

EVALUATION OF INFECTION CONTROL KNOWLEDGE ATTITUDE AND PRACTICES AMONG A GROUP OF EGYPTIAN POSTGRADUATE DENTAL STUDENTS

Norhan El Dokky* and Dalia Mohamed Moheb**

ABSTRACT

Purpose: This study aimed to evaluate knowledge, attitude, and practice regarding the recommended infection control measures among postgraduate students in several dental schools.

Subjects & methods: A cross sectional study was conducted among a group of postgraduate students at Cairo University using a self-administered questionnaire to evaluate their level of knowledge, attitude, and practice regarding infection control measures.

Results: The response rate was 96%. Interesting areas were: Only 40% of the sample could describe the proper method of hand washing. Moving around while wearing face masks and protective gowns was reported by 32% and 28% of the sample, respectively. Data also showed that only 48% of the students had been vaccinated with the required vaccines. Unfortunately, only 24% of the sample displayed correct knowledge about the infections with the highest risk of transmission in the dental setting, whereas 90% knew how to handle an accidental needle prick. The overall data showed that the mean knowledge was 63.72%, attitude was 50.52% and practice was 60.42%. Knowledge scores ranged from 6-12/14; attitude scores were from 3-11/11 and finally practice scores from 2-9/10.

Conclusions: This study revealed inadequate levels of knowledge, attitude, and practices toward infection control and that more training in both educational and practical fields is highly recommended.

KEYWORDS: Infection control measures, KAP surveys, Dental students.

INTRODUCTION

Infection is one of the most crucial problems in health care services worldwide. Diagnostic, clinical, and surgical interventions are known to be one of the most important significant causes of mortality and

morbidity⁽¹⁾. Cross-infection can be defined simply as the transmission of infectious agents within a clinical setting between patients and staff⁽²⁾.

Dental health personnel (DHP), including dental students, are at high risk of exposure to cross-borne

* Professor, Professor in Faculty of Dentistry, Cairo University

** Associate Professor, Pediatric dentistry and Dental Public Health Department, Faculty of Dentistry, Cairo University

pathogens, such as hepatitis B virus (HBV) and hepatitis C virus (HCV), as well as other oral cavity and the upper respiratory tract viruses and bacteria that harbor the oral cavity and the upper respiratory tract such as influenza virus, *Mycobacterium tuberculosis*, and type 1 herpes simplex virus, via different routes either directly with blood or oral fluids or indirectly with contaminated instruments or surrounding surfaces⁽³⁻⁶⁾.

Accidental exposure to infections in dental settings can be avoided using safety measures and implementing infection control guidelines⁽⁶⁻⁷⁾. Infection control is defined as “measures practiced by health care workers to minimize the risks of transmission of infectious agents between patients and clinicians (e.g. proper hand hygiene, use of personal protective equipment such as masks, eye-protectors and gowns). Infection control measures include contact, droplet and airborne precautions, in addition to vaccination and adequate post-exposure management based on the method of transmission of an infectious agent⁽⁸⁾.

Because most patients carrying infectious diseases are unaware of their condition and cannot be clinically detected⁽⁹⁾, implementing standard universal precautions in dental schools, in addition to vaccination against common infectious agents, proper hand hygiene, and personal protective equipment, is an appropriate way of managing cross infection regardless of the patient’s infection status. Dental institutions are responsible for providing effective infection control measures, adequate training of dental students to protect patients, and maintaining a healthy working environment⁽¹²⁾. The guidelines for infection control in dental settings of the Center for Disease Control and Prevention (CDC) were revised and updated in 2003, comprising standard precautions aimed at establishing a safe working environment and preventing the possible transmission of infections between DHP and their patients⁽¹³⁾. Unfortunately, there have been several misbehaviors in this regard in various universities, hospitals, and offices. One of the shortcomings in

this field is the lack of evaluation of infection control in universities. Improving the level of knowledge, attitude, and compliance of healthcare workers is therefore necessary in order to achieve standard universal infection management steps⁽¹⁴⁾.

The three main elements that make up the intricate structure of life are knowledge, attitude, and practice. Knowledge is described as information that can be obtained through a variety of means, such as reading, experience and understanding. Moreover, it is the basic criterion that makes it possible to distinguish between right and wrong. Attitude, on the other hand, refers to the way, the feeling or the location, the person or object, tendency, or orientation, especially of the mind. While practice represents the rules and knowledge that are translated into action. As a consequence, the right knowledge, positive attitude, and constructive practice are also essential to guide health care professionals in the treatment and service of their patients⁽¹⁵⁾.

DHPs compliance with the CDC guidelines has been previously studied in different parts of the world and it indicates the presence of gaps between dentists’ knowledge⁽¹⁶⁾. Moreover, several studies worldwide have examined the awareness and attitudes of undergraduate dental students about infection control measures, reported lack of practice with infection control guidelines, and suggested the need to improve knowledge and attitudes about infection control^(6-7,17-18). To the best of our knowledge, few studies were conducted to assess knowledge, attitude, and practices among dental students about infection control measures. So, the aim was to evaluate knowledge-attitude-practice (KAP) levels-regarding infection control measures in a group of Egyptian postgraduate students.

SUBJECTS AND METHODS

A cross-sectional study was conducted on 50 postgraduate students at Faculty of Dentistry, Cairo University. Participation in the study was

entirely voluntary. They were informed that their answers would be anonymous and confidential. A questionnaire consisting of 35 questions, was designed to obtain information on the knowledge, attitude, and practice infection control among the studied sample. 23 close-ended and 12 open ended questions were included in the questionnaire and were self-administered to the participants during their clinical sessions (5-6,8,12,19).

The questionnaire was designed to assess Knowledge, Attitude, and Practice (KAP) levels in the most important areas of infection control measures such as handwashing, the use of personal protective equipment (PPE), disinfection of surfaces and impressions, and instrument sterilization with a focus on hand pieces, burs, and endodontic files. The questionnaire also examined the KAP levels of dealing with accidental needle prick as well as vaccination and infectious agents frequently encountered in dental settings.

The data was tabulated and inserted into Microsoft excel 2010 and analyzed using the SPSS software 16.0. The descriptive analysis of the responses was carried out and the findings were expressed in the form of percentages and analyzed to detect levels of KAP in different areas of infection control measures. Upon analyzing the responses, any percentage below 50% was considered poor regarding knowledge, attitude, and practice.

RESULTS

A total of 50 postgraduate students participated in the current study. The response rate was 96% (48 out of 50). There were 14 questions on the assessment of knowledge, 11 questions on the assessment of attitude, and 10 questions to assess infection control practice of the respondents. Each participant's response was assessed on the three parameters (KAP) and the overall mean KAP percentages for the studied sample are shown in (Table 1).

TABLE (1) Mean percentages of Knowledge, attitude, and practice for the questionnaire.

Variable	Mean
Knowledge	63.72%
Attitude	50.52%
Practice	60.42%

The range of each parameter (KAP) was evaluated for the sample being studied to display the minimum, and maximum scored results for the studied sample. Knowledge scores ranged from 6-12/14; attitude scores were from 3-11/11 and finally practice scores from 2-9/10. The questionnaire was structured to assess the KAP levels in the main areas of infection control as follows:

A- KAP levels of handwashing:

The levels of knowledge in this area were quite high, with (100%) of the participants responding correctly and being aware of the effectiveness of handwashing as a main step in all infection control measures. The attitude parameter was acceptable, with an 82% level assessed in the sample, but the practice levels were not as good.

The following (Table 2) summarizes the results of handwashing.

TABLE (2) Mean percentages for Knowledge, Attitude and Practice for Handwashing

Knowledge	100%
Attitude	82%
Practice	40%

B. Sterilization and disinfection KAP Levels:

The questionnaire focused on sterilization fundamentals, including the concept of disinfection and the commonly used agents, the temperature and time required for effective sterilization, and sterilization of the handpiece, burs, surfaces, and

impressions. The attitude as well as the practices were evaluated by scoring the correct answers for the studied sample and the following (Table 3) summarizes the results.

TABLE (3) Mean Percentages of Knowledge, Attitude and Practice for Sterilization and Disinfection

Knowledge	61.6%
Attitude	74%
Practice	68.6%

C- Personal Protective Equipment

The questionnaire assessed the levels of knowledge, attitude, and practice in that critical area by asking questions about glove types, how often they should be changed, the importance of goggles and infection transmission through the retina, the attitude of walking around wearing protective clothing, and when masks, gloves, and gowns should be changed.

Extremely poor attitude levels were scored in this area (34%). The levels of the KAP in this area can be summarized in the following (Table 4).

TABLE (4) Mean Percentages of Knowledge, Attitude and Practice of Personal Protective Equipment

Knowledge	76.5%
Attitude	34 %
Practice	66%

D- KAP levels of vaccination and infective agents

The results of the questionnaire assessed the levels of awareness, attitude, and practices of the postgraduate students in the sample being studied as regards the needed vaccines like tetanus, TB, and Hepatitis virus. An extremely poor level of

knowledge was displayed in this area (31%). A weak level of practice was also noted (51%).

The levels of the KAP in this area can be summarized in (Table 5)

TABLE (5) Mean Percentages of Knowledge, Attitude and Practice of Vaccination and Infective agents

Knowledge	31%
Attitude	86%
Practice	51%

E- Dealing with accidental needle prick:

The scores of the questionnaire assessed the level of knowledge, attitude, and practice of the studied sample in this area and the results can be seen in the following (Table 6).

TABLE (6) Mean Percentages of Knowledge, Attitude and Practice of Accidental needle prick

Knowledge	90%
Attitude	80%
Practice	90%

The results of some questions were interesting in the different parameters (KAP).

Regarding knowledge: most of the students (96%) displayed correct knowledge about getting infected through retina, while only 24% knew the microorganism with the highest rate of transmission, and 38% had correct knowledge about the viability of microorganisms on the impression material and less than half the sample (48%) had proper knowledge regarding the right method of sterilization as shown in (Table 7).

TABLE (7) Sample of questions of the questionnaire and percentage of answers assessing students' Knowledge regarding infection control measures

Question	Count (Correct answer)	Percentage
1. Do you know that you may get infected through retina?	48	96%
2. Which microorganism has the highest rate of transmission?	12	24%
3. How long can the micro-organisms remain viable on the impression?	19	38%
4. What is the method you use for sterilization?	24	48%

Moving around while wearing gloves, protective glasses, face masks, and protective gowns was reported by 78%, 52%, 32%, and 28% of the sample studied, respectively. Data also showed that only 48% of the students had been vaccinated with the required vaccines, while 84% had been vaccinated with HBV as shown in (Table 8).

TABLE (8) Sample questions of the questionnaire and percentage of answers assessing students' Attitude regarding infection control measures

Question	Count (Correct answer)	Percentage
1. Do you move around wearing gloves?	39	78%
2. Do you wear protective glasses?	26	52%
3. Do you move around wearing your face masks?	16	32%
4. Do you move around wearing gowns?	14	28%
5. Which vaccine had you taken?	HBV 42 All 24	84% 48%

Finally, the Practice: Table (9) shows that only

40% of the sample displayed the proper method of washing hands, whereas 90% knew how to handle an accidental needle prick

Table (9): Sample questions of the questionnaire and percentage of answers assessing students' Practices regarding infection control measures

Question	Count (Correct answer)	Percentage
1. What is the correct way of washing your hands?	20	40%
2. If you get needle prick, what you should do?	45	90%

DISCUSSION

Despite the extensive improvement in the field of infection control in recent years, several mistakes have been documented in this area in different medical and dental centers. Therefore, improving the level of knowledge, attitude, and practice of healthcare workers is mandatory to establish standard infection control measures ⁽¹⁴⁾.

In Egypt, the data regarding knowledge, attitude, and practice regarding infection control measures among dentists is scarce. Consequently, this cross-sectional study was carried out to evaluate knowledge, attitude and practices regarding the recommended infection control measures among postgraduate students at the Faculty of Dentistry-Cairo University.

Handwashing is considered one of the most effective means of reducing the risk of cross-infection, according to the results of this research all the respondents responded with correct answers about standard precautions of hand hygiene (100%), and displayed appropriate attitude (82%), this high knowledge could be attributed to adequate basic infection control programmes, however only

(40%) of the subjects demonstrated the proper method of washing hands, this result nearly goes in accordance with **Naik et al;** ⁽²⁰⁾ where about 44.6% displayed proper method of washing hands, this low percentage of proper hand washing practice could be due to lack of continuous monitoring and evaluation.

Regarding the section of using Personal protective equipment (PPE), the levels of knowledge and practice were more than half of the studied subjects. Unfortunately, the attitude was extremely low (34%). This could be attributed to subjective responses from the respondents.

In the current study, approximately half of the sample (52%) indicated that they wore protective glasses at work, which contradicted **de Souza et al; 2006** ⁽¹²⁾, which reported that 84.2% used protective glasses, while **Rahman et al; 2013** ⁽⁶⁾ reported only 27%; additionally, another study by **Tada et al; 2014** ⁽²¹⁾ reported 37%, while **Halboub et al; 2015** ⁽²²⁾ revealed only 14%. This poor use of eyewear may suggest a low level of awareness among dentists about the probability of disease transmission via aerosols and blood splashes ⁽²¹⁾. In the current study, 96% of the students were aware that they could become infected through the retina, which may explain why half of them wore eye protection.

HBV infection is a major public health concern in the Middle East ⁽²³⁾. According to the current study's data, 84% of the students reported having been vaccinated with the HBV vaccine, which is considered a satisfactory level of awareness. This may reflect that our students have a reasonable awareness and knowledge about management protocols for HBV infections, though it should be noted that vaccination rates among dental health professionals differ considerably worldwide and have been recorded to range from 33% to 97% ^(9,16,23-26), this broad difference may be attributed to not setting HBV vaccination as mandatory prerequisite for registration in Health Specialties Commissions ⁽¹⁶⁾.

In contrast to the high percentage of HBV vaccination, only 48% of the sample had received all required vaccines, indicating that knowledge of infection control measures does not guarantee adherence to all measures. Furthermore, compliance of dentists with infection control procedures was neither total nor uniform for various items ⁽²¹⁾, and as reported by **Qudeimat et al; 2006** ⁽²³⁾ it is not considered as mandatory request by the dental and medical schools

Unfortunately, only 24% of the students displayed correct knowledge about the infections with the highest risk of transmission in the dental setting. These results are comparable to the findings of studies conducted in different countries in Middle Eastern Arabian countries such as Jordan ^(9,27), and Saudi Arabia ⁽²⁸⁾, besides Pakistan ⁽²⁴⁾ and India ⁽²⁶⁾. This could be attributed to sufficient basic infection control programs in dental schools but subsequent lack of consistent reinforcement and assessment through continuing education courses and regularly updated recommendations circulated via dental schools and dental associations.

In terms of the findings of the methods used for sterilization, less than half of the studied group (48%) compared to those published by **Ali et al; 2014** ⁽²⁴⁾ who reported 78.8%, which could be attributed to a lack of knowledge regarding this item or a lack of care on the part of the students on this topic, as the dental nurses in the clinic are in charge of sterilization.

Surprisingly, 90% knew how to handle an accidental needle prick, which may be attributed to a high level of awareness that sharp injuries may pose the risk of transmission of blood-borne pathogens, and the levels of attitude and practice were 80% and 90%, respectively. In contrast to this result, **AlAhdal et al; 2019** ⁽¹⁶⁾ revealed that only 55% were unaware of the correct protocol for management of needle prick injury.

In terms of moving around in the clinic while

wearing gloves, face masks, and gowns, the results were 78%, 32%, and 28%, respectively, which is contradictory, but this could be due to the fact that they do not wear gowns and face masks, as well as the high cost of infection control equipment (29).

Results of the current study revealed that only 38% knew how long the microorganisms remain viable on the surfaces and impressions. This information deficiency could be attributed to the inadequacy of infection control educational materials during years of study. In addition, this might be due to lack of belief that practice of standard precautions measures may interfere with patient health and care (30).

Finally, the overall data showed the mean knowledge was 63%. In previous studies by **Rahman et al;** and **Halboub et al;** (6,22) this could be attributed to the fact that the responses 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.

From the limitations of the present study, the number of questions was limited and cannot reflect real awareness of the sample being examined, but they were held to a minimum to boost the response rate.

Despite this restriction, the current study offers some valuable details about post graduate dental students' knowledge, attitude, and practices regarding infection control. Such information should help to recognize areas that need improvement or greater emphasis in the dental curriculum.

CONCLUSION

The results of the current study revealed inadequate levels of knowledge, attitude, and practices toward infection control and that more training in both educational and practical fields is highly recommended.

REFERENCES

1. Lacerda RA, Egry EY. As infecções hospitalares e sua relação com o desenvolvimento da assistência hospitalar: reflexões para análise de suas práticas atuais de controle [Hospital infections and their relationship to the development of hospital care: analysis of current control practices]. *Rev Lat Am Enfermagem*. 1997; 5:13-23. Portuguese.
2. Yüzbasıoğlu E, Saraç D, Canbaz S, Saraç YS, Cengiz S. A survey of cross-infection control procedures: Knowledge and attitudes of Turkish dentists. *J Appl Oral Sci* 2009; 17:565-9.
3. Antonioli P, Manzalini MC, Stefanati A, Bonato B, Verzola A, Formaglio A, et al. Temporal trends of healthcare associated infections and antimicrobial use in 2011-2013, observed with annual point prevalence surveys in Ferrara University Hospital, Italy. *J Prev Med Hyg*. 2016; 57:135-41.
4. Campagna M, Maria Mereu N, Mulas L, Pilia R, Francesca Piazza M, Spada L, et al. Pattern of hepatitis A virus epidemiology in nursing students and adherence to preventive measures at two training wards of a university hospital. *Hepat Mon*. 2016; 16: 1-5.
5. Deogade SC, Suresan V, Galav A, Rathod J, Mantri SS, Patil SM. Awareness, knowledge, and attitude of dental students toward infection control in prosthodontic clinic of a dental school in India. *Niger J Clin Pract*. 2018; 21:553-9.
6. 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.
7. Singh A, Purohit BM, Bhambal A, Saxena S, Singh A, Gupta A. Knowledge, attitudes, and practice regarding infection control measures among dental students in Central India. *J Dent Educ*. 2011; 75:421-7.
8. Shetty D, Verma M, Shetty S, Dubey S, Walters S, Bernstein I. Knowledge, attitudes and practice of dental infection control and occupational safety in India: 1999 and 2010. *World J Dent*. 2011; 2:1-9.
9. Al-Omari MA, Al-Dwairi ZN. Compliance with infection control programs in private dental clinics in Jordan. *J Dent Educ*. 2005; 69: 693-8.

10. Laheij A, Kistler J, Belibasakis G, Välimaa H, De Soet J. Healthcare-associated viral and bacterial infections in dentistry. *J Oral Microbiol.* 2012; 4: 1-10.
11. Al-Anesi MS, Alhadj MN, Al-Basmi AA. Compliance of Dental Students toward Infection Control in Dental Teaching Hospital at Tamar University-Yemen. *Braz Dent Sci.* 2017; 20: 40-8.
12. 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(4):282-4.
13. Kohn WG, Collins AS, Cleveland JL, Harte JA, Eklund KJ, Malvitz DM. Centers for Disease Control and Prevention (CDC). Guidelines for infection control in dental health-care settings--2003. *MMWR Recomm Rep.* 2003; 19:521-61.
14. Iqbal M J, Asnaashari M, Hosseini MR. Knowledge, attitude and practice of dental students about infection control in the Department of Endodontics, School of Dentistry, Shahid Beheshti University. *Shaheed Beheshti University of Dental Journal.* 2005;61 :377-9.
15. Jain M, Sawla L, Mathur A, Nihlani T, Ayair U, Prabu D, et al. Knowledge, attitude and practice towards droplet and airborne isolation precautions among dental health care professionals in India. *Med Oral Patol Oral Cir Bucal.* 2010;15: 957–61.
16. AlAhdal A, Aljehani W, Ali G, Bayoumi A. Knowledge, Attitude and Practice of Infection Control Measures in Private Dental Clinics in Jeddah, Saudi Arabia. *Int J Dent and Oral Health.* 2019; 5:1-6.
17. McCarthy GM, Britton JE. A Survey of Final-Year Dental, Medical and Nursing Students: Occupational Injuries and Infection Control. *J Can Dent Assoc.* 2000; 66:561-8.
18. Sofola OO, Folayan MO, Denloye OO, Okeigbemen SA. Occupational exposure to bloodborne pathogens and management of exposure incidents in Nigerian dental schools. *J Dent Educ.* 2007; 71:832-7.
19. Milward MR, Cooper PR. Competency assessment for infection control in the undergraduate dental curriculum. *Eur J Dent Educ.* 2007; 11:148-54.
20. Naik S, Khanagar S, Kumar A, Vadavadagi S, Neelakantappa MH, Ramachandra S. Knowledge, attitude, and practice of hand hygiene among dentists practicing in Bangalore city – A cross-sectional survey. *J Int Soc Prev Community Dent.* 2014; 4: 159-63.
21. Tada A, Watanabe M, Senpuku H. Factors Influencing Compliance with Infection Control Practice in Japanese Dentists. *Int J Occup Environ Med* 2014; 5: 24-31.
22. Halboub ES, Maweti 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 of Int Oral Health.* 2015; 7:15-19.
23. Qudeimat MA, Farrah RY, Owais AI. Infection control knowledge and practices among dentists and dental nurses at a Jordanian university teaching center. *American J Infect Control.* 2006; 34: 218-22.
24. Ali MF, Hussain A, Maqsood A. Knowledge, attitude and practice concerning infection control measures among dental health care providers. *Pakistan Oral & Dent J.* 2014; 34: 452-6.
25. Shaghaghain S, Pardis S, Mansoori Z. Knowledge, attitude and practice of dentists towards prophylaxis after exposure to blood and body fluids. *Int J Occup and Environ Med.* 2014; 5: 146-54.
26. MP SK. Knowledge, attitude, and practices regarding infection control among undergraduate dental students. *Asian J Pharm Clin Res.* 2016; 9:220-4.
27. AlNegrish A, Momani AS, Al Sharafat F. Compliance of Jordanian dentists with infection control strategies. *Int Dent J.* 2008; 58: 231–6.
28. Al-Rabeah A, Mohamed AG. Infection control in the private dental sector in Riyadh. *Ann oSaudi Med.* 2002; 22:13–17.
29. Naing L, Nordin R, Musa R. The prevalence of and factors related to compliance with glove utilization among nurses in Hospital University Sains Malaysia. *Southeast Asian J Trop Med Public Health.* 2001;32:636-2.
30. Alharbi G, Shono N, Alballaa L, Aloufi A. Knowledge, attitude and compliance of infection control guidelines among dental faculty members and students in KSU. *BMC Oral Health.* 2019; 19: 1-7.