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RESEARCH ARTICLE

The Level of Knowledge and Preparedness of Dental Professionals for COVID-19 among Public and Private Dental Sectors in Saudi Arabia: A Cross-Sectional Study

Maha Alharbi[1,*], Reema Al Joaib[2], Bashayer AL Bassam[2], Abdulaziz A Qahtani[3], Fasial Alsineedi[4] and Arulanantham Zechariah Jebakumar[5]

[1]Lecturer, Dental and Oral Health Department, Prince Sultan Military College of Health Sciences, Dammam, Saudi Arabia
[2]Public Health Specialist, Dentistry Department, King Abdel Aziz Air Base Hospital, Dhahran, Saudi Arabia
[3]Senior Registered General Dentist, Dentistry Department, King Fahad Military Medical Complex, Dhahran, Saudi Arabia
[4]Dental Department Head, Dentistry Department, King Fahad Military Medical Complex, Dhahran, Saudi Arabia
[5]Lecturer, Vice Deanship of Postgraduate Studies and Research, Prince Sultan Military College of Health Sciences, Dammam, Saudi Arabia

Abstract:

Background:

COVID-19 has become a serious public health issue throughout the world's healthcare system due to its rapid spread. Because COVID-19 is so contagious, workers must be properly trained to prevent the virus from spreading to them. Protective clothing, sanitised gloves, and respirators are just a few examples of the safety precautions that need to be taken. Dental institutions and their affiliated health centres and research stations have been severely impacted by the coronavirus outbreak. According to the World Health Organisation (2020), the risk of fast infection is higher among individuals who are close to or who operate near the COVID-19 patients, for instance, family members or health practitioners. This research was conducted to determine the level of knowledge, preparedness, and perception of COVID-19 among dentists in the private and public dental sectors.

Methods:

A cross-sectional study was conducted that used a non-probability sampling method. The data were collected through online questionnaires between February 2021 and June 2021, where standardized close-ended questions were asked *via* Google forms from dentists in public and private dental sectors in five regions of Saudi Arabia. A total of 145 people responded to the questionnaire; three of them decided not to participate in the study, while 30 respondents failed to select the correct answer to the quality assurance question. The remaining 112 respondents were included in the analysis. This study was approved by the Ethics Committee of Prince Sultan Military College of Health Sciences (IRB-2021-DOH-021).

Results:

The findings showed that most dentists (58%) had high knowledge of COVID-19, which was followed closely by those who had average knowledge (34.8%), while the rest (7.1%) had insufficient knowledge about COVID-19. In terms of evaluating the level of preparedness, which included the method of prevention and practice of dentists while dealing with COVID19, results showed that most of the respondents (42.9%) indicated that they have the highest preparedness level. Concerning the level of perception of dentists toward COVID-19, the results showed that the majority (48.2%) of dentists had the highest perception. However, the perception level was higher compared to their level of preparedness but lower compared to their level of knowledge.

Conclusion:

Dentists in KSA have enough understanding of COVID-19 transmission and general information. As the number of COVID-19 cases in KSA and other countries continue to grow, dentists must stay up to date on the latest information concerning the disease. Continuous educational programs are required to improve the understanding of infection management.

Keywords: Coronavirus, Dentists, Pandemic, Level of preparedness, Perception, Disease.

1. INTRODUCTION

The coronavirus pandemic brought about by the SARS-CoV has resulted in the deaths of thousands of people globally. In order to enhance awareness and knowledge about coronavirus disease, significant information has been availed, including discussions linked to dental practices [1 - 5]. Dental institutions and their affiliated health centres and research stations have been severely impacted by the coronavirus outbreak [3]. According to the World Health Organisation (2020), the risk of fast infection is higher among individuals who are close to or who operate near the patients, for instance, family members or health practitioners [4]. To determine dentists' preparedness in this period, many studies around the world are assessing the knowledge about the virus. In this research paper, dental infection control, WHO precautions, COVID-19 vaccinations, and the Saudi health ministry precautions are included in order to analyse dental professionals' preparedness for COVID-19.

1.1. About COVID-19

Since the virus was first reported in Wuhan, China, in December 2019, it has turned into a significant health issue globally [1]. COVID-19 is caused by a novel virus called SARS-CoV-2, which results in pneumonia, with signs vary from mild to deadly. This virus's infection can result in an acute inflammatory reaction and respiratory failure [6]. The World Health Organisation (WHO) announced COVID-19, a global pandemic, on 11th March 2020 [4]. By 6th July 2020, the virus had spread to 216 nations, causing 11,496,926 positive cases and claiming over 535,000 lives [4].

1.2. Dental Practice Prevention

In dental practice, prevention approaches are physical distancing. Service delivery in dental healthcare needs close physical touch between the sick and professionals. However, social distancing is a crucial strategy to prevent the transmission of the virus. A professional can limit the number of visitors entering the facility, encourage alternative means of communication between the visitors and patients, or fix appointments to reduce the number of patients in queues. Seats in the waiting area can also be arranged at least 1.5 meters apart. The Centre for Disease Control and Prevention (2020) recommends that all dental professionals should adopt the global source control approaches, referring to the use of masks to cover an individual's mouth and nose to stop the spread of respiratory secretions [7].

Dental professionals are also advised to implement the use of personal protective equipment to protect them from any virus that might find its way out into the atmosphere or surface. Dental professionals should only provide services after they have evaluated the sick and weighed both the risk to the patient of postponing services and the risk to the professionals and patients of transmission of the virus in the process of healthcare provision [8].

* Address correspondence to this author at the Lecturer, Dental and Oral Health Department, Prince Sultan Military College of Health Sciences, Dammam, Saudi Arabia; E-mail: malharbi@psmchs.edu.sa

1.3. World Health Organisation Precautions

Since close personal contact seems to be the leading cause of transmission, social distancing remains the main form of mitigating the spread. The WHO has recommended keeping a distance of close to 1.5 meters from each other in public places [9]. The distance avoids direct contact with respiratory droplets. The World Health Organisation also has recommended maintaining high hygienic standards. Regular handwashing with soap is -also suggested. Practising proper hygiene is a crucial habit that helps in the prevention of coronavirus transmission [10]. According to the WHO (2020), one should clean his/her hands often with soap and water for a minimum of 20 seconds, mainly after being in a public place or after coming in contact with their nose or mouth. If no soap or water is readily available, one must use a hand sanitiser with at least 60% alcohol [4]. The WHO also warns against touching one's nose, eyes, and mouth with unwashed hands. According to Loey et al. (2020), face masks have become crucial tools in protecting individuals from contracting the coronavirus [2]. The World Health Organisation recommends that individuals wear face coverings in public contexts. Moreover, studies have indicated that individuals with the new coronavirus could be asymptomatic [11].

1.4. Protocols by the Saudi Ministry of Health

The Saudi Ministry of Health has put in place several protocols to ensure the virus does not spread in the country. The first strategy is early recognition of the virus and the application of source control measures. Secondly, the ministry applies standard precautions to all the patients and, later on, implements additional empirical safeguards. In the health facilities, the ministry has put in place mechanisms to control the virus's exposure [12]. Environmental cleaning and disinfection take place as a form of environmental control [13].

1.5. COVID-19 Vaccines

With the world going through an unprecedented time due to the COVID-19 pandemic, economies and normal lives have come to a standstill, with many lives being lost. Due to these challenges, the COVID-19 vaccine was developed at a record speed [14]. Today, the world has many types of vaccines being administered to people, and dental professionals, being among the high-risk group, will be vaccinated to prevent the spread of the disease [15]. In Saudi Arabia, 2 vaccines have been approved by Saudi Food and Drug Authority (FDA), namely, (Pfizer BioNTech and Oxford-AstraZeneca) to be used on its population [16].

With the world facing a novel challenge in the name of the COVID-19 pandemic, a lot of caution has been taken, and several measures have been adopted in all aspects of life. In the medical sector, the pandemic has brought massive challenges and caused many losses, including the loss of lives. Among the most vulnerable individuals to this pandemic are medical practitioners, including dental professionals. Therefore, the level of preparedness among this group of individuals should be studied to determine if they are well prepared to tackle this deadly enemy. Information from the research can also be crucial to government institutions and other humanitarian

entities willing to provide these professionals with financial or psychological support. It has been indicated that authorities have the responsibility to society members to implement environmentally sustainable practices to support their health and well-being, now and in the future.

2. MATERIALS AND METHODS

2.1. Study Design and Setting

This study is a cross-sectional study with a non-probability sampling method. The target population comprised registered dentists in the Kingdom of Saudi Arabia.

2.2. Study Sample and Data Collection

This study was approved by the Ethics Committee of Prince Sultan Military College of Health Sciences (IRB-2021-DOH-021). The data was collected through online questionnaires between February 2021 and June 2021, where standardized close-ended questions were asked *via* Google forms among registered dentists in public and private dental sectors in five regions in Saudi Arabia. There were a total of 145 respondents to the questionnaire; three of them decided not to participate in the study, while 30 respondents failed to select the correct answer to the quality assurance question. The remaining 112 responses that were complete were included in the analysis. Informed consent was obtained on the first page of the online questionnaire.

2.3. The Instrument and Measurement

The researchers designed the structured online questionnaire according to the primary objective of the present study based on the Saudi Ministry of Health, World Health Organization (WHO) guidelines, and previous research. A total number of 38 questions, include 14 question assessing demographic and work related questions, 10 questions assess the knowledge level, 13 questions assess the preparedness and perception level of dentist toward COVID19. In addition, one question was inserted in the middle of the questionnaires with a specific answer to ensure the quality of responses and verify that the participants read the questions carefully. A panel of experts reviewed and validated the questions. Then, a pilot test was performed to measure the reliability of the questions with 30 participants whose data were not included in the final study sample. The reliability of the questionnaire was tested with the use of SPSS, which has a reliability coefficient (Cronbach's alpha) of 0.89. The questionnaire completion time was estimated to be approximately 10 min. These questionnaires included the following domains: demographic questions and knowledge, preparedness, and perception of the dentists during the COVID-19 pandemic.

2.4. Statistical Analysis

The data collected from the dentists were analyzed and tested *via* Statistical Package for the Social Sciences (SPSS1) software (SPSS Inc., Chicago, IL, USA) version 26. Descriptive statistics were calculated as frequency, percentage, mean, and standard deviation (SD). The mean score of every question was calculated. The average of each domain was calculated out of the total point of each domain point. Knowledge score was calculated as one point for each correct answer and 0 for an incorrect answer, or "I do not know," and the total score ranged from 0 to 10. The mean score, the minimum score, and the maximum score were calculated to generate three levels of knowledge: low knowledge for those who answered six or fewer correct answers from 10 ($\geq$6), average knowledge, *i.e.*, between 7 to 8 correct answers, and high knowledge with >8. Preparedness and perception were scored on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). A mean score was generated to determine the preparedness and perception score domains with five levels: "lowest prevention" for answers with a mean value between 1–1.79; "low prevention" for answers with a mean value between 1.8–2.59; "average prevention" for answers with a mean value between 2.6–3.39; "high prevention" for answers with a mean value between 3.4–4.19; and "highest prevention" for answers with a mean value between 4.2–5. We used an independent t-test and one-way ANOVA to test the significant differences in the mean score of the three domains with the demographic variable. The statistical significance was set at $P < 0.05$ for all analyses.

3. RESULTS

Table **1** represents the distribution of selected demographic data for this study. Most of the participants were Saudi dentists (92.9%), male (50.9%), and in the age group of 30 years and less (45.5%). More than half of dentists were single (55.5%), held bachelor's degrees (60.7%), and were general dental practitioners (62.5%). Most of the respondents worked in the military sector (36.6%) in the Eastern region (40.7%). Most of the responses were from dentists who worked 30-50 hours per week (55.4%) and had experience of 10 years or less (71.4%). More than half of the dentists' (67.9%) main source of clinical information on COVID-19 was from the MOH, while 73.2% of the dentists had attended training or received lectures on COVID-19. Most of the dentists (92.9%) were not infected by COVID-19 in their workplaces. However, 7.1% of dentists were infected. Most of the dentists (77.7%) received COVID-19 vaccines, while 22.3% did not receive them. Table **2** describes dentists' knowledge, preparedness, and perception level during COVID-19 outbreaks in Saudi Arabia. The mean score of the knowledge is 8.5 (85%). The mean score of preparedness is 3.88 (77.6%), while perception is 3.84 (76.8%) (n=112).As shown in Table **2**, concerning the knowledge level of dentists regarding COVID-19, sixty-five (58%) dentists had high knowledge, thirty-nine (34.8%) dentists had average knowledge, and eight (7.1%) dentists had low knowledge of COVID-19. In terms of the preparedness level (prevention and practice) of dentists in dealing with COVID-19. Forty-eight (42.9%) reported the highest preparedness level, while five (4.5%) had a low preparedness level. Meanwhile, in terms of the perception of dentists toward COVID-19, fifty-four (48.2%) of dentists had the highest perception, while seven (6.3%) had the lowest perception. Table **3** represents a total of 112 dentists who participated in the study. In the category of gender, the mean knowledge score of the female dentist (8.69) is higher than the male dentist (8.37), while in the level of preparedness and perception, male dentists have a higher mean

score than female dentists. The mean knowledge score was (8.60), and the mean preparedness score was (3.96), which was the highest for the age group 31 to 45, while the age group of more than 45 had the highest mean score of perception (4.14). Single dentists had higher mean scores in knowledge, preparedness, and perception domains than married dentists, but they were not statistically significant. Non-Saudis had higher means scores in knowledge, preparedness, and perception domains than Saudi dentists but were not statistically significant. Educational level showed a statistically significant difference in participants' responses to the knowledge domain only. Dentists who held master's degrees scored statistically significantly higher than dentists who held bachelor's degrees, a PhD, or were in residency programs, with a mean score of (9.07) and a p-value of 0.005. In the position category, there was a statistically significant difference in participants' responses for the knowledge domain only. Specialized dentists were statistically significantly higher than general dental practitioners and consultants, with a mean score of (9.07) and a p-value of 0.025. There was a statistically significant difference in participants' responses for the preparedness domain only. Dentists working in the military sector were statistically significantly higher than in other sectors (public, private, university), with a mean score of (4.14) and a p-value of 0.004. The region of practice in KSA showed a statistically significant difference in participants' responses for the knowledge domain only. Dentists working in the eastern region were statistically significantly higher than in other regions (central, western, northern, and southern regions), with a mean score of (8.87) and a p-value of 0.039. Dentists who worked 20-34 hours per week had a higher mean knowledge score of 8.88 than other categories, but no statistically

significant differences were found between participant responses. Dentists who had 11-20 years of work experience had a higher mean knowledge score of (9.95) than other categories, but no statistically significant differences were found between participant responses. Dentists who had more than 20 years of experience had a higher mean score in preparedness and perception domains, with mean scores of (3.93) and (4.14), respectively. Dentists who attended lectures or received training had higher mean scores in knowledge, preparedness, and perception domains than dentists who did not receive lectures or training on COVID-19, with mean scores of (8.65, 3.92, and 3.90), respectively. However, they were not statistically significant. The mean knowledge score was high for dentists who obtained their main sources of clinical information on COVID-19 from healthcare professionals or colleagues (9.33). However, they were not statically significant. The mean preparedness (4.25) and perception scores (4.85) were high for dentists who obtained clinical information on COVID-19 from published literature. However, they were not statically significant. The mean scores of dentists who had not been infected by COVID-19 from the workplace in knowledge (8.55), preparedness (3.90), and perception (3.83) domains were higher than dentists that were infected. However, the results were not statically significant. The number of dentists who received the COVID-19 vaccine (87) was higher than dentists who did not receive the COVID-19 vaccine (25). However, the mean scores of preparedness (3.92) and perception (3.92) domains of the dentists who did not receive vaccines were higher than dentists who received the vaccine. However, dentists who received the vaccine had a higher mean score in the knowledge domain (8.59).

Table 1. Demographic and work-related characteristics.

Variables	Frequency	Percentage
Gender	-	-
Male	57	50.9
Female	55	49.1
Age group	-	-
30 and Less than	51	45.5
31 – 45	50	44.6
More than 45	11	9.8
Marital Status	-	-
Married	50	44.6
Single	62	55.4
Nationality	-	-
Saudi	104	92.9
Non-Saudi	8	7.1
Educational Status	-	-
Bachelor	70	62.5
Master	15	13.4
PhD or Residency Program	27	24.1
Position	-	-
General dental practitioners	68	60.7
Specialist	29	25.9
Consultant	15	13.4
Currently working in	-	-

(Table 1) contd.....

Variables	Frequency	Percentage
Public Sector	28	25
University Sector	25	22.3
Military Sector	41	36.6
Private Sector	14	12.5
Others	4	3.6
Region of Practice in KSA	-	-
Central Region	34	30.1
Eastern Region	46	40.7
Western Region	14	12.4
Northern Region	6	5.3
Southern Region	12	10.6
Working hours per week	-	-
1 – 19 hours	23	20.5
20 – 34 hours	26	23.2
35 – 50 hours	62	55.4
Above 50 hours	1	0.9
Years of Experience	-	-
10 years and less than	80	71.4
11 – 20 years	21	18.8
More than 20 years	11	9.8
Have you attended training or received lectures on COVID-19?	-	-
Yes	82	73.2
No	30	26.8
What is your main source of clinical information on COVID-19?	-	-
Saudi Ministry of Health	76	67.9
WHO	14	12.5
Social media/public news	12	10.7
A healthcare professional/colleague	3	2.7
Published literature	7	6.3
Have you been infected by COVID-19 from the workplace?	-	-
Yes	8	7.1
No	104	92.9
Did you receive the COVID-19 vaccine?	-	-
Yes	87	77.7
No	25	22.3

Table 2. The level of knowledge, preparedness, and perception among dentists toward COVID-19.

The Knowledge Level	Frequency	Percentage
Low Knowledge	8	7.1
Average Knowledge	39	34.8
High Knowledge	65	58
Preparedness	Frequency	Percentage
Lowest Preparedness	5	4.5
Low Preparedness	4	3.6
Average Preparedness	13	11.6
High Preparedness	42	37.5
Highest Preparedness	48	42.9
Perception	Frequency	Percentage
Lowest Perception	7	6.3
Low Perception	12	10.7
Average Perception	10	8.9
High Perception	29	25.9

(Table 2) contd.....

The Knowledge Level	Frequency	Percentage
Highest Perception	54	48.2

Table 3. The level of knowledge, preparedness, and perception among dentists toward COVID-19.

Demographic and Work-related Variables	No	Mean Knowledge Score (95% CI)	P-value	Mean Preparedness Score (95% CI)	P-value	Mean Perception Score (95% CI)	P-value
Gender							
Male	57	8.37(8.07-8.66)	0.14	3.90(3.67-4.13)	0.838	3.98(3.69-4.27)	0.211
Female	55	8.69(8.37-9.01)	-	3.86(3.64-4.09)	-	3.71(3.38-4.04)	-
Age group	-	-	-	-	-	-	-
30 and Less than	51	8.51(8.19-8.83)	0.693	3.80(3.55-4.04)	0.624	3.67(3.33-4.00)	0.287
31 − 45	50	8.60(8.25-8.95)	-	3.96(3.73-4.19)	-	3.97(3.66-4.28)	-
More than 45	11	8.27(7.74-8.80)	-	3.93(3.25-4.62)	-	4.14(3.31-4.96)	-
Marital Status	-	-	-	-	-	-	-
Married	50	8.52(8.17-8.87)	0.956	3.85(3.60-4.10)	0.737	3.85(3.60-4.10)	0.946
Single	62	8.53(8.25-8.81)	-	3.91(3.69-4.12)	-	3.91(3.69-4.12)	-
Nationality	-	-	-	-	-	-	-
Saudi	104	8.47(8.24-8.70)	0.072	3.88(3.72-4.04)	0.509	3.84(3.62-4.06)	0.666
Non-Saudi	8	9.25(8.66-9.84)	-	3.90(2.88-4.91)	-	3.94(2.86-5.00)	-
Educational Status	-	-	-	-	-	-	-
Bachelor	70	8.26(7.96-8.56)	0.005*	3.78(3.57-3.99)	0.208	3.76(3.47-4.04)	0.557
Master	15	9.07(8.62-9.23)	-	3.90(3.33-4.47)	-	3.97(3.30-4.63)	-
Ph.D. or Residency Program	27	8.93(8.62-8.74)	-	4.13 (3.88-4.38)	-	4.02(3.60-4.43)	-
Position	-	-	-	-	-	-	-
General dental practitioners	68	8.29(7.98-8.61)	0.025*	3.79(3.57-4.01)	0.339	3.80(3.52-4.08)	0.726
Specialist	29	9.07(8.62-9.23)	-	3.97(3.64-4.31)	-	3.84(3.39-4.30)	-
Consultant	15	8.93(8.62-8.74)	-	4.12 (3.81-4.42)	-	4.07(3.47-4.67)	-
Currently working in	-	-	-	-	-	-	-
Public Sector	28	8.43(7.91-8.95)	0.207	3.64(3.26-4.02)	0.004*	3.64(3.26-4.02)	0.06
University Sector	25	9.00(8.62-9.38)	-	3.08(3.72-4.44)	-	3.08(3.72-4.44)	-
Military Sector	41	8.44(8.09-8.79)	-	4.14(3.96-4.31)	-	4.14(3.96-4.31)	-
Private Sector	14	8.21(7.53-8.90)	-	3.53(3.03-4.04)	-	3.53(3.03-4.04)	-
Others	4	8.25 (6.25-10)	-	2.89 (1.00-4.77)	-	2.89 (1.00-4.77)	-
Region of Practice in KSA	-	-	-	-	-	-	-
Central Region	34	8.44(8.06-8.83)	0.039*	3.82(3.46-4.18)	0.801	3.90(3.48-4.32)	0.575
Eastern Region	46	8.87(8.55-9.19)	-	3.97(3.75-4.20)	-	3.76(3.39-4.13)	-
Western Region	14	8.43(7.84-9.15)	-	3.75(3.25-4.24)	-	4.21(3.96-4.74)	-
Northern Region	6	8.00(6.85-9.15)	-	4.09 (3.21-4.97)	-	3.33(1.65-5.00)	-
Southern Region	12	7.83(6.64-8.73)	-	3.76(3.28-4.23)	-	3.88 (3.49-4.26)	-
Working hours per week	-	-	-	-	-	-	-
1 − 19 hours	23	8.74(8.30-9.18)	0.124	3.72(3.21-4.23)	0.265	3.76(3.11-4.41)	0.124
20 − 34 hours	26	8.88(8.54-9.23)	-	3.71(3.43-4.00)	-	3.50(3.08-3.92)	-
35 − 50 hours	62	8.31(7.98-8.63)	-	4.02(3.83-4.22)	-	4.05(3.79-4.31)	-
Above 50 hours	1	8	-	3.27	-	2.5	-
Years of Experience	-	-	-	-	-	-	-
10 years and less than	80	8.45(8.18-8.72)	0.154	3.92(3.73-4.10)	0.631	3.86(3.62-4.11)	0.509
11 − 20 years	21	9.95(8.51-9.40)	-	3.72(3.31-4.12)	-	3.64(3.05-4.23)	-
More than 20 years	11	8.27(7.74-8.80)	-	3.93(3.25-4.62)	-	4.14(3.31-4.96)	-
Have you attended training or received lectures on COVID-19?	-	-	-	-	-	-	-
Yes	82	8.65(8.41-8.88)	0.07	3.92(3.73-4.11)	0.42	3.90(3.65-4.16)	0.413
No	30	8.20(7.70-8.70)	-	3.77(3.47-4.08)	-	3.70(3.27-4.13)	-

(Table) contd.....

Demographic and Work-related Variables	No	Mean Knowledge Score (95% CI)	P-value	Mean Preparedness Score (95% CI)	P-value	Mean Perception Score (95% CI)	P-value
What is your main source of clinical information on COVID–19?	-	-	-	-	-	-	-
Saudi Ministry of Health	-	-	-	-	-	-	-
WHO	-	-	-	-	-	-	-
Social media/public news	76	8.43(8.17-8.70)	0.566	3.93(3.75-4.11)	0.355	3.95(3.71-4.19)	0.112
Health professional/colleague	14	8.50(7.79-9.21)	-	3.62(2.95-4.29)	-	3.82(3.01-4.63)	-
Published literature	12	8.83(8.18-9.49)	-	3.61(3.00-4.22)	-	3.13(2.20-4.05)	-
	3	9.33(6.46-10.00)	-	4.18 (2.60-5.00)	-	3.17 (2.45-3.88)	-
	7	8.71(7.55-9.87)	-	4.25(3.60-4.90)	-	4.85(3.63-4.06)	-
Have you been infected by COVID-19 from workplace?	-	-	-	-	-	-	-
Yes	8	8.25(7.09-9.41)	0.484	3.65(2.85-4.45)	0.427	4.06(3.24-4.88)	0.588
No	104	8.55(8.33-8.77)	-	3.90(3.73-4.07)	-	3.83(3.60-4.06)	-
Did you receive COVID-19 vaccine?	-	-	-	-	-	-	-
Yes	87	8.59(8.36-8.81)	0.312	3.87(3.31-4.06)	0.819	3.83(3.57-4.08)	0.726
No	25	8.32(7.72-8.92)	-	3.92(3.62-4.21	-	3.92(3.53-4.31)	-

Note: *:Significance.

4. DISCUSSION

The COVID-19 virus has become a serious public health issue throughout the world's healthcare systems due to its rapid spread [1]. Because COVID-19 is so contagious, workers must be properly trained to prevent the virus from spreading. Protective clothing, sanitised gloves, and respirators are just a few examples of the safety precautions that need to be taken [2]. Dentists have an important role to play in raising public and professional awareness of the global health catastrophe caused by the spread of COVID-19. In light of this, it is crucial for the dental staff to have a solid understanding of COVID-19, show a constructive outlook on the importance of infection management and the seriousness of this pandemic, and also be well-prepared when encountering patients during the pandemic [7]. Therefore, research on Saudi Arabian dental professionals was conducted to determine their levels of knowledge, preparedness, and perception of COVID-19 in the private and public dental sectors. Thus, this section discusses the results of the current research by comparing and contrasting them with prior studies.

4.1. Dentists' Level of Knowledge

In assessing the level of knowledge among the dentists, results showed that most dentists (58%) had high knowledge of COVID-19, which was followed closely by those who had average knowledge (34.8%), while the rest (7.1%) had low knowledge of COVID-19. The results imply that when COVID-19 emerged, there was significant awareness of this pandemic, owing to several organizations, such as the health sectors worldwide, that gave much attention to reducing its spread. Thus, there was a higher level of knowledge among the workers, for example, the dentists. In line with these results, Widyarman *et al*. (2020), in their study, examined dental professionals' perceptions, attitudes, and knowledge regarding COVID-19 in Indonesia [5]. The results of this study showed that many materials had been made available to raise awareness and knowledge of coronavirus illness, including

issues related to dentistry procedures. The results imply that the level of information that the government of Indonesia provided among the health sectors improved the knowledge of the workers. On a similar note, according to the Centers for Disease Control and Prevention (CDC), dental practitioners should utilise global source control techniques, which include wearing masks over one's mouth and nose to prevent the transmission of respiratory secretions [7]. In addition, studies at the Centers for Disease Control and Prevention (CDC) noted that dental practitioners should also use personal protective equipment (PPE) to protect them from viruses that may be present in the atmosphere or on the surface. On the other hand, Turkistani and Turkistani (2020) indicated that dental practitioners should always offer services after evaluating the ill person and weighing the risks to the patient of delaying treatment as well as the potential of virus transmission to the professionals and patients throughout the healthcare delivery process [8]. The results indicate that there was higher knowledge gained when offering services to people with dental cases. In support of the results presented above, Mustafa *et al*. (2020) examined dentists' early-outbreak-period knowledge, attitudes, and preparedness for COVID-19 in Saudi Arabia; they established that dentists in Saudi Arabian dental sectors were generally well-informed about COVID-19. This research concluded that dentists' expertise could be improved by expanding their access to information offered by dental healthcare authorities, which details the most effective and secure methods for treating patients during and after an outbreak [17]. In line with the aforementioned research findings, Khader *et al*. (2020) explored Jordanian dentists' knowledge, beliefs, and practices relating to the spread of the coronavirus (COVID-19) disease during the year 2020. They established that a majority of dentists had a good understanding or were knowledgeable about COVID-19, as seen by their ability to correctly identify patients at risk of being infected by the virus, report the known modes of transmission, and implement preventative measures within their practices [18].

Similarly, Alisofayan *et al*. (2020) indicated several measures that the Saudi Ministry of Health has implemented to prevent the virus from spreading throughout the kingdom [12]. According to the author, the first method is used to detect the infection early on to implement source control measures. The second method is that the ministry takes conventional measures with all patients and then adds further empirical protections afterwards. The government has put in place procedures to prevent the virus from spreading in healthcare institutions. The results of this study imply that the measures put in place to deter the spread of the said virus have enabled the acquisition of knowledge about COVID-19 by many health practitioners, for example, dentists, to grow significantly, which is consistent with the results of the current study [19].

4.2. Dentists' Level of Preparedness

In addition, when evaluating the level of preparedness, which included the method of prevention and practice of dentists while dealing with COVID-19, results showed that most of the respondents (42.9%) indicated that they had the highest preparedness level. These results implied that during the COVID-19 outbreak, most health practitioners, such as dentists, were caught unaware. Therefore, their preparedness was not as significant as compared to their level of knowledge. However, due to their professionalism, dentists must be prepared for any pandemic that may affect their daily activities. In support of these results, a study by ILO (2020) established that the coronavirus outbreak had a significant impact on dental schools, as well as their linked health centres and research stations [3]. The results were due to many health centres not having enough preparations for curbing a severe pandemic. Therefore, according to this study, many practitioners have improved preparedness, but it is not sufficient, which is consistent with the results of the current study. In contrast, as per the World Health Organisation (2020), the risk of rapid infection is greatest among people who are close to or work with patients, such as family members or health care providers [4]. The results imply that when a pandemic outbreak occurs, in this case, COVID-19, most people who are close to or work with patients are at a higher risk of being infected. This may be a result of poor preparedness in handling such pandemics. Thus, results indicated that medical practitioners have low preparedness, which contradicts the results of the current study.

4.3. Dentists' Level of Perception

Finally, when examining the level of perception of dentists toward COVID-19, the results showed that the majority (48.2%) of the dentists had the highest perception. However, the perception level was higher compared to their level of preparedness but lower compared to their level of knowledge. The results implied that since the coronavirus was a new pandemic, the only known thing was that it originated from Wuhan, China. In contrast, the perception of its source, its influence, the rate of spread, and the most affected personnel was initially not known among the people and other health workers, causing the perception level to be lower [20]. However, due to instant research that started after the outbreak, the knowledge of preventing the fast spread was shared, which also affected the perception level among dentists. The results of

this study lacked direct support from the work of literature, which indicates that identifying the dentists' perception level toward COVID-19 fills a gap in the work of literature and will act as guidance or reference to other researchers who may conduct a similar study in the future. In addition, while determining the difference between the level of knowledge and preparedness and perception toward COVID-19 among dentists concerning various factors, results showed a statistically significant difference in participants' responses regarding the knowledge in education level, position, and region of practice in KSA. On the other hand, results illustrated that the difference in participants' responses to the preparedness was statistically significant for the current workplace. Nonetheless, factors such as gender, age, marital status, main sources of clinical information on COVID-19, working hours per week, and nationality had no statistically significant difference in either level of knowledge, preparedness, and perception toward COVID-19 among dentists. However, no earlier research has identified a difference between the given factors in the level of knowledge and preparedness, and perception of COVID-19, given that the various factors had shown either statistically significant or insignificant differences in the level of knowledge, preparedness, and perception of COVID-19.

The current study has some practical and theoretical implications. For instance, the results from this study give a glimpse into the knowledge, preparedness, and perception of dentists working in health sectors about infection management in general and COVID-19 in particular during the period of its occurrence in 2020. In addition, these results imply that it would be advantageous when assessing the requirement for educational and clinical training for dentists if there were a scale to measure their level of preparedness and understanding of COVID-19. Therefore, for dental workers to get the most out of the COVID-19 training, it should be tailored to their specific needs. These results imply that dentists with higher levels of knowledge were better able or were more prepared to treat patients during the pandemic and that level of education had a beneficial effect on the dentists' degree of COVID-19 knowledge. In addition, the results of this study can assist in pinpointing any knowledge gaps, which may then be used to guide future interventions aimed at enhancing the knowledge and preparedness of dentists while attending to their patients during the COVID-19 period.

Several limitations of this study that could guide the future must be kept in mind when interpreting the data. This study's participants had to have access to the Internet and specifically social media. When not available, the generalizability of study findings could be threatened. Using social media may have limited the opportunity to participate in this study affecting the sample size. In addition, overall mean scores were the focus of this investigation. The individual results were not considered in the analyses, which is a drawback of the current research. In addition, there is limited literature on dental specialists' knowledge, preparedness, and perception scores on COVID-19, which affected the comparison of the results to have a broader understanding. Nonetheless, the current study was conducted during the pandemic's peak period, and since COVID-19 is considered a fresh and unexplored topic, the updates and recommendations may be revised, amended, or

added daily. As a result, these new changes due to revising and amending practices and recommendations to curb the spread of COVID-19 were a major limitation to the current situation since they could not be generalised. Another limitation of our study was the possibility of recall bias among our respondents.

Researchers in the future should increase the sample size to cover a larger population and increase the reliability of results. In addition, researchers should undertake the same research when the spread of this pandemic is contained to involve face-to-face interviews and reduce the possibility of respondents making mistakes when giving out feedback, and thus reducing the bias when reporting. Finally, future research should involve a scale measuring dentists' COVID-19 preparedness and knowledge that would effectively evaluate the need for educational and clinical training. To ensure the optimum gain of knowledge and preparedness, the COVID-19 training should be customised for dental professionals.

CONCLUSION

In summary, from various papers of research and the findings of this study, it can be concluded that dentists in Saudi Arabia have enough understanding of COVID-19 transmission and general information, as evidenced by the fact that most dentists properly answered the provided survey questions. Dentists affiliated with private hospitals and academic institutions had greater knowledge than dentists linked with public hospitals. The majority of dentists who took part in this study, on the other hand, could not tell the difference between a normal cold and COVID-19 since both conditions have the same symptoms, such as headache, sore throat, cough, fever, and exhaustion. However, patients with COVID-19 may be asymptomatic or even fever-free. Thus, to manage patients during this pandemic, further progress is required. Therefore, as the number of COVID-19 cases in Saudi Arabia and other countries increases, dentists must stay up to date on the latest information concerning the disease. Continuous educational programmes should be provided to dentists to improve their understanding of infection management. Therefore, there should be specifications of the best and safest techniques to deal with COVID-19 patients during and after the outbreak. In addition, the results conclude that the accessibility of materials offered by dental healthcare authorities should be increased among dentists.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was approved by the Ethics Committee of Prince Sultan Military College of Health Sciences (IRB-2021-DOH-021).

HUMAN AND ANIMAL RIGHTS

No animals were used for studies that are the basis of this research. All the humans were used in accordance with the ethical standards of the committee responsible for human experimentation (institutional and national), and with the Helsinki Declaration of 1975, as revised in 2013 (http://ethics.iit.edu/ecodes/node/3931).

CONSENT FOR PUBLICATION

Informed consent was obtained from all participants of this study.

STANDARDS OF REPORTING

STROBE guidelines were followed.

AVAILABILITY OF DATA AND MATERIALS

Not applicable.

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None.

CONFLICT OF INTEREST

The authors declare no conflicts of interest, financial or otherwise.

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