ORIGINAL ARTICLE

DOI:10.33897/fujd.v4i1.343

Assessing COVID-19 Perceptions, Practices and Vaccine Reluctance Amongst Dental Students and Dentists in Karachi – A Mixed Method Study

Sanam Faheem[1], Rimsha Qasim[2], Syed Jaffar Abbas Zaidi[3], Shahida Maqsood[4], Suraiya Hirani[5]

Received: 26 Nov 2022 / Revised: 04 Jul 2023 / Accepted: 29 Jul 2023 / Published online: 27 Jan 2024

ABSTRACT

Objectives: The coronavirus disease (COVID-19) pandemic has posed a global threat to the lives of many. This mixed-methods study aimed to assess the parameters of knowledge, attitude, and practices concerning the COVID-19 pandemic, along with vaccine hesitancy among the dental fraternity of Karachi, Pakistan.

Materials and Methods: A cross-sectional survey was conducted among 300 dentists, dental students, and faculty of selected dental facilities and institutes in Karachi, Pakistan, from March 2021 to April 2021. A close-ended questionnaire evaluated the knowledge, attitude, and practice towards COVID-19. Results were assessed using a scoring system, and a chi-squared test was performed to detect significant ($p < 0.05$) differences among various variables. To explore the reasons behind the observed attitudes and practices, as well as vaccine hesitancy, semi-structured interviews were conducted with a subset of 21 respondents, selected using purposive sampling. The interview guide was developed to probe participants' understanding of COVID-19, their experiences and challenges in adhering to protocols, and their perceptions and concerns about the COVID-19 vaccine. All interviews were audio-recorded, transcribed, and analysed using thematic analysis.

Results: More than 80% of respondents displayed good knowledge regarding the mode of transmission, diagnostic methods, and symptoms of COVID-19. Less than 50% believed they had adequate training and protocols to treat the affected patients. COVID-19 guidelines on a personal level, like masking and distancing, were followed by almost 90% of the respondents. Several themes emerged from the interviews, including fear and anxiety related to contracting the virus, concerns about the efficacy and safety of the vaccine, perceived lack of support and resources to follow guidelines and scepticism about the government's handling of the pandemic.

Conclusion: We found that the subjects had adequate awareness of COVID-19, but their belief in the government's health policy was negligible. The qualitative findings shed light on the factors contributing to these attitudes and behaviours, including fear, lack of resources, and distrust. Policies should be implemented to improve practices, address fears and misinformation, and enhance the dental fraternity's contribution to the fight against the pandemic.

Keywords: Attitude, COVID-19, Dentists, Knowledge, Vaccine Hesitancy

[1]Senior Lecturer, [2]Lecturer, [3]Assistant Professor, [4]Associate Professor, Department of Oral Biology, Dow Dental College, Dow University of Health Sciences, Karachi, Pakistan

[5]Senior Lecturer, Department of Oral Biology, Sir Syed College of Medical Sciences, Karachi, Pakistan

Corresponding author: Rimsha Qasim, Department of Oral Biology, Dow Dental College, Dow University of Health Sciences, Baba-E-Urdu Road, Karachi, 74200, Pakistan. Email: rimsha.qasim@duhs.edu.pk

How to cite this Article:

Faheem S, Qasim R, Zaidi SJA, Maqsood S, Hirani S. Assessing COVID-19 Perceptions, Practices and Vaccine Reluctance Amongst Dental Students and Dentists in Karachi – A Mixed Method Study. Found Univ J Dent. 2024;4(1):3-16

ORIGINAL ARTICLE
DOI:10.33897/fujd.v4i1.343

INTRODUCTION

Viruses have afflicted humanity through major pandemics throughout history. In the past two decades, the SARS-CoV (Severe Acute Respiratory Syndrome Coronavirus) in 2002-2003 and the Middle East Respiratory Syndrome Coronavirus (MERS-CoV) in 2012 have posed significant risks to public health.[1] In 2019, the SARS-CoV hit the world again. As a Coronaviridae RNA virus, this Novel virus is single-stranded and zoonotic, which means it can transmit from animals to humans.[2] Primary symptoms of COVID-19 include fever, myalgia, dry cough, and abnormal chest scans.[3] It transmits from one human to another through air droplets generated by sneezing or coughing, touching contaminated surfaces, or coming in direct contact with an infected/asymptomatic person. Like other viruses, it may also be transmitted through saliva or blood.[4] In Pakistan, the first COVID-19 case was reported on 26 February 2020, and a complete lockdown followed on 23 March 2020.[5] Death is not the only grave consequence of this pandemic; it has also affected the psychological well-being of people. Furthermore, having no specific treatment has aggravated the catastrophic effect of this virus.[6,7]

The provision of dental care is a risky predicament during the pandemic.[8] Dentistry has been included in the high-risk category due to the close contact during treatment procedures. Common dental treatment procedures include using instruments like ultrasonic scalers, air polishing, high- and low-speed handpieces, and air-water syringes. Aerosols produced during dental procedures may contain pathogenic viruses and bacteria, posing a serious threat to dentists and other staff members.[9]

Despite the availability of recommended guidelines by the WHO (World Health Organization),[10] dentists are not fully complying with the mandatory measures.[4] Adequate knowledge and practices have played a vital role in controlling outbreaks.[11] Moreover, vaccines have become the first line of defence. Healthcare workers were the first to get vaccinated, but there is conflicting evidence regarding the acceptance of vaccines.[11] Factors such as lack of awareness, concerns regarding safety, and distrust in government bodies are responsible for vaccine hesitancy.[12] Therefore, this study aimed to explore perceptions, attitudes, and practices regarding COVID-19 and investigate COVID-19 vaccine hesitancy among dentists and dental students in Karachi, Pakistan.

MATERIALS AND METHODS

The study population comprised undergraduates, graduates, dental faculty, and practising dentists in the OPDs (Outpatient departments) and clinics of the South district of Karachi, Pakistan. A convenience sampling technique was employed to recruit undergraduates, graduates, and dentists. This cross-sectional study was conducted for two months, from March 2021- April 2021. A questionnaire designed on Google Forms was circulated through social media apps. For the qualitative portion, focus group interviews were conducted through online Zoom sessions for 45 minutes with those participants who consented and contacted through email. All interviews and surveys were done following the Declaration of Helsinki of 1964. Informed consent was obtained from all the participants. Ethical approval was obtained from Sir Syed Dental College's Ethics Review Committee Ref. No. SSCMS/ College/ Principal (Dental)/2022/059.

The questionnaire was developed in English, the primary language in Pakistan's higher education system. To ensure the accuracy of the questionnaire, a small sample of participants was selected for pretesting (n=25). The participants' socio-demographic and professional details were asked in the first section, including age, education, gender, marital status, job title, and years of experience. The second section comprised knowledge questions regarding COVID-19, including the mode of transmission, incubation period, and diagnostic methods. The third section included participants' perceptions, and the fourth section was about dentists' practices. The responses were categorised as correct responses with a value of 1 and wrong responses of 0.

In the qualitative component of the study, semi-structured interviews were conducted to gain an in-depth understanding of the participants' experiences, attitudes, practices, and views on the COVID-19 vaccine.

Data Collection: Semi-structured interviews were chosen for this stage of the study, as they allow for flexibility in questioning, enabling the interviewer to probe deeper into the participants' responses. An interview guide containing open-ended questions and

DOI:10.33897/fujd.v4i1.343

prompts relating to the study objectives was developed. This guide provided a basic structure for the interviews but allowed the discussion to evolve naturally based on the participants' responses. The interviews were conducted via Zoom™ video call, depending on the participants' preferences and the ongoing pandemic-related restrictions. The interviews were recorded digitally using audio recorders on mobile phones, followed by handwritten transcriptions. Theme analysis was carried out on the digital data using NVivo®. A framework analysis consists of five steps: familiarisation, identifying a theme framework, indexing, charting, and mapping.[14] In the familiarisation stage, the transcribing data were grouped into different themes based on the differences between the participants' responses.

Sampling: A purposive sampling strategy was used to select a subset of 21 participants from the larger group of 300 who participated in the quantitative survey. This strategy involved selecting participants who could provide rich, relevant, and diverse insights related to the research questions. The sample included a mix of dentists, dental students, and faculty members from selected dental facilities and institutes in Karachi, Pakistan.

Grounded Theory: In this study, the interviews were first transcribed verbatim. Then, using the principles of grounded theory, the transcriptions were reviewed line by line to identify initial concepts. Grounded theory is a systematic qualitative research methodology that involves collecting and analysing data to develop a theory grounded in the data itself.

These initial concepts were then grouped into more abstract categories based on their similarities and differences. These categories were further refined and connected to form a theoretical framework explaining the participants' knowledge, attitudes, and practices concerning COVID-19 and their perceptions and concerns about the COVID-19 vaccine. A thematic framework was then developed after identifying four main themes: Knowledge of COVID-19, Attitude towards COVID-19 protocols, Practices concerning COVID-19 and Vaccine Hesitancy. Codes were assigned to these themes, and indexing was performed for the numerical annotation of transcripts to identify consistencies. Responses were categorised and coded through the charting process by abstraction and discrimination. A revised thematic framework was devised in the stage of mapping and interpretation, in which the themes were interrelated and correlated to understand the different themes and their association based on participants' responses.

The process of data analysis in grounded theory is iterative, meaning that the researchers may go back and forth between the data and their emerging theoretical framework to refine their understanding. They may also use theoretical sampling to gather more data if they identify gaps in their understanding during the analysis process. Thus, the qualitative component of this study provided a detailed and nuanced understanding of the issues being studied, complementing the more general findings from the quantitative survey.

SPSS version 21 was used to analyse the data. Numbers and percentages were used to compute results on categorical measurements. Descriptive statistics were performed, and data were reported as percentages and frequency. Chi-square tests of significance (Fisher's exact test) were used with a 95% confidence interval ($p < 0.05$) to establish a significant relationship between tested variables.

RESULTS

Three hundred seventy participants were given an online survey on Google Forms, but only 300 responses were received (male: 44%, female: 56%) responded, producing a response rate of 81%. Of the 300, 117 were undergraduates, 159 were graduates, and 24 were postgraduates. The survey revealed that 7% of respondents were faculty members at dental institutes, 40% were dental students, 36% were dental interns, and 17% were general dental practitioners. The demographic data are shown in Table 1. Subjects examined in Angle Class I was 90 (66.2%), 38 (27.9%) subjects were examined in Class II and 8 (5.9 %) subjects were examined in Class III as shown in Table 2.

Table 2 shows the correct responses to the domain of knowledge from different perspectives. A closed-ended questionnaire assessed this with dichotomous options. There was a general awareness of the COVID-19 virus, but 2% did not correctly answer the source of transmission. Regarding its spread from person to person, 99% correctly answered, while 44 per cent did not know that it may affect more than once in life. Thirty-seven per cent of the respondents believed that the virus could lead to death. Eighty-eight per cent also

DOI:10.33897/fujd.v4i1.343

believed that symptoms appeared within 14 days. Nasopharyngeal swabs were regarded as a diagnostic tool by 84%. A majority (84%) of the participants were unsure if it was safe to communicate after recovery (Table 2)

The results of the participants' attitudes toward COVID-19 have also been summarised in Table 2. Almost 5% of the participants were neutral about temperature screening at the country's entry points. Only 22% agreed when asked whether dentists were prepared for the pandemic. Most people (98%) strongly agreed that hand hygiene was essential for prevention, and 279 participants seemed unsatisfied with government policies regarding COVID-19 and believed that the government needs to take more stringent measures to control this pandemic. Similarly, only 93 (31%) participants thought they had followed proper infection prevention protocols.

Regarding the practices summarised in Table 2, 52% did not wear an N-95 mask. 87% of the participants inquired about viral symptoms from their patients in their daily routine. Additionally, 52% said symptomatic patients should only be treated for dental emergencies. Forty-seven per cent of dental offices lacked handwashing stations or sanitisers in the waiting rooms, and seventy-two per cent said they would refer an emergency dental case of a suspected COVID-19 patient to a relevant hospital. According to 83% of respondents, masking and distancing the patient is the most effective way to prevent transmission in an OPD.

Based on a comparison of knowledge, attitude, and practices with different demographic variables in Table 3, participants aged 18-27 had adequate knowledge, showing a statistically significant p-value of 0.246. Moreover, single students (*p*-value: 0.001) and professionals with 1-2 years of experience (*p*-value 0.005) had adequate knowledge about the impact of COVID-19 on humans. Participants practising dentistry for 1-2 years and house officers reflected more awareness with significant p-values than other groups. However, no difference was seen with gender, except that females had a more positive attitude than males.

For in-depth interviews, 35 individuals were initially approached. Of these, 21 participants agreed to participate, with a response rate of 60%. The four main themes identified through qualitative analysis were:

Table 1: Socio-demographic variables of the study participants

Variable	Categories	N (%)
Age	18-27 years	279 (93%)
	28-37 years	9 (3%)
	38-47 years	12 (4%)
Education	Undergraduate	117 (39%)
	Graduate	159 (53%)
	Postgraduate	24 (8%)
Gender	Male	132 (44%)
	Female	168 (56%)
Marital status	Single	225 (75%)
	Married	72 (24%)
	Prefer not to say	3 (1%)
Designation	Faculty	21 (7%)
	Student	120 (40%)
	House officer	108 (36%)
	General practitioner	51 (17%)
Years of practice	1-2 years	252 (84%)
	3-4 years	27 (9%)
	5 years or more	21 (7%)

DOI:10.33897/fujd.v4i1.343

Table 2: Study participants' knowledge, attitudes, and practices regarding the COVID-19 pandemic

Qs	Statements	N	%
Knowledge		Correct answers	
K 1	COVID -19 infection is a pandemic	300	100%
K 2	Coronavirus is the main cause of this disease	294	98%
K 3	COVID -19 virus may spread from person to person	297	99%
K 4	COVID -19 may affect humans more than once in a life	168	56%
K 5	Air droplets or physical contact may act as the primary route of transmission of this disease	195	65%
K 6	Signs and symptoms of the disease are the same as seasonal flu (fever; cough, sore throat, muscle ache, etc.	270	90%
K 7	Symptoms of the disease may appear within 2 weeks of getting infected	264	88%
K 8	Diagnosis is made by nasopharyngeal swab	252	84%
K 9	The severe form of the disease can become fatal	111	37%
K 10	After 14 days, an infected person who was cured of the disease can communicate with others recovering	48	16%
Attitude			
A1	Yes, I think there should be temperature screening at the entry point of the country	286	95.3%
A2	Yes, we should avoid leaving our homes unnecessarily	270	90%
A3	Yes, I think dentists are prepared to deal with pandemic outbreaks like the coronavirus	66	22%
A4	Hand hygiene is necessary to prevent the spread of coronavirus	294	98%
A5	Standard isolation precautions are necessary to prevent infection transmission	279	93%
A6	I would get vaccinated once vaccination is available	199	66.3%
A7	I think available information is enough to treat patients during the pandemic	133	44.3%
A8	Yes, an intensive care unit is required for the diagnosed patient in a serious condition	246	82%
A9	Yes, there are proper guidelines or protocols to treat an infected patient	93	31%
A10	Yes, the government should take stricter preventive actions against this pandemic disease	279	93%
Practice			
P1	Yes, I wear an N95 mask as a preventive measure	144	48%
P2	I do take proper distance from an infected patient	282	94%
P3	Masking and distancing the patient is the most important respiratory precaution taken to prevent transmission in an OPD	249	83%
P4	PPE should be removed and discarded upon exit from the room of an infected patient	285	95%
P5	In dental practice & OPDs, patients are asked about symptoms (fever, dry cough & flu) related to coronavirus & their travel history	261	87%
P6	Yes, an asymptomatic patient without any dental emergency should not be treated	156	52%

DOI:10.33897/fujd.v4i1.343

P7	In dental practice, awareness signs related to the prevention of coronavirus are displayed at the patient's end	93	31%
P8	Alcohol-based sanitiser and handwashing facilities are available in waiting areas of dental practices	159	53%
P9	The same treatment protocols are followed to deal with emergency or elective patients	108	36%
P10	Emergency dental cases of suspected coronavirus patients are referred to relevant hospitals	216	72%

[a]*Chi-square test*

Knowledge of COVID-19, Attitude towards COVID-19 protocols, Practices concerning COVID-19 and Vaccine Hesitancy. The four themes with assigned codes and representative sentences are displayed in Table 4.

Table 3: Comparison of knowledge, attitude and practice with socio-demographic variables

Variables		**Knowledge**		**Attitude**		**Practice**	
		Adequate	Inadequate	Positive	Negative	Good	Poor
Education	Undergraduate	101	16	72	45	48	69
	Graduate	134	25	122	37	84	75
	Postgraduate	24	0	16	8	18	6
		0.085[£]		0.021[£]		0.005[£]	
Years of Practice	1-2 years	211	41	169	83	126	126
	3-4 years	27	0	21	6	9	18
	5 years > 5	21	0	20	1	15	6
		0.005[£]		0.017*		0.032*	
Designation	Student	21	0	14	7	12	9
	House officer	104	16	73	47	42	78
	Faculty	83	25	86	22	57	51
	General practitioner	51	0	37	14	39	12
		*<0.001**		*0.020**		*<0.001**	
Age	18-27 years	238	41	196	83	135	144
	28-37 years	9	0	8	1	9	0
	38-47 years	12	0	6	6	6	6
		0.246[£]		0.189[£]		*<0.006*[£]	
Gender	Male	107	25	83	49	69	63
	Female	152	16	127	41	81	87
		*0.018**		*0.017**		0.485*	
Marital status	Single	205	20	154	71	99	126
	Married	54	18	53	19	51	21
	Prefer not to say	0	3	3	0	0	3
		<0.001[£]		0.478[£]		*<0.001*[£]	

[a]*Chi Square test*

DOI:10.33897/fujd.v4i1.343

Table 4: Themes of COVID-19 hesitancy

Theme	Category	Codes	Representative Sentence
Knowledge of COVID -19	Understanding of transmission modes	FUA1	"I know that COVID-19 can be spread through droplets when an infected person coughs, sneezes, or talks."
	Recognition of symptoms	FUA2	"The common symptoms are fever, cough, loss of smell or taste, and difficulty in breathing."
Attitude towards COVID -19 protocols	Adherence to guidelines	FAB1	"I always ensure to wear a mask and maintain a safe distance from patients."
	Perception of training adequacy	FAB2	"I don't feel we were given enough training to handle this kind of pandemic situation."
Practices concerning COVID -19	Implementation of guidelines	FPA1	"In our facility, we have strict guidelines that we follow, like sterilising instruments and sanitising surfaces regularly."
	Personal protective mea sures	FPC1	"I always wear a mask, use sanitisers frequently, and avoid touching my face."
Vaccine Hesitancy	Safety concerns of COVID-19 vaccine	FGA1	“COVID-19 vaccines are unsafe for humans as they can cause severe immune disorders and allergies. People are dying from vaccines.”
	Fear of adverse events	FGA2	“I have heard COVID-19 will make you infertile.”
	Possibility of COVID-19 from vaccine	FGB2	“My friend at work recently contracted COVID-19 from the vaccine. Vaccines are spreading COVID-19.”
	Pharmaceutical companies influence vaccine policies	FGC1	“American and British companies are selling their vaccines for earning profit from third world countries.”
	Long -term efficacy of vaccines	FGD1	“If vaccines are so effective, then how come vaccine companies are recommending booster doses now and then?”

DISCUSSION

This study's demographic distribution of respondents is comparable to other studies conducted on similar populations. In 2020, Al-Hanawi and colleagues conducted a study on the knowledge, attitudes, and perceptions of healthcare workers toward COVID-19 in Saudi Arabia. In that study, the sample consisted of 57% males and 43% females, and students represented a significant portion of respondents, similar to this study.[13]

The general awareness of COVID-19 transmission and symptoms is also reflected in similar studies. In a study by Kamate and colleagues, most of the dental students (95%) knew about the common symptoms and mode of transmission of COVID-19.[3] However, this study found that only 37% recognised that the virus could lead to death, which is lower than expected considering the gravity of the situation and the worldwide reporting of COVID-19 mortality. This discrepancy might be due to differences in the sample or the time of the study, which can impact the evolving understanding of COVID-19. Moreover, 84% of respondents recognise nasopharyngeal swabs as a diagnostic tool is consistent with a study by Bhagavathula et al. (2020), indicating a high level of knowledge about COVID-19 diagnostic procedures among healthcare workers.[14]

DOI:10.33897/fujd.v4i1.343

The participants' attitudes towards COVID-19 and dissatisfaction with the government's policies mirror a global sentiment. A study by Pagnini et al. (2020) found a widespread belief that government measures were inadequate among healthcare workers in Italy, reflecting dissatisfaction with the response to the pandemic.[15] It indicates that healthcare professionals worldwide desire more proactive and effective governmental measures.

The practices observed in the study reflect both positive aspects (87% inquiring about symptoms, 83% practising masking and distancing) and areas of concern (52% not wearing N95 masks, 47% of dental offices lacking handwashing or sanitiser facilities). These are important findings that can guide interventions to improve practices among dental professionals. A study by Ahmed et al. (2020) similarly reported inadequate practices, suggesting the need for further training and resources to ensure adherence to recommended protocols.[16]

Regarding demographic correlations, a study by Tomar et al. (2020) found that younger age and being a student were associated with higher knowledge about COVID-19, which aligns with the findings of this study.[17] The gender differences in attitudes align with a study by Zhong et al. (2020), which found that females generally showed a more positive attitude towards disease prevention.[18]

In this study, researchers investigated how the dental fraternity deals with the COVID-19 virus daily and the routine application of their beliefs. An overwhelming majority of the respondents knew about the COVID-19 virus and its spread, which aligns with the findings in China, where 90% of the respondents were aware.[19] Most respondents (84%) were unsure whether communicating with a recovered patient was safe. It could be because of the early days of the pandemic and the lack of surety regarding interaction with the infected. Even though the Centers for Disease Control and Prevention (CDC) suggests a 14-day quarantine, recent research indicates that these patients may still be carriers.[20,21]

In our study, we investigated the awareness of the incubation period, the mode of transmission, and diagnostic methods for COVID-19. Participants of this study were better aware of the modes of transmission of COVID-19 (84%) compared to the study in Saudi Arabia, where half of the respondents were unaware of the person-to-person transmission source.[13] Although WHO recommends using the N95 mask as a preventive measure, approximately 52% of participants did not use N95 masks.[22] This finding was alarming and contrasted with the study in India.[23] We believe the lack of availability of N95 masks could be a reason for this difference. Contrary to a study in Nigeria, single participants were significantly more knowledgeable than those with partners. However, this can be due to our study's high number of single participants.[24] Only 22% of respondents said they were trained to deal with this pandemic based on WHO guidelines. The results of this finding were lower than those of a multinational study, in which 43% claimed to be trained.[3] This shows a lack of training on the government's part. This study found a low level of practice (50%) among the participants, which contrasts with studies in China and Pakistan.[25,26]

Participants believed that the government had not done enough to combat this epidemic. This finding was inconsistent with the one in China, where a considerable number of people believed that their government would be able to tackle this deadly virus.[19] Economic turmoil also renders less belief in the government, which could explain the difference. To disrupt the transmission chain, isolating the patient and providing palliative treatment is essential.[27] It was encouraging to find out that 83% of respondents in our study agreed that masking and isolating the patient was necessary, and a further 95% believed that personal protective equipment (PPE) should be discarded after exiting the room of a COVID-19-positive patient. Surprisingly, fresh graduates were more knowledgeable than postgraduates in this study, and this finding was inconsistent with a study in India where postgraduates exhibited a higher knowledge score.[28] The Main reason for the contrasting difference could be that undergraduate students were more in number than postgraduate students in our study.

Knowledge of COVID-19: The first theme identified through qualitative analysis of interviews was “Knowledge of COVID-19”. Two categories were identified: "Understanding of Transmission Modes” and “Recognition of Symptoms.”

"I know that COVID-19 can be spread through droplets when an infected person coughs, sneezes, or talks."

(FUA1)

DOI:10.33897/fujd.v4i1.343

This response indicates an accurate understanding of the primary mode of COVID-19 transmission, which is crucial for implementing effective prevention measures. As per WHO guidelines and various research papers, this knowledge is essential for healthcare providers, including dentists who work close to patients' oral cavities. However, this statement doesn't touch upon airborne transmission or transmission via surfaces, which might be areas where knowledge enhancement could be beneficial.

"The common symptoms are fever, cough, loss of smell or taste, and difficulty in breathing." (FUA2)

The respondent correctly identifies some of the common symptoms of COVID-19, as per the CDC and WHO guidelines. This knowledge is critical for self-monitoring and for recognizing potential COVID-19 cases among patients. However, it would be useful to delve deeper into whether respondents are aware of other symptoms and non-specific presentations of the disease, particularly as new variants emerge.

Attitude towards COVID-19 protocols: Two categories identified under this theme are "Adherence to guidelines" and "Perception of training adequacy".

"I always ensure to wear a mask and maintain a safe distance from patients)." (FAB1)

This indicates a positive attitude towards following recommended preventive measures, which is crucial for reducing the risk of transmission in healthcare settings. Research suggests a strong correlation between healthcare providers' attitudes and their adherence to COVID-19 guidelines. However, it would be important to probe further into other preventive measures being practised, such as hand hygiene and the use of other personal protective equipment.

"I don't feel we were given enough training to handle this kind of pandemic situation." (FAB2)

This highlights a significant concern about the lack of adequate training reported by healthcare workers globally during the pandemic. The feeling of being inadequately prepared can lead to increased anxiety and burnout among healthcare professionals. It underscores the need for continued professional development and support during public health emergencies.

Practices concerning COVID-19: The two categories identified under this overarching theme were Implementation of guidelines" and "Personal protective measures".

"In our facility, we have strict guidelines that we follow, like sterilising instruments and sanitising surfaces regularly." (FPA1)

This statement indicates that the respondent is working in an environment that has put infection prevention measures in place. This practice aligns with global recommendations for maintaining safe dental practices during the pandemic. However, the statement would need to be cross-checked with actual observations or audits to validate the self-reported practice.

"I always wear a mask, use sanitisers frequently, and avoid touching my face." (FPC1)

This is an important reflection of personal preventive behaviours. These behaviours, particularly mask-wearing and hand sanitising, have been shown in numerous studies to reduce the risk of COVID-19 transmission significantly. The adherence to these practices is encouraging, although the survey should ensure the respondent's understanding of proper techniques and situations requiring these precautions.

Vaccine Hesitancy: Under this theme, five categories were identified: Safety concerns about the COVID-19 vaccine, Fear of adverse events, the possibility of COVID-19 from the vaccine, pharmaceutical companies influencing vaccine policies and the long-term efficacy of vaccines.

"COVID-19 vaccines are unsafe for humans as they can cause severe immune disorders and allergies. People are dying from vaccines." (FGA1)

The main reasons for the safety concerns of COVID-19 were attributed to the lack of information about the new vaccines, with claims of allergies, severe side effects, immune disorders, and even death. Arguments were associated with general vaccination safety, inadequate testing, and preliminary clinical trials.

The representative statement underlines deep-rooted vaccine hesitancy characterised by beliefs that COVID-19 vaccines are unsafe and can cause severe health issues, even death. According to the representative sentence, these concerns stem primarily from a perceived lack of information about the vaccines, suspicions about the safety of vaccinations in general, perceived inadequacy of vaccine testing, and doubts

DOI:10.33897/fujd.v4i1.343

about the preliminary clinical trials.

While it is true that vaccines, like any medication, can cause side effects, severe reactions such as anaphylaxis are exceedingly rare. For the vast majority of people, the benefits of vaccination far outweigh the risks, especially considering the severe outcomes of a COVID-19 infection, including the risk of death. Multiple studies and ongoing real-world evidence affirm the safety and efficacy of approved COVID-19 vaccines.

Moreover, the development and testing processes for these vaccines have been rigorous, with extensive preclinical and clinical trials conducted according to international standards and under the scrutiny of regulatory bodies. Although the development was accelerated, no steps were skipped.

The representative statement thus reflects misinformation or misunderstanding about COVID-19 vaccines, which could undermine vaccination efforts and public health. It underscores the urgent need for accurate, accessible, and persuasive public health communications to dispel myths and build confidence in COVID-19 vaccines. In addition, it highlights the necessity of transparency and openness about vaccine development processes, side effects, and the system in place for reporting and monitoring adverse events. The source of information also matters greatly, as studies have shown that healthcare professionals are among the most trusted sources of health information for the public. Therefore, ensuring that healthcare professionals are well-informed and equipped to address patients' vaccine concerns is paramount.

“I have heard COVID-19 will make you infertile.” (FGA2)

This statement reveals a common concern about vaccine side effects, which has significantly contributed to vaccine hesitancy globally, as reported in several studies. It suggests a need for effective communication strategies to educate healthcare professionals about vaccine safety and potential side effects using evidence-based information. These adverse events were related to misinformation and fake news on social media. Other commonly reported adverse events include death within two years of vaccination, infertility after vaccination, and even amnesia. The fear of adverse events was linked to undue belief in natural immunity over vaccines and a lack of confidence in the government. This reflects a lack of trust in government policies, identified in research as a critical factor influencing vaccine acceptance. Governments' transparency and effective communication are crucial for building public trust and ensuring successful vaccine uptake, especially among healthcare providers, who are often role models for their patients and the general public.

Due to the potential adverse effects of vaccines, some dentists proposed better ways to prevent COVID-19 than using vaccines, such as maintaining physical distancing and using masks.

“My friend at work recently contracted COVID-19 from the vaccine. Vaccines are spreading COVID-19.” (FGB2)

The third category of vaccine hesitancy relates to the possibility of COVID-19 through vaccinations. Some research participants reported cases of friends and family members contracting COVID-19 even after vaccination. The statement presents a perspective highlighting a common misconception about COVID-19 vaccination: the notion that the vaccine can cause or spread the disease. The claim appears to stem from a personal anecdote, referring to a friend contracting the virus post-vaccination, which is conflated with the causal effect of the vaccine. This statement underscores the depth of misinformation or misunderstanding about the nature and function of vaccines. COVID-19 vaccines teach our immune systems how to recognise and fight the virus that causes COVID-19. They do not contain live viruses and, thus, cannot cause or spread the infection.

There are several reasons why someone might test positive after vaccination. Firstly, no vaccine is 100% effective, and breakthrough infections can occur, although they are typically less severe. Secondly, most vaccines require some time (up to two weeks after the second dose) to provide complete protection. Thus, if a person is exposed to the virus just before or after getting the vaccine, they could still contract and test positive for the virus.

The anecdotal nature of the claim ("my friend at work") reflects another common issue in health-related beliefs: personal experiences or stories often hold more sway than abstract statistics or facts despite not necessarily representing the broader reality. This emphasises the importance of clear, empathetic communication in public health messaging, including addressing individual concerns and experiences.

DOI:10.33897/fujd.v4i1.343

Lastly, this statement signals potential mistrust in the scientific community or public health authorities, suggesting a broader challenge in building public trust and adherence to recommended public health measures. Health literacy, media literacy, and transparent communication from trusted sources become essential in this context.

"American and British companies are selling their vaccines for earning profit from third world countries." (FGC1)

The fourth category of the vaccine hesitancy theme is pharmaceutical companies influencing vaccine policies. Some regarded mandatory vaccination as a marketing strategy used by Western pharmaceutical industries to sell their products to third-world countries at higher rates. This statement expresses a belief that pharmaceutical companies from developed countries (specifically the US and UK) are exploiting the COVID-19 pandemic for profit, particularly in third-world or low-income countries.

It is critical to acknowledge that vaccine production is indeed a business for pharmaceutical companies, and they do seek a return on their research and development investments. Some pharmaceutical companies, such as Pfizer and Moderna (American), have generated significant revenues from their COVID-19 vaccines. AstraZeneca, a British-Swedish multinational company, has also sold its vaccine worldwide, although it pledged to provide it at cost during the pandemic.

However, the assertion that these companies are profiteering specifically from third-world countries might not be entirely accurate. Multiple initiatives have been undertaken to ensure equitable global distribution of vaccines. For instance, COVAX, led by the World Health Organization, GAVI, and the Coalition for Epidemic Preparedness Innovations (CEPI), aims to facilitate fair and equitable access to COVID-19 vaccines for every country, regardless of income level. Moreover, AstraZeneca has licensed its vaccine to the Serum Institute of India, enabling greater access in lower-income countries.

Despite these efforts, there is a significant disparity in vaccine distribution, with wealthier nations having more access than poorer countries. This global inequity is an issue that needs addressing. Still, it's less a direct result of profiteering by vaccine companies and more related to systemic problems in international health policy, global supply chains, and intellectual property rights.

The sentiment in the statement indicates mistrust and scepticism toward the intentions of pharmaceutical companies and possibly even toward the vaccines themselves. Such mistrust can undermine vaccination efforts and public health. Thus, it is essential to improve transparency in vaccine pricing, distribution, and intellectual property rights and communicate these matters effectively to the public.

"If vaccines are so effective, then how come vaccine companies are recommending booster doses now and then?" (FGD1)

The fifth and last category was the long-term efficacy of vaccines. The participants claimed that since these vaccines had not been tested in third-world countries, their effectiveness in our population is questionable. The statement reflects scepticism towards the need for booster doses of the COVID-19 vaccine, questioning their effectiveness and potentially attributing the recommendation for boosters to motivations other than public health. In assessing the validity of this scepticism, it's essential to understand the principles of vaccine science and the specific context of the COVID-19 pandemic. Vaccine effectiveness is typically measured by its ability to prevent or significantly reduce the severity of the disease in question. In the case of COVID-19, vaccines have been remarkably effective, substantially reducing severe disease, hospitalisation, and death across populations.

That said, the immune response to vaccination can wane over time, reducing protection. This phenomenon is not unique to COVID-19 vaccines; it is why booster doses are standard for many vaccines, such as tetanus or pertussis. Moreover, the COVID-19 situation is evolving, with new variants emerging. Some of these variants may partially evade the immunity provided by vaccination or natural infection, making booster shots a vital strategy to maintain a high level of immunity in the population.

Therefore, the recommendation for COVID-19 booster doses does not imply that vaccines are ineffective. Instead, it's a proactive measure to maintain their effectiveness amidst waning immunity and the emergence of new variants. Public health authorities

DOI:10.33897/fujd.v4i1.343

and vaccine manufacturers must communicate these nuances clearly and transparently to counteract misconceptions and foster trust in vaccination efforts.

The qualitative component of the study adds depth to quantitative findings by revealing underlying beliefs and concerns, such as fear, mistrust, and perceived lack of resources. These themes are consistent with those found in qualitative studies among healthcare workers in other contexts; for example, a survey by Karasneh et al. (2021) found similar themes among dental professionals in Jordan, indicating shared concerns across different settings.[29]

In summary, this study's findings align with and contribute to the growing body of literature on healthcare professionals' knowledge, attitudes, and practices during the COVID-19 pandemic, shedding light on specific challenges and concerns within the dental fraternity.

This study has some limitations. The data collected is self-reported; thus, it is susceptible to recall bias and social desirability bias. Participants might have over-reported their knowledge, attitudes, or practices regarding COVID-19. However, the interviews have brought to light the richness of the experiences of the research participants. The study was conducted in Karachi, Pakistan, and therefore, the findings may not be generalised to dental professionals in countries with different cultural, socioeconomic, or health system contexts. The study is cross-sectional, and therefore it captures the knowledge, attitudes, and practices at a specific point in time. The responses might change as the situation evolves and more information about COVID-19 becomes available. This cross-sectional study could not assess how knowledge, attitudes, and practices might change over time as the pandemic progresses or as more information about COVID-19 is disseminated.

CONCLUSION

This study found that dental undergraduates and graduates had adequate knowledge of COVID-19. However, the majority did not practice the WHO guidelines adequately. Substantial awareness campaigns with rigid governance and policy can help curb this outbreak.

DISCLAIMER

None to declare.

CONFLICT OF INTEREST

There is no conflict of interest among the authors.

ETHICAL STATEMENT

Ethical approval was obtained from Sir Syed Dental College's Ethics Review Committee Ref. No. SSCMS/College/Principal (Dental)/2022/059.

FUNDING DISCLOSURE

The author(s) received no financial support for the research, authorship, and/or publication of this article.

AUTHORS CONTRIBUTION

Conception and design of the study: S. Faheem

Acquisition of data: S. Hirani

Analysis and interpretation of data: S. Faheem

Drafting of the manuscript: R. Qasim

Critical review of the manuscript: S.J.A Zaidi, S. Maqsood

Approval of the final version of the manuscript to be published: S. Faheem, R. Qasim, S.J.A Zaidi, S. Maqsood, S. Hirani

REFERENCES

1. Cascella M, Rajnik M, Cuomo A, Aleem A, Scott C, Napoli R. Features, evaluation and treatment coronavirus (COVID-19). Uniformed Services University Of The Health Sciences. [Updated 2021 Mar 1]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing. Available from: https://www.ncbi.nlm.nih.gov/books/NBK554776
2. Ather A, Patel B, Ruparel NB, Diogenes A, Hargreaves KM. Coronavirus Disease 19 (COVID-19): Implications for clinical dental care. J Endod. 2020;46(5):584-595. doi: 10.1016/j.joen.2020.03.008
3. Kamate SK, Sharma S, Thakar S, Srivastava D, Sengupta K, Hadi AJ, et al. Assessing Knowledge, Attitudes and Practices of dental practitioners regarding the COVID-19 pandemic: A multinational study. Dent Med Probl. 2020; 57(1):11-7. doi: 10.17219/dmp/119743
4. Khader Y, Al Nsour M, Al-Batayneh OB, Saadeh R, Bashier H, Alfaqih M, et al. Dentists' Awareness, Perception, and Attitude Regarding COVID-19 and Infection Control: Cross-Sectional Study Among

DOI:10.33897/fujd.v4i1.343

Jordanian Dentists. JMIR Public Health Surveill. 2020;6(2):e18798:1-7. doi: 10.2196/18798

5. Waris A, Atta U, Ali M, Asmat A, Baset A. COVID-19 outbreak: current scenario of Pakistan. New Microbe and New Infect. 2020;35(5):100681:1-6. DOI: 10.1016/j.nmni.2020.100681
6. Cao W, Fang Z, Hou G, Han M, Xu X, Dong J, et al. The psychological impact of the COVID-19 epidemic on college students in China. Psych Res. 2020(5);287:112934. doi: 10.1016/j.psychres.2020.112934
7. Giao H, Han NTN, Van Khanh T, Ngan VK, Van Tam V, Le An P. Knowledge and attitude toward COVID-19 among healthcare workers at District 2 Hospital, Ho Chi Minh City. Asian Pac J Trop Med. 2020;13(6):260-65.
8. 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(10):561-65.
9. Harrel SK, Molinari J. Aerosols and splatter in dentistry: a brief review of the literature and infection control implications. J Am Dent Assoc. 2004;135(4):429-37. doi: 10.14219/jada.archive.2004.0207
10. Organisation WH. Clinical management of severe acute respiratory infection when novel coronavirus (nCoV) infection is suspected, Interim guidance, 13 March 2020. https://apps.who.int/iris/handle/10665/331446. License: CC BY-NC-SA 3.0 IGO
11. Wolf TG, de Col L, Banihashem Rad SA, Castiglia P, Arghittu A, Cannavale M, et al. How the COVID-19 Pandemic Affects Risk Awareness in Dentists: A Scoping Review. Int J Environ Res Public Health. 2022;19(9):1-14. doi:10.3390/ijerph19094971
12. Peretti-Watel P, Seror V, Cortaredona S, Launay O, Raude J, Verger P, et al. A future vaccination campaign against COVID-19 at risk of vaccine hesitancy and politicisation. Lancet Infect Dis. 2020;20(7):769-70. doi: 10.1016/S1473-3099(20)30426-6
13. Sana A, Shakoors A, Shafique H, Jamil Y, Hassan H, Khan AS. COVID-19 Vaccine Acceptability in Dental Auxiliaries in Pakistan. are we Ready Yet. PJMHS. 2022;16(2):1066-68. doi: https://doi.org/10.53350/pjmhs221621066
14. Molete MP, Daly B, Hlungwani TM. Oral health promotion in Gauteng: a qualitative study. Glob Health Promot. 2013;20(1):50-8. doi: 10.1177/1757975913476906
15. Zhong B-L, Luo W, Li H-M, Zhang Q-Q, Liu X-G, Li W-T, et al. Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: a quick online cross-sectional survey. Int J Biol Sci. 2020;16(10):1745-52. doi: 10. 7150/ijbs.45221
16. Salman M, Mustafa ZU, Asif N, Zaidi HA, Hussain K, Shehzadi N, et al. Knowledge, attitude and preventive practices related to COVID-19: a cross-sectional study in two Pakistani university populations. Drugs & Therapy Perspectives. 2020;36(7):319-25. doi: 10.1007/s40267-020-00737-7
17. Kolifarhood G, Aghaali M, Saadati HM, Taherpour N, Rahimi S, Izadi N, et al. Epidemiological and clinical aspects of COVID-19; a narrative review. Arch Acad Emerg Med. 2020;8(1):e41;1-9.
18. Al-Hanawi MK, Angawi K, Alshareef N, Qattan AMN, Helmy HZ, Abudawood Y, et al. Knowledge, Attitude and Practice Toward COVID-19 Among the Public in the Kingdom of Saudi Arabia: A Cross-Sectional Study. Front. Public Health. 2020;8:217;1-10. doi: 10.3389/fpubh.2020.00217
19. Cook TM. Personal protective equipment during the coronavirus disease (COVID) 2019 pandemic - a narrative review. Anaesthesia. 2020;75(7):920-27. doi: 10.1111/anae.15071
20. Modi PD, Nair G, Uppe A, Modi J, Tuppekar B, Gharpure AS, et al. COVID-19 Awareness Among Healthcare Students and Professionals in Mumbai Metropolitan Region: A Questionnaire-Based Survey. Cureus. 2020;12(4):1-18. DOI: 10.7759/cureus.7514
21. Chioma Ngozichukwu Pauline M, Chimaobi Marie-Claire A, Ikechukwu Innocent M, Chizalu Ifeyinwa N, Amaka Yves-Ann E, Ifeoma Bridget U, et al. COVID-19 infection: Knowledge, attitude, practices, and impact among healthcare workers in a South-Eastern Nigerian state. TJ Infect Dev

DOI:10.33897/fujd.v4i1.343

Ctries. 2020;14(09):943-52. doi: 10.3855/jidc.13248

22. Zhang M, Zhou M, Tang F, Wang Y, Nie H, Zhang L, et al. knowledge, attitude, and practice regarding COVID-19 among healthcare workers in Henan, China. J Hosp Infect. 2020;105(2):183-87. doi: 10.1016/j.jhin.2020.04.012
23. Saqlain M, Munir MM, Rehman SU, Gulzar A, Naz S, Ahmed Z, et al. Knowledge, attitude, practice and perceived barriers among healthcare workers regarding COVID-19: a cross-sectional survey from Pakistan. J Hosp Infect. 2020;105(3):419-23. doi: 10.1016/j.jhin.2020.05.007
24. Sarate S, Pawar BR, Salavadi SS, Sarate K, Dubey YK, Wankhede TD, et al. awareness and attitude of dental professionals towards pandemic outbreak of covid-19 in central India-A questionnaire study. IP Int J Periodontol Implantol . 2020;5(3):124-28. https://doi.org/10.18231/j.ijpi.2020.028
25. Gambhir RS, Dhaliwal JS, Aggarwal A, Anana S, Anana V, Bhangu K. Covid-19: a survey on knowledge, awareness and hygiene practices among dental health professionals in an Indian scenario. Rocz Panstw Zakl Hig. 2020;71(2):223-29. doi: 10.32394/rpzh.2020.0115
26. Saqlain M, Ahmed A, Nabi I, Gulzar A, Naz S, Munir MM, et al. Public Knowledge and Practices Regarding Coronavirus Disease 2019: A Cross-Sectional Survey From Pakistan. Front Public Health. 2021;9:629015. doi: 10.3389/fpubh.2021.629015.
27. Chen Y, Zhang R, Lou Y, Li W, Yang H. Facilitators and barriers to the delivery of palliative care to patients with Parkinson's disease: a qualitative study of the perceptions and experiences of stakeholders using the socio-ecological model. BMC Health Serv Res. 2023;23(1):215. doi: 10.1186/s12913-023-09203-2.
28. Padmanaban S, Rajendran P, Davis P, Velayutham P. Knowledge, attitude and practices towards COVID-19 among higher education students in India: a cross sectional study. Z Gesundh Wiss. 2022;30(7):1661-1673.