COVID-19 Knowledge amongst Dentists and Evaluation of the Dental Infection Prevention Protocol

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Abstract

Background and Objectives: Dentists are at higher risk of acquiring corona virus disease -19 (COVID-19). +

The objective of the study is to assess the level of knowledge regarding COVID-19 among dentists and to evaluate the implementation of the infection prevention protocol.

Materials and Methods: An online questionnaire was administered to 188 Jordanian dentists. The questionnaire was composed of three sections: demographic and professional data, knowledge of COVID-19 and the implemented infection prevention protocol.

Results: The overall knowledge of COVID -19 common symptoms was high (>90%) among all participants. However, knowledge of specialists or who received infection prevention education regarding uncommon symptoms was significantly higher than others (p-value ≤ 0.05). About one-third of all participants correctly identified the scientific name of the causative virus (SARS-CoV-2) with no significant statistical difference. Most participants agreed that the infection prevention protocol is easy to read but the items are scarce. Female dentists were more likely to advise others to use the protocol (p-value = 0.01), and dentists with postgraduate education in infection prevention within the last three years answered that they will follow the protocol strictly (p-value = 0.03). Specialists and those who received postgraduate infection prevention education showed more knowledge regarding the specific measures for infection prevention.

Conclusion: The overall knowledge of COVID-19 was high among dentists. Infection control protocol for dentists was easy to read and comprehensive but the items required to implement it such as personal protective equipment are scarce. This is expected considering the worldwide high demand on such items.

Keywords: Dentists, COVID-19, coronavirus, knowledge, infection prevention.

1. Introduction

A novel coronavirus was responsible for severe cases of pneumonia in Wuhan, China on December 2019. This virus was initially named by the World Health Organization (WHO) as 2019 novel coronavirus (2019-nCOV) and the

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disease was named coronavirus disease 2019 (COVID-19) [1-3]. The virus was later renamed by the coronavirus study group as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [4]. The virus represented a major health problem globally which led to declaring it as a pandemic by the WHO On March 2020 [5].

The SARS-CoV-2 belongs to the Coronaviridae family and it is an enveloped non-segmented positive sense RNA virus [6]. The virus has an incubation period of 2 days and extend as long as 14 to 24 days with an average of 5.2 days [3], although case definitions typically consider the 14 days incubation period [7]. It is mainly transmitted through respiratory droplets and secretion, and indirectly through contaminated inanimate surfaces [8,9] as it can stay infectious on surfaces from hours to several days depending on ambient temperature and humidity [10]. The main clinical symptoms include fever, dry cough, shortness of breath and sore throat, while some also might have fatigue, muscle pain, headache vomiting and diarrhea, altered sense of taste or smell [11,12]. Having no specific antiviral treatment available so far, preventive measures such as hand washing, social distancing and other respiratory precautions represent the main weapon to stop acquiring and spreading the virus among population [13].

Healthcare workers such as dentists, are at higher risk of acquiring the infection for many reasons but mainly because of the nature of dental treatments and practices which include close contact with symptomatic/asymptomatic patients and the use of some aerosols generating procedures such as high-speed handpiece or ultrasonic instruments [14,15]. Therefore, it is mandatory to have a protocol with strict preventive measures and personal protective equipment that ensure the maximum safety to prevent the cross transmission of infection within dental settings. In Jordan, the dental association developed a protocol for the reopening of the dental clinics (Table 1). The assessed infection prevention protocol was prepared using the previously published guidelines by the WHO, Center for Disease Control and Prevention (CDC) and the American Dental Association (ADA) to prevent COVID-19 transmission among dentists and dental staff and approved by the Jordan National Epidemiology Committee [16-18]. Therefore, the purpose of this study was to assess the knowledge of COVID-19 among Jordanian dentists and to evaluate the implementation of the dental association protocol that was adopted for the prevention of COVID-19.

Table 1. COVID-19 Infection prevention protocol to deal with dental cases during the period of the COVID-19 pandemic.

Therapeutic interventions are made only for emergency cases such as: 1- Dental nerve infections. 2- Acute oral infection. 3- Dental fractures. Other procedures are allowed as necessary and gradually according to loosening of the lockdown and according to pandemic curve ***The history taking and scheduling appointments for patients should be carried out by the dentist over the phone before attending the clinic (Phone screening).** ***Reducing clinics working hours to six hours daily from 10 am until 4 pm.**
On patient arrival to the clinic, the following actions should be taken: 1-Recording patient temperature. 2- Recording patient information and personal data (name, age, employment, and address) in addition to his signature on the document. 3- Recording any symptoms related to the Coronavirus such as fever, breathing difficulty, sore throat, coughing, headache, general fatigue or loss of smell or taste sensation. 4- Recording symptoms of the patient's chief complaint such as the nature, duration, and persistence of the pain, the exaggerating and relieving factors; particularly the use of painkillers. 5- Asking about any recent contact (last 3 weeks) with persons infected with or came from a country with a high number of COVID-19 cases, as well as travel history.

6- If the patient has any symptoms or positive contact history, treatment is prohibited; the case should be documented and referred to the designated hospitals after calling the Ministry of Health COVID-19 hotline (111).

* Details related to each medical condition are recorded and documented separately including the physician and staff names, date, day, and the timing of intervention.

* If necessary, only one adult companion is allowed to be with the patient, keeping a distance of 1.5-2 meters.

* No one is allowed to sit in the waiting room.

* Appointments should be scheduled so that around 45 minutes are left between each 2 patients to disinfect the clinic and sterilize reusable instruments

* The patient and the companion must wear respiratory personal protective equipment, and sterilize hands with the alcohol-based sterilizer or soap and water for at least 20 seconds before entering the clinic.

* For prevention purposes, the receptionist must wear the PPE such as N95 mask and gloves and maintain a safety distance of at least 1.5 meter.

* All necessary communications such as future appointments, results or images must be sent electronically, No papers.

Preparing the clinic

1- Because the coronavirus might stay infectious on surfaces for a period that can exceeds 24 hours, effective disinfection of surfaces is required and effective measures must be taken in each area of the clinic such as reception, chairs, computers, doors and office handles. It is advised to use chlorine at a concentration of 1% (the available concentration of chlorine in the market is approximately 6%).

2- The dental chair and its enclosures must be wrapped with single-use covers. Moreover, sterilizers should be used to sterilize the chair and its accessories after each patient.

3- Patients appointments should be organized to allow sufficient time to sterilize the clinic and tools (It is recommended to treat one patient every 45 minutes).

4- Use disposable cover for dental chair and replace between each patient.

5- Keep a good natural ventilation of the clinic area.

Precautions and equipment that the dentist and auxiliary staff must adhere to

1- Wearing the N95 face mask.

2- Eye protection (Goggles).

3- Hand washing

3- Replace surgical gloves after each patient.

4- Change the surgical gown after each patient.

5- Cover the hair.

6- Overshoes.

7- The doctor must change his/her clothes and wear special clothes in the clinic. Besides, he/she should leave the work clothes in the clinic, and wash them at a temperature of at least 60 ° C.

Precautions that the dentist must follow before and during treatment

1- Wash hands thoroughly with soap and water before and after contact with the patient before wearing gloves.

2- Ask the patient to use a mouth rinse with Betadine 0.2% or Hydrogen Peroxide 1%.

3- Avoid the use of air sprays and pressurized water (3 in 1 syringe).

4- Using extra-oral radiography (panorama) instead of intra-oral radiation.

5- Use high volume suction in all conditions.

6- Avoid the use of high-speed handpiece or ultrasonic scalers.

7- Use of rubber dam.

8 - Use disposable manufactured tools, if possible.

9- Ensure that the sterilization procedures were duly completed for low-speed handpieces after each patient. Also, it is mandatory to ensure the presence of an efficient autoclave.

Materials and Methods
Study design

Jordanian Dental Association developed a protocol for infection control related to

prevention of COVID-19 in dental practices in Jordan for treating emergency cases during lockdown and for other non-emergency cases when opening after the lockdown. This was developed under the supervision of the Investigator Dr Alzoubi and approved by Jordan National Epidemiology Committee, Ministry of Health. In order to evaluate this protocol, a national survey was conducted to evaluate dentists' knowledge and opinions of the protocol. Dentists covering different public and private service sectors have participated in the study.

The study questionnaire was based on comprehensive literature review and experts opinion. It was initially tested then piloted on 20 dentists. Data collection was online. The questionnaire was anonymous, no personal information or identifiers were revealed.

The first section contained background information that could affect response to other sections such as age, gender, specialty versus general practitioner, place of practice whether in a hospital or a private clinic, postgraduate training in infection control. The second section was related to knowledge assessment of COVID-19 and the preventive measures in term of the virus, symptoms, and protective measures. The third section consisted of items related to the assessment of the protocol with some items related to improvement such if the protocol was easy to read and follow, acceptance by patients, affordability of the personal protective equipment, if the protocol considered dental assistants and whether the dentist will follow the protocol or advise others to use it. It also had items related to areas that might not be covered completely by the protocol such as triage, hand hygiene, social distancing and patient based infection prevention measures.

We avoided direct leading questions to ensure more valid results. For example, items related to symptoms of COVID-19, we had list of symptoms with irrelevant symptoms included.

Sample Size

Recent reports from the Jordanian Ministry of health indicate that there are about 6,800 practicing dentists in Jordan. Assuming an average COVID-19 knowledge of 80% among the participants, a 5% margin of error and 90% confidence level a sample size of 169 participants is needed [19,20].

Statistical analysis plan

Descriptive statistics including means, frequencies and proportions are summarized for the collected data. Summaries are provided by the participants' demographics. Chi-squared and Fishers exact tests were used whenever appropriate to examine differences among categorical predictors. Data was analyzed using R statistical computing software [21].

Results

Background information

A summary of participants' demographics is shown in Table 2. The overall number of participants was 188 dentists with mean age 39.2 years. Among all participants 81 (43.1%) were females. Around 80% of participants were practicing in private non-governmental clinics and around two thirds of all participants were from Amman, the capital of the country. The table also shows that 88 (46.8%) did not receive any continuing postgraduate training in infection prevention, 37 (19.7%) received training but was more than 3 years ago and 63 (33.5%) received training within the last 3 years.

Table II. Background data of all participants

Background data	Overall (N=188)
1. Age:	
Mean (SD)	39.2 (9.89)
Median [Min, Max]	39.0 [23.0, 72.0]
2. Gender:	
Female	81 (43.1%)
Male	107 (56.9%)
3. Specialty:	
General dentist	133 (70.7%)
Specialist	55 (29.3%)
4. Nature of practice:	
Both	9 (4.79%)
Governmental sectors	32 (17.0%)
Private	147 (78.2%)
5. Place of practice:	
Both	15 (7.98%)
Clinic outside hospital setting	152 (80.9%)
Hospital Based Clinic	21 (11.2%)
6. City of practice:	
A. Amman	119 (63.3%)
B. Irbid	30 (16.0%)
C. Others	39 (20.8%)
7. Have you received continuing postgraduate education on prevention of infections:	
No	88 (46.8%)
Yes, more than 3 years ago	37 (19.7%)
Yes, within the last 3 years	63 (33.5%)

Data on assessment of the protocol

Figures 1 and 2 show summaries of the participants' assessment of the protocol by their gender and receiving postgraduate education in infection prevention, respectively. Overall, around 90% of all participants agreed that the protocol was easy to read, but more than two thirds of participants agreed that the protocol contains items (personal protective equipment) that are not affordable. As shown in Figure 1, female dentists were more likely to advise others to use the protocol compared to male dentists (p-value= 0.01). Interestingly, as shown in Figure 2, there were differences between participants according to history of education in infection prevention. Dentists who undertook postgraduate education in infection prevention within the last three years were more likely to follow the protocol strictly (p-value= 0.03).
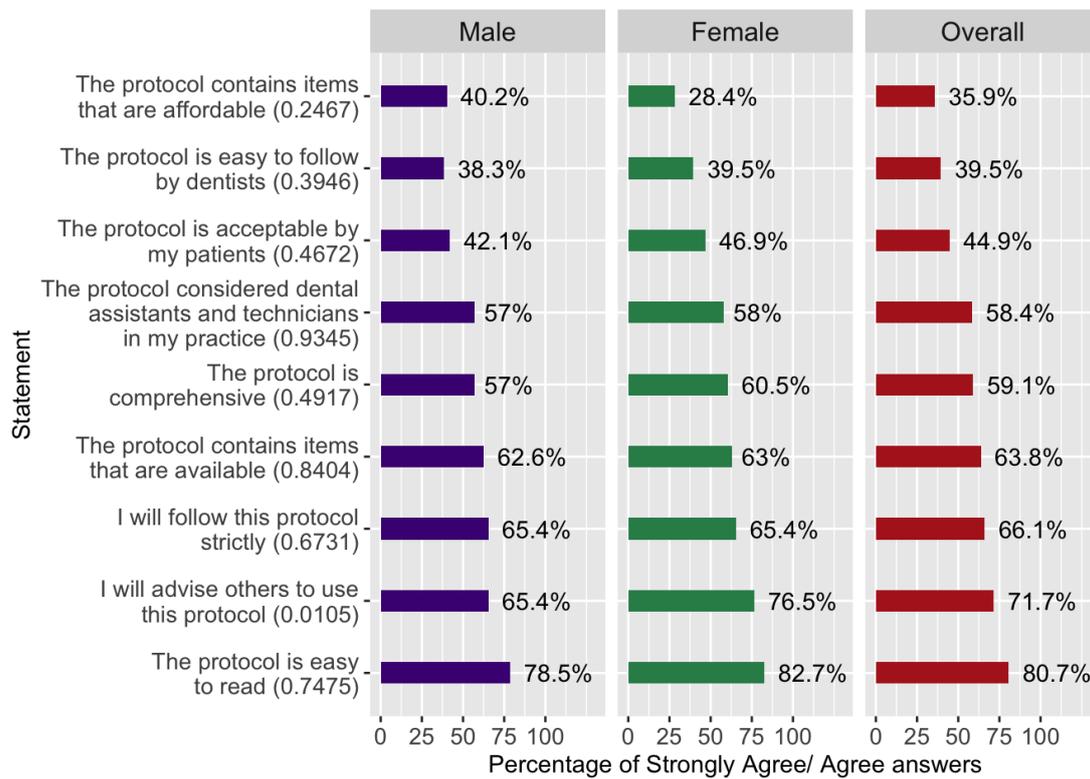
Figure 1. Answers for the infection prevention protocol assessment questions by gender and overall among all participants regardless of the gender with the calculated p-value for each response in brackets.
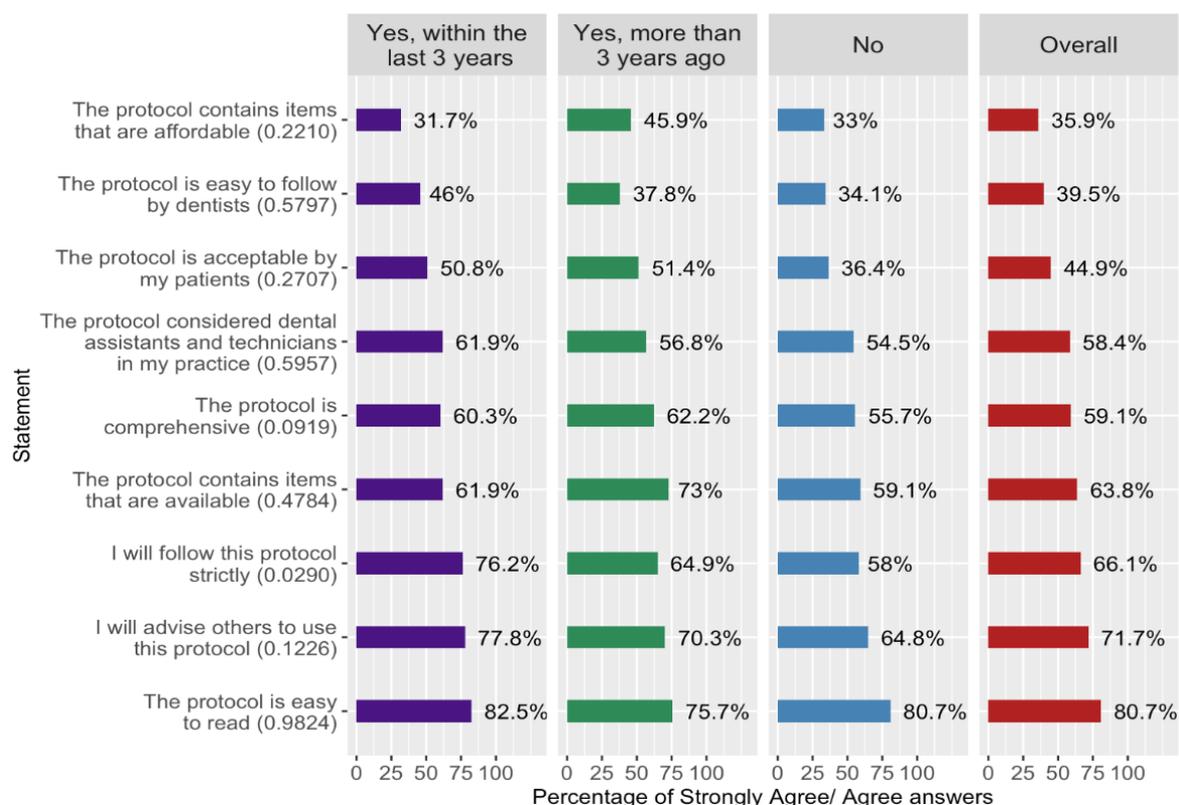
Figure 2. Answers for infection prevention protocol assessment questions according to postgraduate education in infection prevention, with the calculated p-value for each response in brackets.

Knowledge of COVID-19 symptoms

Results about the knowledge of COVID-19 symptoms among participants according to specialty status are shown in Figure 3. The overall knowledge of COVID -19 common symptoms such as fever, cough and shortness of breath was high (>90%) among all participants with no statistically significant difference (*p*-value $\geq$ 0.05). However, specialists had more knowledge and correct answers regarding COVID-19 uncommon symptoms compared to general dentists as can be seen in Figure 3.

For example, 70.9% of specialists and 50.4% of general dentists were able to identify chills as a probable symptom (*p*-value= 0.015),

78.2% of specialists and 60.2% of general dentists identified that weight loss is not a presenting symptom of COVID-19 (*p*-value= 0.032), and 94% of specialists and 79.9% of general dentists identified that hair loss is not a presenting symptom of COVID-19 (*p*-value= 0.026). Similarly, our results showed that dentists who had previous postgraduate education in infection control had more correct answers regarding COVID-19 symptoms compared to general dentists. For example, trained dentists were more able to identify that loin pain, dysuria and hair loss as non-presenting symptoms of COVID-19 (*p*-value $\leq$ 0.05).
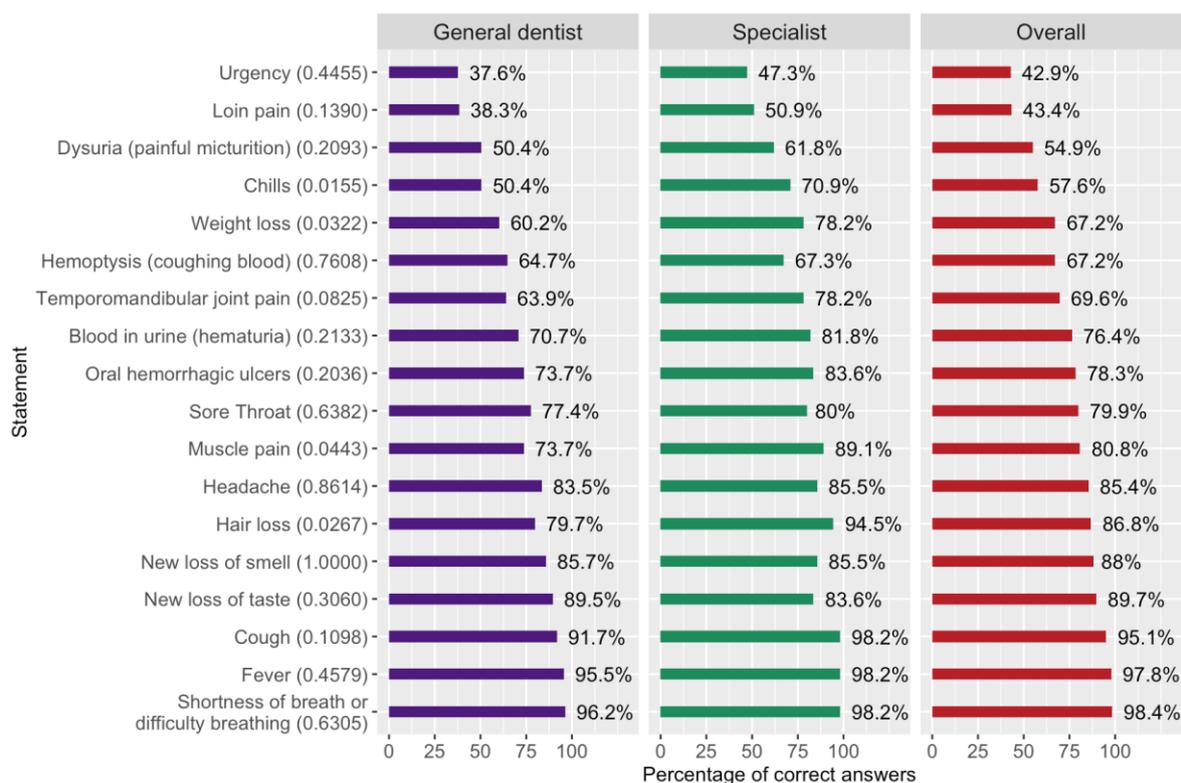
Figure 3. Knowledge of COVID-19 symptoms among general dentists and specialists.

Knowledge of COVID-19 causative virus and the measures to prevent the spread of infection

Results about the knowledge of the scientific name of the causative virus and preventive measures among participants according to specialty status and according to history of having postgraduate education in infection prevention are shown in Figures 4 and 5. Figure 4 shows that the overall knowledge of the scientific name of the causative virus (SARS CoV-2) among specialists (25.5%) and general dentists (29.3%) was low with no significant statistical difference (*p*-value= 0.69). Overall, specialists had more correct answers regarding the knowledge of specific preventive measures than general dentists. For example, a total of 83.6% of the specialists compared to 63.9% of general dentists (*p*-value= 0.01) would postpone appointments for patients with recent travel history to areas with high incidence of COVID-19.
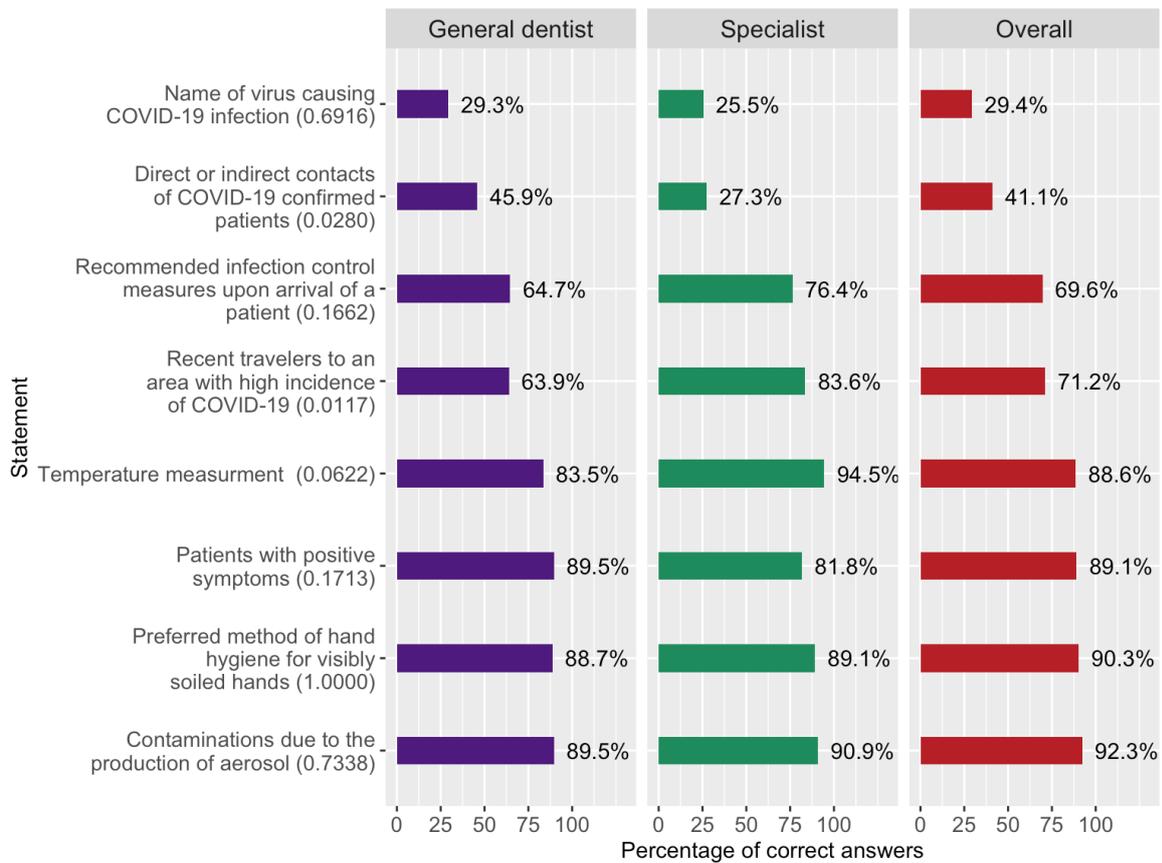
Figure 4. Knowledge of scientific name of the virus and steps to prevent infection among general dentists and specialists.

Figures 5 shows that dentists who received infection control training had generally better knowledge compared with those with no training. For example, trained dentists were more likely to ensure that the patient completed the pre-arrival screening questionnaires compared to dentists who had no previous infection control training (*p*-value= 0.003).
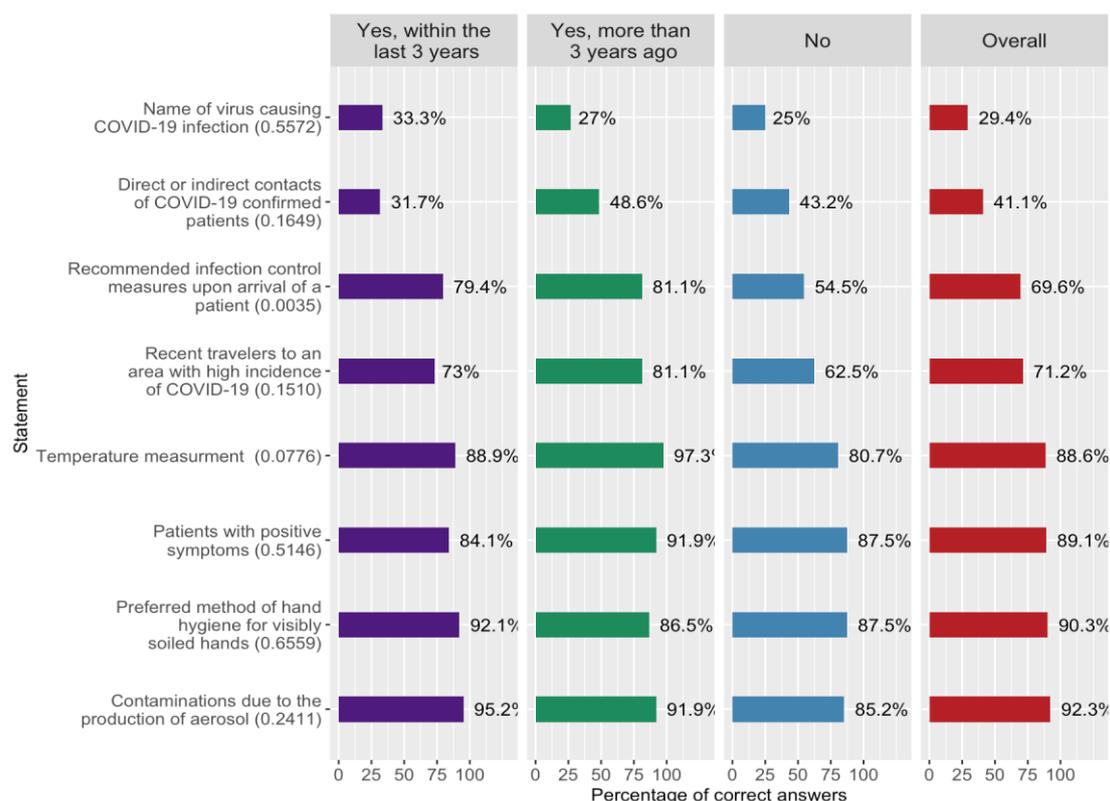
Figure 5. Knowledge of scientific name of the virus and steps to prevent infection according to postgraduate education in infection prevention.

Other factors

There was no statistically significant difference in responses between general dentists and specialists, males and females, and when comparing dentists work at hospital based clinical with clinics outside hospitals in the assessment of the protocol, and knowledge assessment.

Discussion

The COVID-19 was declared as a pandemic by the WHO on March 2020 [5]. Since then, relentless efforts were exerted to enrich the knowledge of the publics and healthcare workers regarding the virus and the necessary preventive measures to stop the spread of the infection. Dentists are at increased risk of acquiring COVID-19 because they have close contact with the patients, and because they use respiratory droplets generating instruments [14,15]. Therefore, infection prevention measures are extraordinarily required for dentists to prevent cross infections.

This cross-sectional study provided an insight to the knowledge of the dentists regarding COVID-19 and the infection prevention protocol that was developed by local health authorities for dentists using the best available guidelines [16-18]. The study assessed the knowledge of dentists according to different factors such as gender, postgraduate education in infection prevention, specialty level and place of practice whether private or governmental.

The study showed an overall high level of knowledge among participants regarding the common symptoms of COVID-19 where more than 90% were able to identify fever, cough and shortness of breath as presenting symptoms. This was expected and could be due to the

seriousness of the virus as circulated by different media and health authorities especially after being declared as a pandemic by WHO [5], and the successfulness of different awareness campaigns delivered within the country. Such high level of knowledge was previously noted in different other studies where knowledge of common COVID-19 symptoms was reported in more than 90% of dentists [22,23].

However, the results showed that specialist dentists and those who received postgraduate infection prevention education significantly had more knowledge of uncommon or non-presenting symptoms such as chills, weight loss, hair loss and urgency. Additionally, they also showed more knowledge than others regarding some specific measures for infection prevention.

Such findings were noted in previous studies which showed that the knowledge of dentists was significantly higher among those with postgraduate qualifications compared to graduates during COVID-19 pandemic [23], and other outbreaks such as Ebola virus disease and Zika virus [24,25]. Such better knowledge might be because specialists and postgraduates are more likely to be involved in continuous medical education sessions and research as part of their career progression which is necessarily reflected by updating their overall knowledge and attitude.

Therefore, specialists and different health bodies such as dental association should put more efforts in training and updating the knowledge of general dentists regarding more specific aspects of COVID-19 symptoms and preventive measures. The ability of all participants to identify the scientific name of the causative virus as the SARS-CoV-2 was generally low (less than one-third) regardless of gender, training and specialty level. One explanation might be because the nomenclature of the virus was changed 3 times since its appearance in 2019 [1-4]. In addition, the scientific name of the virus is usually used when writing a scientific paper, but for clinical practice it is commonly referred to by using the disease name as COVID-19.

In assessing the infection prevention protocol, results showed that female dentists were more likely to advise others to use the protocol compared to male dentists (p value = 0.01), and dentists with postgraduate education in infection prevention within the last three years were more likely to follow the protocol strictly (p value = 0.03). The majority of participants agreed that the infection prevention protocol is easy to read but the items are unaffordable. This is expected since there is a high demand for the personal protective equipment globally which can lead to shortage in supply and probably increase in the prices.

Conclusions

Our study demonstrated that the overall knowledge of COVID-19 among all participant dentists regarding common symptoms of COVID-19 and preventive measures was high. However, knowledge of uncommon symptoms and some specific preventive measures was significantly higher among specialists and among those who received postgraduate infection prevention education. This highlights the importance of post-graduate educational activities and advanced training in infection control.

Additionally, Infection control protocol for dentists was found to be easy to read and covered almost all necessary aspects. However, the items required to implement it such as personal protective equipment are scarce according to participants. This is expected considering the worldwide high demand on such protective equipment and hopefully it will be available soon in the near future.

Conflicts of interest

The authors declare that there is no conflict of interest.

Acknowledgments

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تقييم معرفة أطباء الأسنان عن مرض فيروس كورونا **19** وتقييم بروتوكول الوقاية من العدوى المتبع

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الملخص

الهدف من الدراسة: أطباء الأسنان أكثرعرضة للإصابة بمرض فيروس كورونا –19 (كوفيد –19) والهدف من هذه الدراسة هو تقييم مستوى المعرفة فيما يتعلق بمرض فيروس كورونا 19 بين أطباء الأسنان وتقييم بروتوكول الوقاية من العدوى الفيروسية.

منهجية البحث: تم إرسال استبيان إلكتروني إلى 188 طبيب وطبيبة أسنان أردنيين. تكوّن الاستبيان من ثلاثة أقسام: البيانات الديموغرافية والمهنية، المعرفة المتعلقة بمرض فيروس كورونا19 وبروتوكول الوقاية من العدوى منه.

النتائج: كانت المعرفة العامة بأعراض مرض كورونا 19 الشائعة عالية (90%<) بين جميع المشاركين. ولكن كانت معرفة الأخصائيين أو الذين تلقوا تعليما حول الوقاية من العدوى فيما يتعلق بالأعراض غير الشائعة أعلى بكثير من الآخرين.(0.05 ≥ p) حدد حوالي ثلث جميع المشاركين الاسم العلمي للفيروس المسبب (SARS-CoV-2) بشكل صحيح مع عدم وجود فرق إحصائي كبير. اتفق معظم المشاركين على أن بروتوكول الوقاية من العدوى سهل القراءة ولكن الأدوات اللازمة لتطبيقةكأدوات الوقاية الشخصية شحيحة صعب الحصول عليها. اظهرت النتائج أن طبيبات الأسنان سينصحن الآخرين باستخدام البروتوكول (القيمة الاحتمالية = 0.01) مقارنة مع الأطباء الذكور، وأجاب أطباء الأسنان الحاصلون على تعليم بعد التخرج في الوقاية من العدوى خلال السنوات الثلاث الماضية بأنهم سيتبعون البروتوكول بدقة (القيمة الاحتمالية = 0.03) وأظهرت النتائج أن المتخصصون وأولئك الذين تلقوا تعليمًا للوقاية من العدوى بعد التخرج مزيدًا من المعرفة فيما يتعلق بالتدابير الخاصة للوقاية من العدوى.

الخلاصة: كانت المعرفة العامة بـ COVID-19عالية بين أطباء الأسنان. تبين أن بروتوكول مكافحة العدوى لأطباء الأسنان سهل القراءة وشاملًا ولكن العناصر المطلوبة لتنفيذه مثل معدات الحماية الشخصية شحيحة وهذا متوقع بسبب ارتفاع الطلب العالمي على هذه العناصر في ظل الجائحة.

الكلمات الدالة: أطباء الأسنان ،كوفيد –19 ، فيروس كورونا ، معرفة ، الوقاية من العدوى.