

Implications of the COVID-19 Pandemic on the Mental Health and Professional Psychomotor Skills of Dental Students

Fahad Abdulaziz Alrashed¹
 Kamran Sattar²
 Syed Rashid Habib³
 Tauseef Ahmad²
 Abdulaziz Saud Al Rashoud³
 Turki ali Y SAFHI³
 Abdulrhman Hamad M Almajed³
 Hamad Ali H Alnafisah³
 Norah Hamad Alharbi³
 Abdulrahman Alsubiheen⁴

¹Department of Cardiac Sciences,
 College of Medicine, King Saud
 University, Riyadh, Saudi Arabia;

²Department of Medical Education,
 College of Medicine, King Saud
 University, Riyadh, Saudi Arabia;

³Department of Prosthetic Dental
 Sciences, College of Dentistry, King Saud
 University, Riyadh, Saudi Arabia;

⁴Department of Rehabilitation Sciences,
 College of Applied Medical Sciences, King
 Saud University, Riyadh, Saudi Arabia

Purpose: To estimate dental students' self-perception of mental well-being (MWB) and its effects on their clinical psychomotor skills (CPS) once they (or their family members) get infected with COVID-19.

Materials and Methods: This is a cross-sectional (n =268) study from a public dental college in Riyadh. We collected data on MWB and CPS. An 18-item online survey was used to collect the responses from the participants. The inter-rater reliability for the finalised survey came out to be 0.86.

Results: The participants (54.3%) who were infected with COVID-19 recorded that their CPS were significantly affected (almost 4 times higher) as compared to others ($OR= 4.02$; $P=0.0004$). However, 42.2% reported infection control measures at clinics resulted in bringing significant ($OR=2.22$, $P=0.04$) psychological upsets, for those who were infected with COVID-19. Participants (45.1%) also reported that they have difficulty in recalling old memories or information due to the COVID-19 pandemic; among them, 46.7% were the ones who (and/or any family member) were exposed to COVID-19.

Conclusion: The study spotlighted the extent of dental students' MWB and its significant effect on their CPS once (themselves or a family member) infected with COVID-19. Moreover, levels of infection control measures at clinics resulted in psychological upsets for dental students.

Clinical Significance: The issue is fundamental as participants enter the clinical workforce and face the ever-increasing demands of dental practice.

Keywords: dental students, clinical psychomotor skills, mental well-being, pandemic, COVID-19

Background

In the midst of confining due to the COVID-19 pandemic, regular educational activities for students of undergraduate and postgraduate dentistry were significantly disrupted around the world.¹ Currently, healthcare in general, and oral healthcare in particular, is being profoundly reshaped by a convergence of economic, demographic, and technological trends.² In such demanding and challenging times, E-learning, and in particular, the use of internet sources, boost learning and comprehension for students.³ This transformation was a rapid response, so was not devoid of limitations and drawbacks, specially for academic fields requiring face-to-face sessions. Acquiring authentic dental education⁴ requires realistic, practical participation. Students' understanding of the topic of dental education tends to be

Correspondence: Fahad Abdulaziz
 Alrashed
 Department of Cardiac Sciences, College
 of Medicine, King Saud University, Riyadh,
 Saudi Arabia
 Email faaalrashed@ksu.edu.sa

improved by pragmatic involvement.⁵ Hence, this recent transition from face-to-face classes on campus to online distance learning sessions not only brought facilitation in the demanding times as well as generated challenges for dental students to cope with their clinical psychomotor skills (CPS).⁶ The intern doctor and the patient, as well as the teacher, will have frequent interaction. In a pandemic situation, this is also the most daunting aspect of dental education to contend with.⁷

Dental environments have particular features that necessitate extra attention to infection control. Although dentists are knowledgeable, they are yet prone to various infectious diseases, as hepatitis B and C. Many other occupations do not have to worry about infection to the same extent.⁷⁻⁹ Dental practitioners and dental students face an elevated risk from dental patients for viral infections because their practice and everyday training require face-to-face contact with patients involving contact with saliva and blood. SARS-CoV-2 transmission can thus occur during dental procedures through inhalation of infected individuals' aerosol/droplets or direct interaction with mucous membranes, oral fluids, and contaminated instruments and surfaces.^{9,10} The WHO was urged by the unique and uncertain existence of this pandemic to warn about the potential outbreak of workplace stress and psychiatric disorders.¹¹ The New York Times prompted that dentists are the most vulnerable individuals when it comes to COVID-19 risk.¹²

Human beings are mostly living in close association with other family members, depending on various cultures. Hence, there are always chances of any viral disease to affect mentally and physically from one person to another in a family or group of people. When it comes to COVID-19, the transmission rate or attack gets higher, with worse clinical outcomes in the family cluster.¹³ Individuals with COVID-19 infection (at risk) family members were three-fold more likely to have mental health-related symptoms.¹⁴

Dental education is progressing at a rapid rate.¹⁵ Dental students and teachers are also using these available digital resources for communication on an everyday basis. Despite these new developments focused on education-related issues, no information remains vivid about the actual effect of these resources on the learning development of students. Research in the domains of dentistry not only allows for reliable monitoring of the prevalence and spread of oral disease, but it also permits stakeholders for the preparation and evaluation of various educational

challenges.¹⁶ Moreover, the negative impacts of the COVID-19 pandemic on dental students' performance in clinical settings are not much explored. Studies have shown good experiences but in with grave limitations.¹⁷

At College of Dentistry, we have a five-year program. Students are required to attend clinical training in different courses, with real and simulated patients and mannequins, which starts from 2nd year onwards. According to our best knowledge, this is the first study in Saudi Arabia, and we explored dental students' self-perception of MWB and its effects on their CPS once they (or their family members) get infected with COVID-19. This is significant, as there is currently very little published work available, and the findings from this investigation can improve current and post-pandemic learning and teaching, especially in programs that rely heavily on clinical training. This is especially significant in undergraduate dental education.

Methods

Study Design and Settings

This was a cross-sectional type observational study conducted from September to December 2020.

Study Participants

A total of 309 participants agreed for this study. We employed a convenience sampling. Inclusion criteria consisted of; undergraduated dental students, from year 2 to 5. Dental interns were also included in this study. Dental students who were in year 1 were not requested as they are not getting trained in the dental clinics for clinical psychomotor skills. All the agreed participants were informed about the objectives of the study. Later on, we included completed responses from 268 participants for this study. All the participants were informed about the study and an ethical approval was also received from the institutional review board (IRB # E-20-5321). Verbal, as well as written consents were obtained from all participants before data collection. This study was conducted in accordance with the Declaration of Helsinki.

Instrument

A panel of 3 experts working as medical educationists held a 4 hour meeting to form survey items. Initially, 30 item survey (1st version) was prepared in the light of available literature. In 2 subsequent meetings (week apart), this panel discussed and agreed upon deleting 3 items and keep 27 items for the 2nd version. To achieve reliability

and validity of the survey items, the 2nd version was pilot tested with 17 students from year 2nd and 3rd, and 4 interns of College of Dentistry. After standardising all items, reasonably a good inter-rater reliability score was achieved (Cronbach's $\alpha=0.71$). Face validation of the questionnaire was performed by two independent experts among the team of experts. After carefully evaluating the results from the pilot study, face validation of the instrument was carried out and 5 items were removed, as they were found to be duplicating or ambiguous. Thus, a 22 item survey was used to collect the data from the agreeing participants. The inter-rater reliability for the finalised survey came out to be 0.86.

We used Google forms for collecting the data. The finalised questionnaire sought responses using a Five-Point Likert Scale.¹⁸ The demographic details (using 4 items) were collected for gender, age, study level, and a question asking the participants, "Have you and or your family member were infected with COVID-19". Here family member depicts blood relatives living in the close vicinity of the participants (Table 1). The following 11 items were designed to explore participants' personal feelings amid the COVID-19 pandemic outbreak (Table 2). Whereas the last part (7 items) addressed the items related to the participants' interaction with patients at the dental clinic and their knowledge/skills during the COVID-19 pandemic outbreak (Table 3).

Table 1 Demographic Information of Participants

Variable	Description	Number (%)
Gender	Male	111(41.4)
	Female	157(58.6)
Age	≤ 20	7 (2.6)
	21 to 25	259 (96.6)
	26 to 30	2 (0.7)
Level of Study	2nd Year	6 (2.23)
	3rd Year	49 (18.3)
	4th Year	68 (25.4)
	5th Year	78 (29.1)
	Intern	67 (25.0)
Have you and/or your *family member were infected with COVID-19	Yes	92(34.3)
	No	176(65.7)

Notes: *Blood relative, living in close vicinity.

Data Collection

Participant's responses were collected using online distribution of the questionnaire. This online survey consisted of informed consent stating that the participation was on a volunteer basis. There was no incentive for the participants. The collected information was kept secure and confidential.

Statistical Analysis

Once the data were collected, we entered and analysed it using SPSS version 22.0 (IBM. Armonk, NY, USA). The prevalence of a result variable was estimated along with confidence intervals of 95%. Pearson's chi-square test and odds ratios (ORs) were used to determine and quantify the associations between a definite outcome and the variables being considered. During the entire study, the statistical significance level has been established as $P<0.05$.

Results

A total of 268 (out of 309 initially agreed participants) completed surveys were included with a response rate of 86.73%. Among 268 participants, 111 (41.4%) were male, and 157 (58.6%) female. The most (96.6%) contributing age group was 21 to 25. Out of the total participants, 92 (34.3%) reported a direct or indirect association of infection (Table 1). It was recorded that male participants have a higher (52.2%) rate of exposure as were themselves and/or their family members infected with COVID-19, as compared to female participants who were themselves (and/or any of their family members) were infected (47.8%). This shows a significantly higher rate in male participants ($OR=1.95$; $P=0.01$) (Table 1).

It was also found that the age group (21–25 years) had more chances for infection ($OR= 3.25$; $P=0.27$).

Utilization of the online resources (to get information about coronavirus) was 2.6 times significantly higher ($OR=2.61$; $P=0.006$) by the infected participants, as compared to those who remained uninfected (Table 4).

Experience of insomnia was found to be 3.53 times more among those who themselves (or a family member) were infected. Concerning the self-reported depression during the current pandemic, 23.1% of the participants stated positive affirmation, and among them, the ones who were directly exposed have stated prevalence of depression ($OR=1.78$; $P=0.06$). Moreover, 37.2% of students have perceived feeling of hopelessness, and among

Table 2 Students Personal Feeling About Own Health During the COVID-19 Pandemic Outbreak

			Has Anyone in Your Family Infected with COVID-19			
Variable	Description	Number (%)	Yes n(%)	No n(%)	χ^2 (P-value)	
I have poor concentration on your work in clinic during COVID-outbreak	Agree	85(31.7)	36(39.1)	49(27.8)	3.56(0.16)	
	Neutral	71(26.5)	22(23.9)	49(27.8)		
	Disagree	112(41.8)	34(37.0)	78(44.3)		
I am afraid of the dental clinic because there is a possibility of getting infected with COVID-19	Agree	140(52.2)	56(60.9)	84(47.7)	5.67(0.05)	
	Neutral	56(20.9)	19(20.7)	37(21.0)		
	Disagree	72(26.9)	17(18.5)	55(31.3)		
I feel a slowness in the execution of movement	Agree	87(32.5)	36(39.1)	51(29.0)	3.20(0.20)	
	Neutral	62(23.1)	21(22.8)	41(23.3)		
	Disagree	119(44.4)	35(38.0)	84(47.7)		
I have frequent thoughts of being infected during COVID-19 pandemic	Agree	145(54.1)	55(59.8)	90(51.1)	2.61(0.27)	
	Neutral	62(23.1)	21(22.8)	41(23.3)		
	Disagree	61(22.8)	16(17.4)	45(25.6)		
I have a feeling of being in a confused state most of the time	Agree	104(38.8)	37(40.2)	67(38.1)	11.77(0.003)	
	Neutral	57(21.3)	29(31.5)	28(15.9)		
	Disagree	107(39.9)	26(28.3)	81(46.0)		
I have a sense of being emotionally detached from family and friends	Agree	108(40.3)	50(54.3)	58(33.0)	11.95(0.003)	
	Neutral	57(21.3)	13(14.1)	44(25.0)		
	Disagree	103(38.4)	29(31.5)	74(42.0)		
I feel anxious while dealing with febrile patients	Agree	134(50.0)	49(53.3)	85(48.3)	0.68(0.71)	
	Neutral	68(25.4)	21(22.8)	47(26.7)		
	Disagree	66(24.6)	22(23.9)	44(25.0)		
I can remember my subject's contents appropriately	Agree	102(38.1)	29(31.5)	73(41.5)	2.66(0.26)	
	Neutral	108(40.3)	42(45.7)	66(37.5)		
	Disagree	58(21.6)	21(22.8)	37(21.0)		
I can concentrate on my studies	Agree	113(42.2)	43(46.7)	70(39.8)	1.48(0.47)	
	Neutral	84(31.3)	25(27.2)	59(33.5)		
	Disagree	71(26.5)	24(26.1)	47(26.7)		

There is a deterioration in my work performance/studying	Agree	108(40.3)	44(47.8)	64(36.4)	13.67(0.001)
	Neutral	95(35.4)	38(41.3)	57(32.4)	
	Disagree	65(24.3)	10(10.9)	55(31.3)	
I have difficulty in recalling old information	Agree	121(45.1)	43(46.7)	78(44.3)	5.02(0.08)
	Neutral	80(29.9)	33(35.9)	47(26.7)	
	Disagree	67(25.0)	16(17.4)	51(29.0)	

them a higher prevalence rate was found among those who were infected with COVID-19 ($OR=2.43$; $P=0.002$).

The participants (54.3%) who were infected with COVID-19 recorded that their CPS were significantly affected (almost 4 times higher) during the pandemic as compared to others ($OR= 4.02$; $P=0.0004$) (Table 4). Furthermore, 42.2% reported infection control measures required to practice at clinics affecting psychologically, which is significantly high ($OR=2.22$, $P=0.04$) for those who were infected with COVID-19. However, 50.4% of participants were reported as ready to treat patients during the current pandemic situation; among them was not significant of those who themselves (and/or any family member) were exposed to coronavirus ($OR=1.97$; $P=0.06$) (Table 4).

Table 2 summarises the personal feeling about own health during the COVID-19 pandemic outbreak. This study found that most (52.2%) of the participants were found to be afraid of their training and practice at dental clinics because there was a possibility of coronavirus infection, among these a significantly high ($P=0.05$) number was of those students (60.9%) who themselves (or any family member) were exposed to COVID-19. In the current study, 54.1% of students reported that they have frequent thoughts of being infected during the COVID-19 pandemic. 38.8% of students agreed that they have the feeling of being in a confused state most of the time, and among them, 40.2% were those students who themselves (or any family member) were infected with COVID-19. This was statistically significant ($\chi^2=11.7$; $P=0.003$). Similarly, 40.3% of students reported that they have a sense of being emotionally detached from family and friends due to coronavirus, this type of feeling was reported mostly (54.3%) by those who themselves (or any family member) were infected with COVID-19 ($\chi^2=11.95$; $P=0.003$). Furthermore, 45.1% of participants reported that they have difficulty in recalling old memories or information due to the COVID-19 pandemic; among them 46.7% were the ones who (or any family member) were infected with COVID-19.

Table 3 summaries the participants' knowledge and skills and the way of interaction with patient at the dental clinical during the COVID-19 pandemic. Majority of the participants (91.8%) inquired the visiting patients about fever, cough, or recent travel history during regular check-ups. Similarly, 82.8% of the participants agreed about using hand sanitisation more frequently while at the dental clinic. Furthermore, 60.8% of students with no history of

Table 3 Students Interaction with Patients at the Dental Clinic and Their Knowledge/Skills During the COVID-19 Pandemic Outbreak

Variable	Description	Number (%)	Has Anyone in Your Family Infected with COVID-19		
			Yes: 92 [n(%)]	No: 176 [n(%)]	χ^2 (P-value)
It is important to ask patients about high fever, dry cough, or recent travel history	Agree	246(91.8)	85(92.4)	161(91.5)	0.11(0.94)
	Neutral	15(5.6)	5(5.4)	10(5.7)	
	Disagree	7(2.6)	2(2.2)	5(2.8)	
I hesitate to treat a patient once he/she is recovered from COVID-19 infection	Agree	77(28.7)	24(26.1)	53(30.1)	0.61(0.73)
	Neutral	67(25.0)	25(27.2)	42(23.9)	
	Disagree	124(46.3)	43(46.7)	81(46.0)	
I use hand sanitization more frequently while at the dental clinic	Agree	222(82.8)	88(95.7)	159(90.3)	2.25(0.32)
	Neutral	30(11.2)	3(3.3)	10(5.7)	
	Disagree	16(6.0)	1(1.1)	7(4.0)	
I like to wear Personal Protective Equipment (PPE) while at the dental clinic	Agree	247(92.2)	88(95.7)	159(90.3)	2.60(0.27)
	Neutral	13(4.9)	3(3.3)	10(5.7)	
	Disagree	8(3.0)	1(1.1)	7(4.0)	
I am confidently using the equipment and tools at the dental clinic	Agree	197(73.5)	67(72.8)	130(73.9)	0.09(0.95)
	Neutral	47(17.5)	17(18.5)	30(17.0)	
	Disagree	24(9.0)	8(8.7)	16(9.1)	
I am confident to treat my patients	Agree	163(60.8)	46(50.0)	117(66.5)	16.70(<0.000)
	Neutral	73(27.2)	39(42.4)	34(19.3)	
	Disagree	32(11.9)	7(7.6)	25(14.2)	
The pandemic has affected my clinical skills and it reflects on the treatment outcome of my patient	Agree	99(36.9)	42(45.7)	57(32.4)	18.90(<0.000)
	Neutral	89(33.2)	38(41.3)	51(29.0)	
	Disagree	80(29.9)	12(13.0)	68(38.6)	

Table 4 Associations (Regression Analysis) Between Prevalence and Strategies with Different Variables of Dental Students in the During COVID-19 Pandemic

			Has You and Your Family Infected with COVID-19				
Variable	Description	Number (%)	Yes: 92 N(%)	No: 176 N(%)	OR(95% CI)	P-value	
Gender	Male	111(41.4)	48(52.2)	63(35.8)	1.95(1.17–3.26)	0.01	
	Female	157(58.6)	44(47.8)	113(64.2)	—		
Age	≤20	7(2.6)	1(1.1)	6(3.4)	0	0.27	
	21–25	259(96.6)	91(98.9)	168(95.5)	3.25(0.38–27.41)		
	26–30	2(0.7)	0(0.0)	2(1.1)	0		
Laval of study	2nd Year	6(2.23)	3(3.3)	3(1.70)	0	0.18 0.77 0.67	
	3rd Year	49(18.3)	15(16.3)	34(19.3)	—		
	4th Year	68(25.4)	29(31.5)	39(22.2)	1.68(0.77–3.65)		
	5th Year	78(29.1)	22(23.9)	56(31.8)	0.89(0.40–1.94)		
	Intern	67(25.0)	23(25.0)	44(25.0)	1.18(0.53–2.60)		
Personal feeling about COVID-19 pandemic							
I read and watch more about COVID-19	Agree	108(40.3)	45(48.9)	63(35.8)	2.61(1.31–5.20)	0.006	
	Neutral	90(33.6)	32(34.8)	58(33.0)	2.02(0.98–4.13)	0.05	
	Disagree	70(26.1)	15(16.3)	55(31.3)	—		
I feel anxious	Agree	136(50.7)	57(62.0)	79(44.9)	2.26(1.15–4.43)	0.017	
	Neutral	70(26.1)	20(21.7)	50(28.4)	1.25(0.57–2.73)	0.56	
	Disagree	62(23.1)	15(16.3)	47(26.7)	—		
I feel insomnia	Agree	37(13.8)	21(22.8)	16(9.1)	3.53(1.68–7.40)	0.0008	
	Neutral	76(28.4)	29(31.5)	47(26.7)	1.67(0.92–2.97)	0.08	
	Disagree	155(57.8)	42(45.7)	113(64.2)	—		
I feel depressed	Agree	62(23.1)	26(28.3)	36(20.5)	1.78(0.96–3.29)	0.066	
	Neutral	57(21.3)	23(25.0)	34(19.3)	1.67(0.88–3.15)	0.11	
	Disagree	149(55.6)	43(46.7)	106(60.2)	—		
I feel hopeless	Agree	100(37.3)	48(52.2)	52(29.5)	2.43(1.36–4.31)	0.002	
	Neutral	59(22.0)	14(15.2)	45(25.6)	0.81(0.39–1.70)	0.59	
	Disagree	109(40.7)	30(32.6)	79(44.9)	—		
Patient interaction at clinic during COVID-19 pandemic							
I have fear to get infected by COVID-19 patients	Agree	162(60.4)	58(63)	104(59.1)	1.67(0.78–3.55)	0.181	
	Neutral	62(23.1)	23(25.0)	39(22.2)	1.76(0.75–4.16)	0.19	
	Disagree	44(16.4)	11(12.0)	33(18.8)	—		

(Continued)

Table 4 (Continued).

Variable	Description	Number (%)	Has You and Your Family Infected with COVID-19			P-value
			Yes: 92 N(%)	No: 176 N(%)	OR(95% CI)	
I may infect people around me	Agree	226(84.3)	77(83.7)	149(84.7)	1.03(0.30–3.54)	0.95
	Neutral	30(11.2)	11(12.0)	19(10.8)	1.15(0.28–4.74)	0.83
	Disagree	12(4.5)	4(4.3)	8(4.5)	—	—
I am ready to treat patients	Agree	135(50.4)	51(55.4)	84(47.7)	1.97(0.94–4.11)	0.06
	Neutral	82(30.6)	29(31.5)	53(30.1)	1.77(0.80–3.91)	0.15
	Disagree	51(19.0)	12(13.0)	39(22.2)	—	—
My Clinical/psychomotor skill are affected	Agree	117(43.7)	50(54.3)	67(38.1)	4.02(1.87–8.68)	0.0004
	Neutral	87(32.5)	32(34.8)	55(31.3)	3.14(1.40–7.01)	0.005
	Disagree	64(23.9)	10(10.9)	54(30.7)	—	—
Infection control measures are affecting me psychologically	Agree	113(42.2)	41(44.6)	72(40.9)	2.22(1.03–4.78)	0.04
	Neutral	101(37.7)	40(43.5)	61(34.7)	2.56(1.18–5.55)	0.017
	Disagree	54(20.1)	11(12.0)	43(24.4)	—	—

COVID-19 had much more confidence to treat patients than those who had a history of infection of COVID-19 ($\chi^2=16.70$; $P= <0.000$). Only 36.9% reported that the COVID-19 pandemic had affected their CPS, and among them, a significantly high percentage was for those who themselves (or any family member) were exposed ($\chi^2=18.90$; $P= <0.000$) with COVID-19.

Discussion

Behavioral and social methods are being used in many countries to monitor and control the transmission of coronavirus disease. In health-care facilities, both infected and non-infected patients are isolated. If they are capable, patients can only interact with their family members through mobile phones or electronic tablets.

Supporting patients allow physicians, students (medical and dental), and nurses who are already stressed by the emergency load to serve humanity by treating the ailing community,¹⁹ but it can also be emotionally draining. During the current pandemic, doctors are also cared for at home, mainly by their close family and relatives.

In this study, the participants who themselves (or any family member) were infected had a higher inclination towards gathering information through videos²⁰ and other online resources²¹ to get coronavirus information. Similarly, another study from Pakistan stated that due to the limited data available as COVID-19 preventive guidance for dental practitioners, dental students often turn to the internet for details.²² It is noteworthy that similar findings were reported in a study from China, stating, social media and TV were also among the preferred ways to gather information regarding pandemic,²³ and also in Saudi Arabia.²⁴ In the current study, we found that most dental students (if any of their family member has infected with coronavirus) were anxious and recorded for having more than 2 times high anxiety levels as compared to other respondents (whose family members were not infected). Two other published studies from China and Albania reported a similar finding.^{25,26} The dental clinical students were worried about their family members and friends to get infected hence, experienced anxiety and insomnia.²⁷

The current study reported that dental clinical students were affected by fear of contagion and of infecting family members and friends and this resulted in a high level of insomnia problem (3.53 times higher). Similarly, the findings are in conjunction with results from another study.²⁷ In addition, the effect of insomnia has been linked to

negative aspects of the doctor–patient relationship.²⁸ The prevalence of depression in the dental students was recorded to be 1.78 times high if any family member had been infected with the virus, which showed the similar significant effect in another study.²⁹ Individuals may become hopeless as a result of stressful life events, traumas, depressive symptoms, and anxiety.³⁰ Anxiety levels in the state are closely linked to traumatic incidents, events that last a long time and are unpredictable, such as a pandemic, can exacerbate anxiety and hopelessness. In this study, there is a significant correlation, as the dental students (and any of their family members), was infected with the coronavirus, they were more hopeless (2.43 times higher). A similar finding reported in a previously published study.³¹ On March 11, 2020, the coronavirus disease 2019 (COVID-19) epidemic was declared a pandemic. Several dental clinics in the affected countries have closed or are only offering emergency services.³² Several facilities in some of the affected nations, however, continue to provide routine dental care.³² In the current study, most of the dental clinical students reported that their clinical and psychomotor skills were affected badly due to coronavirus, among them more affected were those students who themselves or any family members were infected with COVID-19. These results were consistent with previous international findings.^{33,34}

This study shows most participants agreed about using hand sanitisation more frequently while at the dental clinic. Findings from another study³⁵ stated that the majority of participants recommended using disinfectants regularly between dental visits. The majority of our study participants also asked patients about fever, cough, or recent travel history during regular checkups at dental clinics. Similar reports were found, emphasising dental staff to inquire about their current health condition before their scheduled appointment.³⁶

Dentistry is an example of such vocations where person-to-person interaction is inevitable. The discipline of dentistry uses CPS teaching models.³⁷ Despite the fact that in current times various modern training resources like mannequins and models are available still, we do require doctor–patient interaction for the learners' excellence. The majority of students viewed clinical training practices as exposing them to the possibility of contracting COVID-19 infection.³⁸ Based on our results, the CPS acquisition was affected, as reported by 36.9% of participants. Moreover, this was predominantly higher (almost 4 times higher) as the majority of the participants who were infected with

COVID-19 recorded that their CPS were significantly affected during the pandemic as compared to others. Such findings are in conjunction with results from another study.³⁹

Cognitive function impairment is also a consequence of the COVID-19 pandemic. Our participants reported that they have difficulty recalling old memories or information due to the COVID-19. These results were consistent with previous international findings.⁴⁰ COVID-19-affected patients have been related to a higher risk of cognitive impairment after resolving the primary infection, according to previous studies.⁴¹ The cognitive impairment reported in the earlier studies suggests the need for long-term follow up of the COVID-affected subjects.^{42,43}

Widespread reports from the published work concluded that depression affects people of all ages and is one of the leading causes of sickness and disability. It is also to blame for serious life issues, and both attempted and completed suicides.^{44,45} Participants in our study reported being depressed. This was consistent with various published works in the recent past where dental students were reported to be depressed.^{46,47} Hakami et al⁴⁸ identified that the prevalence of high levels of depression among dental students illustrates the need for psychological empowerment measures that involve institutional therapy services.⁴⁸

Limitations and Implications

Findings from one healthcare institute limit the generalizability of important outcomes. Nevertheless, offering safe dental services to patients while also protecting dentists and healthcare staff, is crucial. This all can be highlighted, stressed with practical measures targeting mental wellbeing resulting in improved clinical psychomotor skills of learners.

Conclusion

The risk of cross-infection between dental practitioners and patients is high due to the characteristics of dental settings. This risk is amplified as the current pandemic poses risk of COVID-19 infection within healthcare community. Strict and reliable guidelines on the prevention of infections are urgently required for dental practices and hospitals in countries/regions (potentially) affected by COVID-19. We conclude that the potential risk arising from COVID-19 to the dental students' MWB (affecting their CPS) is higher, especially during clinical performance.

This study highlighted the magnitude of dental students' MWB and its substantial influence on their CPS once (themselves or a family member) infected with COVID-19. Additionally, levels of infection control measures at clinics resulted in psychological upsets for dental students, who find it difficult to recall old memories or information.

Ethics Approval and Consent to Participate

The study was approved by the institutional review board college of medicine, KSU. Before completing their responses on the questionnaire, all participants were provided with a written consent to participate in the study.

Acknowledgment

The authors extend their appreciation to the Deputyship for Research and Innovation, "Ministry of Education in Saudi Arabia for funding this research work through the project number IFKSURG-2020-145.

Disclosure

The authors report no conflicts of interest in this work.

References

- Machado RA, Bonan PRF, Perez D, et al. COVID-19 pandemic and the impact on dental education: discussing current and future perspectives. *Braz Oral Res.* 2020;34:e083. doi:10.1590/1807-3107bor-2020.vol34.0083
- Shetty V, Yamamoto J, Yale K. Re-architecting oral healthcare for the 21st century. *J Dent.* 2018;74:S10–S14. doi:10.1016/j.jdent.2018.04.017
- Cardall S, Krupat E, Ulrich M. Live lecture versus video-recorded lecture: are students voting with their feet? *Acad Med.* 2008;83(12):1174–1178. doi:10.1097/ACM.0b013e31818c6902
- Hanks S, Cotton D, Spowart L. Leadership in dental practice: a three stage systematic review and narrative synthesis. *J Dent.* 2020;102:103480. doi:10.1016/j.jdent.2020.103480
- Russell MD, Bill JM, Orr MTS. The efficacy of practical participation in undergraduate dental education. *J Dent.* 1996;24(1):137–139. doi:10.1016/0300-5712(95)00064-X
- Marshall AL, Wolanskyj-Spinner A. COVID-19: challenges and opportunities for educators and generation Z learners. *Mayo Clin Proc.* 2020;95(6):1135–1137. doi:10.1016/j.mayocp.2020.04.015
- Chang T-Y, Hong G, Paganelli C, et al. Innovation of dental education during COVID-19 pandemic. *J Dent Sci.* 2021;16(1):15–20. doi:10.1016/j.jds.2020.07.011
- Tay JRH, Ng E, Ong MMA, et al. A risk-based approach to the COVID-19 pandemic: the experience in National Dental Centre Singapore. *Front Med.* 2020;7:562728. doi:10.3389/fmed.2020.562728
- Izzetti R, Nisi M, Gabriele M, et al. COVID-19 transmission in dental practice: brief review of preventive measures in Italy. *J Dent Res.* 2020;99(9):1030–1038. doi:10.1177/0022034520920580
- Consolo U, Bellini P, Bencivenni D, et al. Epidemiological aspects and psychological reactions to COVID-19 of dental practitioners in the Northern Italy Districts of Modena and Reggio Emilia. *Int J Env Res Public Health.* 2020;17(10):3459.
- WHO. WHO Director-General's opening remarks at the media briefing on COVID-19; 2020. Available from: <https://www.who.int/dg/speeches/detail/who-director-general-sopening-remarks-at-the-media-briefing-on-covid-19—11-march2020>. Accessed May 28, 2021.
- Gamio L. The workers who face the greatest coronavirus risk. *The New York Times.* New York: New York Times 2020.
- Yi B, Fen G, Cao D, et al. Epidemiological and clinical characteristics of 214 families with COVID-19 in Wuhan, China. *Int J Infect Dis.* 2021;105:113–119. doi:10.1016/j.ijid.2021.02.021
- Gill PK, Du C, Khan F, et al. The psychological effects of COVID-19 spread in young Canadian adults. *Int J Soc Psychiatry.* 2021;20764020988878. doi:10.1177/0020764020988878
- Lynch CD, Blum IR, Wilson NHF. Leadership in dental education. *J Dent.* 2019;87:7–9. doi:10.1016/j.jdent.2019.07.011
- Hogan R, Goodwin M, Boothman N, et al. Further opportunities for digital imaging in dental epidemiology. *J Dent.* 2018;74:S2–S9. doi:10.1016/j.jdent.2018.04.018
- Santos GN, Leite AF, Figueiredo PT, et al. Effectiveness of E-learning in oral radiology education: a systematic review. *J Dent Educ.* 2016;80(9):1126–1139. doi:10.1002/j.0022-0337.2016.80.9.tb06195.x
- Zante B, Hautz WE, Schefold JC, Bilotta F. Physiology education for intensive care medicine residents: a 15-minute interactive peer-led flipped classroom session. *PLoS One.* 2020;15(1):e0228257. doi:10.1371/journal.pone.0228257
- Khanagar SB, Alfadley A. Psychological impact of the COVID-19 pandemic on dental interns in Riyadh, Saudi Arabia: a cross-sectional survey. *Int J Clin Pediatr Dent.* 2020;13(5):508–512. doi:10.5005/jp-journals-10005-1773
- Abdulghani HM, Haque S, Ahmad T, et al. A critical review of obstetric and gynecological physical examination videos available on YouTube: content analysis and user engagement evaluation. *Medicine.* 2019;98(30):e16459. doi:10.1097/MD.00000000000016459
- Alsenaity A, Tauseef A. A review of current state M Government in Saudi Arabia. *Glob Eng Technol Rev.* 2012;2(2):5–8.
- Ghai S. Are dental schools adequately preparing dental students to face outbreaks of infectious diseases such as COVID-19? *J Dent Educ.* 2020;84(6):631–633. doi:10.1002/jdd.12174
- Huynh G, Nguyen T, Tran V, et al. 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):260–265. doi:10.4103/1995-7645.280396
- Ahmad T, Sattar K, Akram A. Medical professionalism videos on YouTube: content exploration and appraisal of user engagement. *Saudi J Biol Sci.* 2020;27(9):2287–2292. doi:10.1016/j.sjbs.2020.06.007
- Mechili EA, Saliq A, Kamberi F, et al. Is the mental health of young students and their family members affected during the quarantine period? Evidence from the COVID-19 pandemic in Albania. *J Psychiatr Ment Health Nurs.* 2020;28:317–325. doi:10.1111/jpm.12672
- Özdin S, Bayrak özdin Ş. Levels and predictors of anxiety, depression and health anxiety during COVID-19 pandemic in Turkish society: the importance of gender. *Int J Soc Psychiatry.* 2020;66(5):504–511. doi:10.1177/0020764020927051
- Abdulah DM, Musa DH. Insomnia and stress of physicians during COVID-19 outbreak. *Sleep Med.* 2020;2:100017. doi:10.1016/j.sleepx.2020.100017
- Azzez SS, Abdulah DM, Piro RS, et al. Sleep severity and fatigue manifestations in relation to the doctor-patient relationship. *Sleep Med.* 2019;58:13–17. doi:10.1016/j.sleep.2019.02.015
- Hossain MM, Tasnim S, Sultana A, et al. Epidemiology of mental health problems in COVID-19: a review. *F1000Research.* 2020;9:636. doi:10.12688/f1000research.24457.1
- Mathew AR, Pettit JW, Lewinsohn PM, et al. Co-morbidity between major depressive disorder and anxiety disorders: shared etiology or direct causation? *Psychol Med.* 2011;41(10):2023–2034. doi:10.1017/S0033291711000407

31. Hacımusalar Y, Kahve AC, Yasar AB, et al. Anxiety and hopelessness levels in COVID-19 pandemic: a comparative study of healthcare professionals and other community sample in Turkey. *J Psychiatr Res.* 2020;129:181–188. doi:10.1016/j.jpsychires.2020.07.024
32. Alharbi A, Alharbi S, Alqaidi S. Guidelines for dental care provision during the COVID-19 pandemic. *Saudi Dent J.* 2020;32(4):181–186. doi:10.1016/j.sdentj.2020.04.001
33. Elangovan S, Mahrous A, Marchini L. Disruptions during a pandemic: gaps identified and lessons learned. *J Dent Educ.* 2020;84(11):1270–1274. doi:10.1002/jdd.12236
34. Kochhar AS, Bhasin R, Kochhar GK, et al. Provision of continuous dental care for oral oncology patients during & after COVID-19 pandemic. *Oral Oncol.* 2020;106:104785. doi:10.1016/j.oraloncology.2020.104785
35. Sharaf RF, Kabel N. Awareness and knowledge of undergraduate dental students about the signs and symptoms of Corona viral infection (COVID-19), and the required infection control measures to prevent its spread. *Bull Natl Res Centre.* 2021;45(1):32. doi:10.1186/s42269-021-00494-1
36. Peng X, Xu X, Li Y, et al. Transmission routes of 2019-nCoV and controls in dental practice. *Int J Oral Sci.* 2020;12(1):9. doi:10.1038/s41368-020-0075-9
37. Virdi MS, Sood M. Effectiveness of a five-step method for teaching clinical skills to students in a dental college in India. *J Dent Educ.* 2011;75(11):1502–1506. doi:10.1002/j.0022-0337.2011.75.11.tb05209.x
38. Abdulghani HM, Sattar K, Ahmad T, et al. Association of COVID-19 pandemic with undergraduate medical students' perceived stress and coping. *Psychol Res Behav Manag.* 2020;13:871–881. doi:10.2147/PRBM.S276938
39. Sukumar S, Dracopoulos SA, Martin FE. Dental education in the time of SARS-CoV-2. *Eur J Dent Educ.* 2020;25:325–331. doi:10.1111/eje.12608
40. Garg A, Marji A, Goyal S, et al. A case of COVID-19 with memory impairment and delayed presentation as stroke. *Cureus.* 2020;12(8):e10025.
41. Heneka MT, Golenbock D, Latz E, et al. Immediate and long-term consequences of COVID-19 infections for the development of neurological disease. *Alzheimers Res Ther.* 2020;12(1):69. doi:10.1186/s13195-020-00640-3
42. Zhou H, Lu S, Chen J, et al. The landscape of cognitive function in recovered COVID-19 patients. *J Psychiatr Res.* 2020;129:98–102. doi:10.1016/j.jpsychires.2020.06.022
43. Ardila A, Lahiri D. Executive dysfunction in COVID-19 patients. *Diabetes Metab Syndr.* 2020;14(5):1377–1378. doi:10.1016/j.dsx.2020.07.032
44. Jahan S, Araf K, Griffiths MD, et al. Depression and suicidal behaviors among Bangladeshi mothers of children with Autism Spectrum Disorder: a comparative study. *Asian J Psychiatr.* 2020;51:101994. doi:10.1016/j.ajp.2020.101994
45. Mamun MA, Griffiths MD. A rare case of Bangladeshi student suicide by gunshot due to unusual multiple causalities. *Asian J Psychiatr.* 2020;49:101951. doi:10.1016/j.ajp.2020.101951
46. Gaş S, Ekşi Özsoy H, Cesur Aydın K. The association between sleep quality, depression, anxiety and stress levels, and temporomandibular joint disorders among Turkish dental students during the COVID-19 pandemic. *Cranio.* 2021;1–6. doi:10.1080/08869634.2021.1883364
47. Stormon N, Sexton C, Ford PJ, et al. Understanding the well-being of dentistry students. *Eur J Dent Educ.* 2021. doi:10.1111/eje.12666
48. Hakami Z, Khanagar SB, Vishwanathaiah S, et al. Psychological impact of the coronavirus disease 2019 (COVID-19) pandemic on dental students: a nationwide study. *J Dent Educ.* 2020;85:494–503. doi:10.1002/jdd.12470

Psychology Research and Behavior Management

Dovepress

Publish your work in this journal

Psychology Research and Behavior Management is an international, peer-reviewed, open access journal focusing on the science of psychology and its application in behavior management to develop improved outcomes in the clinical, educational, sports and business arenas. Specific topics covered in the journal include: Neuroscience, memory and decision making; Behavior modification and management; Clinical

applications; Business and sports performance management; Social and developmental studies; Animal studies. The manuscript management system is completely online and includes a very quick and fair peer-review system, which is all easy to use. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.

Submit your manuscript here: <https://www.dovepress.com/psychology-research-and-behavior-management-journal>