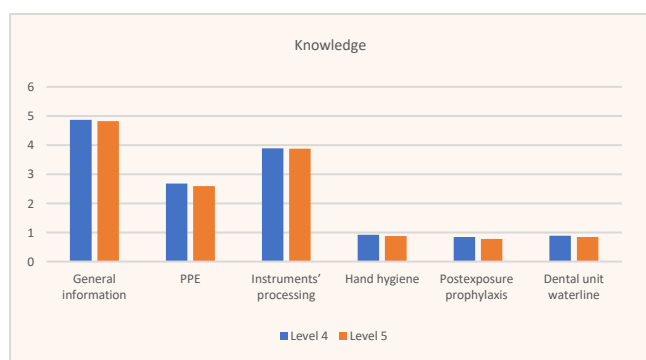


Fig. (2) Bar chart illustrating mean values of responses for knowledge questions in both levels

II-Attitude

Comparing attitude about standard precautions, opinion about the seriousness of infection in dental clinics, importance of HBV vaccination and considering waterline of dental unit as source of infection revealed slightly higher mean scores in level 4, with no statistical significance ($p=0.28$; 0.33 ; 0.28 and 0.099 respectively). Although students of level 5 recorded a slightly higher mean score for considering infection control measures cost effective, the difference between levels didn't reach statistical significance ($p =0.72$), (Table 2, Fig.3)

Table (2) Descriptive statistics and comparisons of response for attitude questions in Level4& level 5

	Level 4 (n=98)		Level 5 (n=172)		P value
	Mea n ±SD	Resp onse	Mea n ±SD	Resp onse	
Should standard precautions be used for all patients and during all dental procedures?	0.95 ±0.2 2	Yes: 94.9% No: 5.1%	0.91 ±0.2 8	Yes: 91.3% No: 8.7%	.28 ns
In your opinion, transmission of infection in dental clinics is serious?	0.96 ±0.2	Yes: 95.9% No: 4.1%	0.93 ±0.2 6	Yes: 93.0% No: 7.0%	.33 ns
Do you think HBV vaccination is important?	0.95 ±0.2 2	Yes: 94.9% No: 5.1%	0.91 ±0.2 8	Yes: 91.3% No: 8.7%	.28 ns

Do you think that maintaining infection control measures is cost-effective procedure (i.e., worth spending money)?	0.80 ±0.4 1	Yes: 79.6% No: 20.4%	0.81 ±0.3 9	Yes: 81.4% No: 18.6%	.718 ns
Do you consider waterline of dental unit a source for health care associated infection?	0.95 ±0.2 2	Yes: 94.9% No: 5.1%	0.89 ±0.3 1	Yes: 89.0% No: 11.0%	.099 ns

Significance level $p \leq 0.05$, ns=non-significant

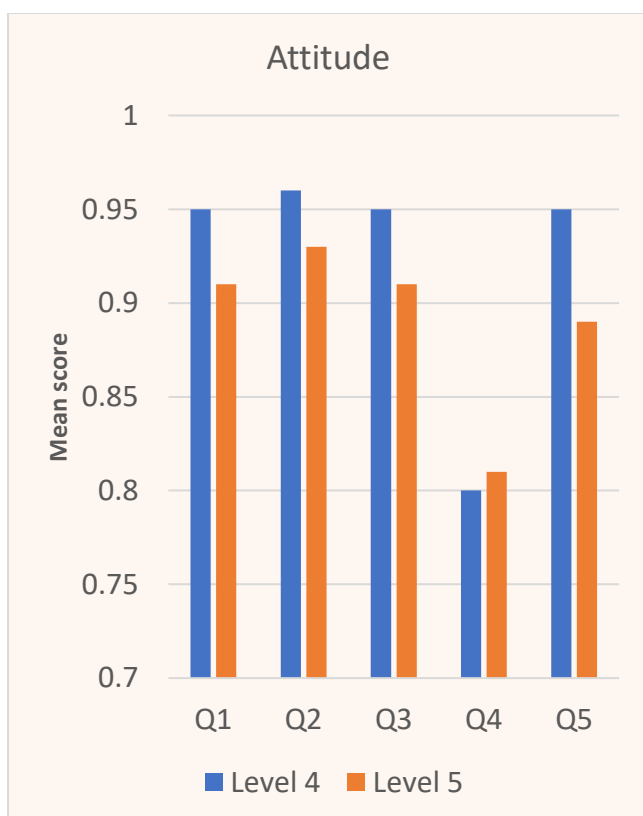


Fig. (3) Bar chart illustrating mean values of responses for attitude questions in both levels

III-Practice

In addition to calculating the total score for practice questions, the score for questions in different categories was also calculated and compared between both levels.

Selected questions in different categories are listed in Table (3). Summary of responses and comparisons between groups are presented in Fig. (4)

Comparison of response to practice questions between groups

Comparing general practice, practice about personal protective equipment (PPE), instruments processing, hand hygiene and sharp waste disposal revealed slightly higher mean scores in level 4. This difference didn't reach the level of statistical significance between levels ($p=0.21$; 0.43 ; 0.64 ; 0.14 and 0.28 for general knowledge, knowledge about personal protective equipment (PPE), instruments processing, hand hygiene and Disposal of sharps respectively (Table 3, Fig.4)

Table (3) Descriptive statistics and comparisons of response for practice questions in Level4& level 5

Item	Level 4 (n=98)	Level 5 (n=172)	P value
	Mean ±SD	Mean ±SD	
General practice	3.74±1.29	3.54±1.24	0.21 ns
PPE	5.1±1.2	4.97±1.34	0.43 ns
Instruments' processing	5.93±1.79	5.83±1.64	0.64 ns
Hand hygiene	3.16±1.02	2.98±0.91	0.14 ns
Disposal of sharps	1.73±0.53	1.65±0.61	0.28 ns

Significance level $p \leq 0.05$, ns=non-significant

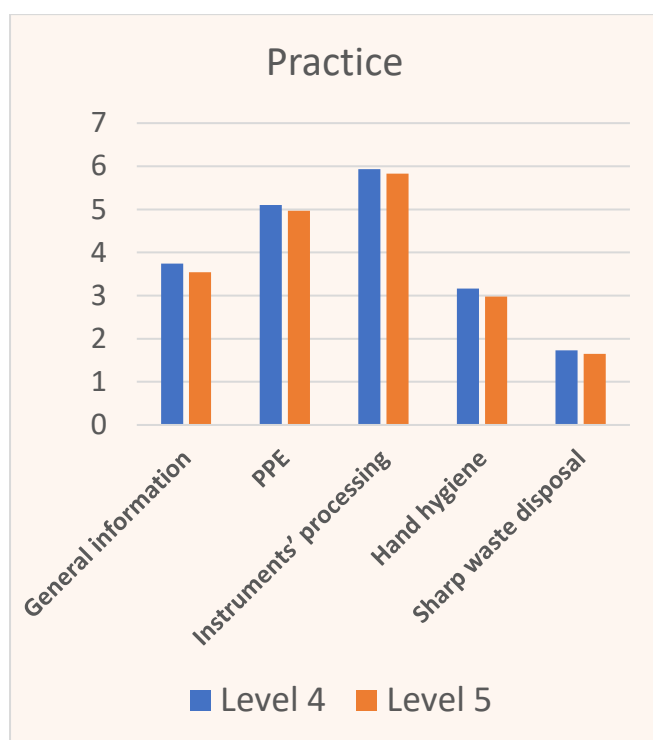


Fig. (4) Bar chart illustrating mean values of responses for practice questions in both levels

Discussion:

It is the ethical obligation of every health care worker to safeguard themselves and their patients from cross-infection. Community expects zero risk of infection transmission from health care providers. An Infection prevention and control (IPC) program can be successful only when everyone is engaged. Each healthcare facility should, therefore, plan frequent in-service education programs for staff, patients, and visitors. In-service training is an ongoing process and should be used to teach good practices, change bad habits, and demonstrate new equipment or procedures. The IPC staff education and training program objectives should include: • a sound knowledge of IPC principles • how these are applied in practice • challenges and problem solving • introduction of new equipment • guidelines and procedures • updates on IPC activities, including IPC committee reports. ⁽²⁶⁾, it is important that dental health care professionals be aware of the risks and seriousness of

infections. ⁽²¹⁾ This survey was conducted to assess the level of knowledge, attitudes, and practices of dental students regarding infection control procedures among dental students at Al Ahram Canadian University. We developed a unified tested questionnaire that could be used in different schools and can be adapted for future research in other developing countries. Responders to the questionnaire were 98 students in level 4 and 172 students in level 5 with a total of 270 students (36%). The percentages of respondents were lower than those in Egypt (85%) and that of Emirates (53%). ⁽²⁷⁾. Different response rates may be due to the time of survey, i.e., during examination sessions or official class activity. Dental education worldwide requires that graduates have a high level of knowledge on the control of infection ⁽²⁸⁾. The present study showed that hand hygiene is the highest correct known item while post exposure prophylaxis was the least. Although general information were acceptable, knowledge scores were generally low, which is in agreement with results of El saaidi et al. ⁽²⁹⁾ and a study by Deogade et al who stated that students' self-assessment and satisfaction reflect their performance toward infection control policy⁽³⁰⁾. Present study results are also in agreement with a study by El Dokky and Moheb ⁽²⁵⁾ although their study was done among post graduate students. Most of the students (91%>) in both levels 4 &5 showed positive attitudes towards infection control measures as the standard precautions, transmission of infection, vaccination of HBV, this is in agreement with a study by Qomar et al ⁽³¹⁾ which encouraging for taking steps and complying with measures on infection control while (>82%) of them considered infection control measures are not cost effective. However the present study not in agreement with a study by AL-Essa and Al Mutairi ⁽³²⁾ where their study showed satisfactory knowledge and positive attitudes regarding infection control. The fourth-year students showed higher scores but not significant for

infection control practice than did the fifth-year students. Results of the present study showed that students of both levels 4 & 5 were compliant with instruments processing and personal protective equipments more than other practices in the dental clinic. This is in agreement with a study by El Saadi et al⁽²⁹⁾ and that by Qomar et al⁽³¹⁾. While a study by Silva et al⁽³³⁾ showed a different result where the level of knowledge was low among the students evaluated; however, as far as the level of practices and attitudes was high.

Strength and limitations:

As with many research projects, the present study has some limitations. One of the primary limitations is that the survey was carried in only one dental school; hence, the results cannot be generalized to the undergraduates of other dental schools. However, the findings would be useful for planning and implementation of right strategies and interventions, including a national-based survey of dental schools across the country. The other limitation is our results reflected only the responses which were subjective rather than being provided under the supervision of the investigators in a clinical environment. Therefore, the results might not have accurately reflected the true levels of knowledge, attitude, and practice. Self-reported practice is subject to self-report bias where people tend to report what they believe. This may be influenced by social desirability bias such that it may be different from the observed practice, thus compromising the external validity of the study. However, the study results should help to recognize areas that need improvement or greater emphasis in the dental curriculum.

The strength of this study is that it was conducted with a senior group of dental students (4th and 5th year) who have studied the module on infection prevention and control.

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