

Psychological Impact of the COVID-19 Pandemic on Dental Hygiene Students in Saudi Arabia: A Nation-wide Study

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ABSTRACT

Aim: Worldwide healthcare professionals are experiencing constant stress during their day-to-day work due to coronavirus disease-2019 (COVID-19) pandemic. Students' anxiety tendency has also been increased due to the disturbance of education. This study aims to evaluate the anxiety and depression levels of dental hygiene students in Saudi Arabia during COVID-19 lockdown period.

Materials and methods: A cross-sectional study was conducted among the dental hygiene students in Saudi Arabia to assess the psychological impact of the COVID-19 outbreak. Questionnaire was distributed to the students, which consisted questions regarding demographics, knowledge, and fear related to COVID-19 and validated self-reported anxiety screening scale (GAD-7), to assess the psychological impact. All the data were then subjected to statistical analysis.

Results: Students from King Abdul Aziz University and Prince Sattam University showed statistically higher anxiety score when comparing the GAD-7 questions. Students whose parents were unemployed during pandemic and the students from rural area had statistically greater anxiety level when compared to others. Also, anxiety levels were found to be significantly higher among students who slightly feared contacting the disease because of their profession.

Conclusion: The present results demonstrate that dental hygiene students suffered from some form of anxiety ranging from mild anxiety to severe anxiety, reporting that they frequently felt nervous and were scared that something terrible would happen. Psychological well-being of healthcare professionals is necessary for the optimal treatment of patients.

Clinical significance: Anxiety is considered as an important factor for healthcare students that may influence negatively on their personal and academic life. Thus appropriate assessment and offering immediate treatment will prove beneficial to prevent serious consequences.

Keywords: Anxiety, COVID-19, Dental hygiene student, Psychological impact, Saudi Arabia.

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INTRODUCTION

Novel coronavirus disease-2019 (COVID-19) is one of the devastating and deadly outbreaks that has been seen to challenge researchers and healthcare systems.¹ The COVID-19 outbreak was declared as a global pandemic by the World Health Organization (WHO) in March' 2020. Now the WHO approves COVID-19 to be an important healthcare problem at an international level.²⁻⁴ Considering the rapid spread of COVID-19, most of the governments worldwide took several measures to slow down the spread and contain the epidemic. Likewise, to control this pandemic, various important measures were taken in the Kingdom of Saudi Arabia such as social distancing, quarantine applications, travel constraints, etc. Various social areas were also closed such as educational institutions, restaurants, sports clubs, malls, and gyms. Further to these precautions, it was also recommended that all the educational institutions must switch to online education.⁵

According to the data from the previous epidemics, highly infectious diseases may have a noteworthy impact on stress-related symptoms, mental health, and increased anxiety of both patients and healthcare workers.⁶ Worldwide healthcare professionals are experiencing constant stress during their day-to-day work due to COVID-19 pandemic. This stress is related to risk of infection, exhaustion, frustration, and social isolation.⁷

Research has been conducted to study the psychological impact of the infectious disease epidemics like SARS and MERS on students. One study in Saudi Arabia documented mild to moderate levels of anxiety in almost 25% of medical students during SARS and MERS epidemics.⁸ In Hong Kong, another study documented

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the anxiety levels in medical students significantly higher than the nonmedical students.⁹

It is important to have the knowledge on the psychological impact of this COVID-19 pandemic on students. After the COVID-19 outburst, studies have been carried out to study the impact of this pandemic on the psychological well-being of the students in Saudi Arabia^{10,11} but none of the studies were conducted on Dental Hygiene students in Saudi Arabia.

Dental hygiene students are at high-risk group for COVID-19 infection due to their close proximity to the patients, aerosols generating procedures, and lack of knowledge about infection control practices.¹²⁻¹⁴ High risk of contamination may be the worrying factor which affects the psychological states of dental hygiene students. It was also observed that due to the disturbance of education, students' anxiety tendency has increased, which in return has lessened their motivation about studying.^{15,16} According

to author's best knowledge, there is no literature regarding the psychological well-being of dental hygiene students in Saudi Arabia. Our study aims to cover this gap in the literature by evaluating the anxiety and depression levels of dental hygiene students in Saudi Arabia during COVID-19.

METHODOLOGY

A cross-sectional study was conducted among the dental hygiene students in Saudi Arabia to assess the psychological impact of the COVID-19 outbreak. Ethical clearance was obtained from the institutional ethical committee of Qassim University prior to the commencement of the study. The students from various Dental hygiene programs across the Kingdom were invited to participate in this study. The survey was conducted during the lockdown period between May 2020 and June 2020. To ensure maximal participation, students were asked to forward the questionnaire to their colleagues (Convenience and snowball sampling). Sample size of 138 participants was calculated after using a 95% confidence level ($\alpha = 0.05$), 5% confidence interval, and statistical power of 0.85 to obtain a statistically significant result.

Email and social media platforms were used to distribute the online questionnaire (google forms) randomly among the dental hygiene students in Saudi Arabia. The questionnaire included a statement of anonymity and consent. Submitted questionnaire were considered as a consent by the students to participate in this study. To avoid questionnaires' bias, submission of completely answered questionnaires was only accepted. Only single submission by each participant was allowed. To avoid sampling bias, the questionnaire was distributed through various online media thus increasing the visibility among the respondents. In addition, reminders through e-mail and text messages were also done.

A structured questionnaire comprising 14 items was used for this study. Questions were focused mainly into three domains, such as demographics, knowledge, and fear related to COVID-19 and validated self-reported anxiety screening scale, to assess the psychological impact.

The first domain included questions related to demographic details such as gender, institution, educational level, parental source of income, and residing area (categorized as urban or rural). The second domain included questions assessing the knowledge and fear related to COVID-19 on a 4-point Likert scale (not at all, slight, moderate, very much). Lastly, the third domain included generalized anxiety disorder scale (GAD-7) to measure the anxiety among dental hygiene students over the last 2 weeks during the lockdown period. Seven questions were included in the GAD-7 anxiety scale which were assessed by the 4-point Likert-type scale (not at all, several days, more than half the days, and nearly every day). The total score for the seven items of GAD-7 ranges from 0 to 21. Scores of 0–5 were represented as mild anxiety, 6–10 as moderate anxiety, 11–15 as moderately severe anxiety, and 16–21 were represented as severe anxiety.¹⁷

All the data were then tabulated and subjected to statistical analysis to assess the association between the variation in anxiety levels and various variables. The data on GAD-7 scale for individual questions are presented as mean and standard deviation (SD) and the data on categorical variables are shown as *n* (% of respondents). The intergroup statistical comparisons of distribution of categorical variables were tested using Chi-square test or Fisher's exact probability test if more than 20% cells have expected frequency less than 5. The intergroup statistical comparisons of distribution of means of continuous variables

across two group were done using independent sample *t* test and analysis of variance (ANOVA) was used for more than two group. Before subjecting the study variables to *t* test and ANOVA, the underlying normality assumption was tested. *P*-values of less than 0.05 were considered to be statistically significant. Statistical Package for Social Sciences (SPSS ver 22.0, IBM Corporation, USA) for MS Windows was used to statistically analyze the entire data.

RESULTS

The study was conducted to assess the psychological impact of the COVID-19 pandemic on dental hygiene students in Saudi Arabia. In total there are six dental hygiene colleges in the Kingdom of Saudi Arabia. Students from all the academic years as well as interns from these colleges were invited to participate in this study. The questionnaire was completed by 140 dental hygiene students.

In this study, 96 (68.6%) were males and 44 (31.4%) were females. Of which 43.6% respondents were from Qassim University. 26.4% respondents were from first year, 17.1% respondents were from second year, 27.9% respondents were from third year, and 28.6% respondents were interns. Major students (67.9%) were from urban area. Source of parental income was government job for 42.9% students. 41.6% students were not at all afraid to be infected with COVID-19 because of their profession and only 8.6% were very afraid to be infected with COVID-19 because of their profession. 42.1% of the dental hygiene students confirmed that they had acquired only slight knowledge through seminars, lectures, information leaflet, etc., since the COVID-19 outbreak, regarding maintaining a safe working environment. [Table 1](#) summarizes the results of domain 1 and 2 of the questionnaire.

The features of GAD-7 scale are presented in [Tables 2](#) and [3](#) and [Figure 1](#). Of 140 respondents, 50 (35.7%) had mild anxiety, 38 (27.1%) had moderate anxiety, 41 (29.3%) had moderate to severe anxiety, and 11 (7.9%) had severe anxiety. The association between the GAD-7 score and other domains of the questionnaire is presented in [Tables 4](#) and [5](#).

Distribution of Responses (Mean Scores) to the Questions of GAD-7 Scale According to Various Parameters of Domain 1 and 2 of the Questionnaire

According to Gender

Distribution of mean scores of all questions of GAD-7 scale did not differ significantly between male and female respondents (*p*-value >0.05 for all).

According to University

Distribution of mean scores of questions such as Q1, Q4, and Q6 of GAD-7 scale did not differ significantly between respondents from different university (*p*-value >0.05 for all). Distribution of mean scores of questions such as Q2, Q3, Q5, and Q7 of GAD-7 scale differs significantly between respondents from different university (*p*-value <0.05 for all).

According to Academic Year

Distribution of mean scores of all questions of GAD-7 scale did not differ significantly between group of respondents from various academic years (*p*-value > 0.05 for all).

Table 1: Distribution of responses to the questions of domain 1 and 2 of the questionnaire

	No. of respondents	% of respondents
Gender		
Male	99	68.6
Female	44	31.4
University		
Qassim University	61	43.6
Prince Sattam University	11	7.9
Al Baha University	17	12.1
King Saud University	15	10.7
King Abdul Aziz University	22	15.7
Mustaqbal University/Buraida Private College	14	10.0
Academic year		
First year	37	26.4
Second year	24	17.1
Third year	39	27.9
Intern	40	28.6
Area		
Rural	45	32.1
Urban	95	67.9
Source of parental income		
Government job	60	42.9
Private job	43	30.7
Self employed	19	13.6
Unemployed	18	12.9
Are you afraid to be infected with COVID-19 because of your profession?		
Slightly afraid	42	30.0
Moderately afraid	28	20.0
Very afraid	12	8.6
Not at all	58	41.4
Acquired sufficient knowledge on COVID-19 outbreak		
Slightly	59	42.1
Moderate	34	24.3
Very much	17	12.1
Not at all	30	21.4

According to Residential Area

Distribution of mean scores of questions such as Q1, Q5, Q6, and Q7 of GAD-7 scale did not differ significantly between group of respondents from rural and urban areas (p -value >0.05 for all). Distribution of mean scores of questions such as Q2, Q3, Q4 of GAD-7 scale differs significantly between group of respondents from rural and urban areas (p -value <0.05 for all).

According to Source of Income

Distribution of mean scores of questions such as Q2, Q3, Q4, Q5, and Q7 of GAD-7 scale did not differ significantly between group

Table 2: GAD-7 scale (anxiety test) of the dental hygiene students

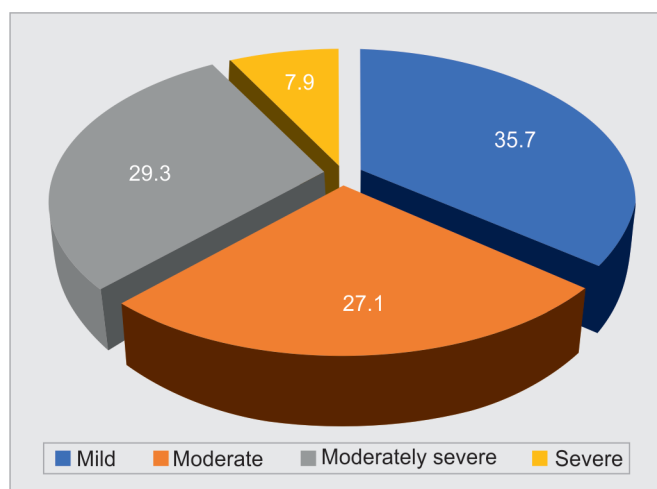
	No. of respondents	% of respondents
Did you experience feeling nervous, anxious, or on edge within the last 2 weeks?		
Not at all	42	30.0
Several days	55	39.3
More than half the days	23	16.4
Nearly every day	20	14.3
Mean \pm SD	1.15 \pm 1.01	
Did you experience not being able to stop or control worrying within the last 2 weeks?		
Not at all	56	40.0
Several days	36	25.7
More than half the days	26	18.6
Nearly every day	22	15.7
Mean \pm SD	1.10 \pm 1.10	
Did you experience worrying too much about different things within the last 2 weeks?		
Not at all	59	42.1
Several days	33	23.6
More than half the days	30	21.4
Nearly every day	18	12.9
Mean \pm SD	1.05 \pm 1.07	
Did you have trouble relaxing within the last 2 weeks?		
Not at all	46	32.9
Several days	37	26.4
More than half the days	39	27.9
Nearly every day	18	12.9
Mean \pm SD	1.21 \pm 1.04	
Did you experience being so restless that it's hard to sit still within the last 2 weeks?		
Not at all	59	42.1
Several days	34	24.3
More than half the days	21	15.0
Nearly every day	26	18.6
Mean \pm SD	1.10 \pm 1.15	
Becoming easily annoyed or irritable within the last 2 weeks		
Not at all	69	49.3
Several days	25	17.9
More than half the days	28	20.0
Nearly every day	18	12.9
Mean \pm SD	0.96 \pm 1.10	
Feeling afraid as if something awful might happen within the last 2 weeks		
Not at all	66	47.1
Several days	28	20.0
More than half the days	25	17.9
Nearly every day	21	15.0
Mean \pm SD	1.01 \pm 1.12	

Higher mean value indicates higher level of anxiety and vice-versa



Table 3: Distribution of level of anxiety among the respondents

Anxiety	GAD-7 score	No. of respondents	% of respondents
Mild	0–5	50	35.7
Moderate	6–10	38	27.1
Moderately severe	11–15	41	29.3
Severe	16–21	11	7.9
Total		140	100.0

**Fig. 1:** Distribution of level of anxiety among the respondents

of respondents with various sources of income (p -value >0.05 for all). Distribution of mean scores of questions such as Q1 and Q6 of GAD-7 scale differs significantly between group of respondents with various sources of income (p -value <0.05 for all).

According to Fear of Infection of COVID-19

Distribution of mean scores of questions such as Q2, Q3, and Q6 of GAD-7 scale did not differ significantly between group of respondents with various levels of fear of infection of COVID-19 (p -value >0.05 for all). Distribution of mean scores of questions such as Q1, Q4, Q5, and Q7 of GAD-7 scale differs significantly between group of respondents with various levels of fear of infection of COVID-19 (p -value <0.05 for all).

According to Knowledge of COVID-19 Outbreak

Distribution of mean scores of questions such as Q2, Q3, Q4, Q5, Q6, and Q7 of GAD-7 scale did not differ significantly between group of respondents with various levels of knowledge of COVID-19 outbreak (p -value >0.05 for all). Distribution of mean scores of Q1 of GAD-7 scale differs significantly between group of respondents with various levels of knowledge of COVID-19 outbreak (p -value <0.05).

Distribution of Level of Anxiety (GAD-7 Scale)

According to Various Parameters of Domain 1 and 2 of the Questionnaire

According to Gender

Male and female respondents did not show any significant difference in the distribution of level of anxiety (p -value >0.05).

According to University

Respondents from different universities did not show any significant difference in the distribution of level of anxiety (p -value >0.05).

According to Academic Year

Distribution of level of anxiety did not differ significantly between group of respondents from various academic years (p -value >0.05).

According to Residential Area

Group of respondents from Urban and Rural areas did not show any significant difference in the distribution of level of anxiety (p -value >0.05).

According to Source of Income

Group of respondents with various sources of income did not show any significant difference in the distribution of level of anxiety (p -value >0.05).

According to Fear of Infection of COVID-19

Distribution of level of anxiety differs significantly between group of respondents with various levels of fear of infection of COVID-19 (p -value <0.05).

According to Knowledge of COVID-19 Outbreak

Distribution of level of anxiety did not differ significantly between group of respondents with various levels of knowledge of COVID-19 outbreak (p -value >0.05).

DISCUSSION

American Psychological Association (APA) describes anxiety as “a feeling described by sentiments of strain, stressed considerations, and physical changes, for example, high level of blood pressure.” WHO describes depression as a “common mental disorder, characterized by misery, loss of intrigue or delight, feelings of blame or low self-esteem, disturbed sleep or hunger, and sentiments of sluggishness and poor concentration.”¹⁸ As per WHO, people who experience stress or depression have 10 years lesser life expectancy than general population.^{19,20} Furthermore, suicidal tendency has also been reported in 11.1% of all the medical students who are experiencing greater level of depression.²¹

COVID-19 has influenced many people and countries all over the world and it is becoming unstoppable. Thus, in the context of the COVID-19 outbreak, there is a need to document its effect on the physical and mental health. To the author’s knowledge, this study is the first to report the psychological effects of the COVID-19 pandemic on dental hygiene students in Saudi Arabia. But various studies have been published reporting the prevalence of anxiety among medical and pharmacy students in Saudi Arabia.^{22–24}

Generalized anxiety disorder (GAD) can lead to other major problems, such as severe depression and is one of the most common anxiety disorders. Early detection is crucial to overcoming this problem and improving quality of life.²⁵ The GAD-7 scale, developed in 2006 by Spritzer et al., is highly considered as an effective tool for screening GAD and assessing its severity in various disciplines.^{17,26} Because the GAD-7 scale has been utilized in several previous publications,^{17,27–30} the authors selected this tool.

An increased prevalence of anxiety among medical and health sciences students has been reported.^{28–34} Various factors can be responsible for this. In previous research, sociodemographic factors, financial difficulties, and fulfilling responsibilities and roles were

Table 4: Distribution of responses (mean scores) of GAD-7 scale questions according to various parameters of domain 1 and 2 of the questionnaire

	Q1 (feeling nervous, anxious, or on edge)	Q2 (not being able to stop or control worrying)	Q3 (worrying too much about different things)	Q4 (trouble relaxing)	Q5 (so restless that it's hard to sit still)	Q6 (easily annoyed or irritable)	Q7 (feeling afraid as if something awful might happen)
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Gender							
Male	1.19 ± 1.04	1.09 ± 1.11	1.08 ± 1.09	1.19 ± 1.04	1.16 ± 1.18	0.92 ± 1.07	0.99 ± 1.16
Female	1.07 ± 0.95	1.11 ± 1.08	0.98 ± 1.04	1.25 ± 1.06	0.98 ± 1.07	1.07 ± 1.17	1.05 ± 1.03
p value	0.518^{NS}	0.921^{NS}	0.590^{NS}	0.743^{NS}	0.393^{NS}	0.452^{NS}	0.786^{NS}
University							
Qassim University	1.11 ± 1.00	0.77 ± 0.96	0.85 ± 1.05	1.10 ± 1.03	0.97 ± 1.09	0.77 ± 1.00	0.77 ± 1.07
Prince Sattam University	1.55 ± 1.21	1.27 ± 0.79	1.73 ± 0.90	1.18 ± 0.87	2.09 ± 1.22	1.18 ± 0.98	2.00 ± 1.09
Al Baha University	1.41 ± 1.00	1.35 ± 1.17	1.41 ± 1.12	1.53 ± 1.12	1.12 ± 1.22	0.82 ± 1.13	1.12 ± 1.17
King Saud University	0.87 ± 0.99	1.47 ± 1.25	0.87 ± 0.74	1.40 ± 1.21	1.07 ± 1.28	1.47 ± 1.12	1.27 ± 1.10
King Abdul Aziz University	1.05 ± 0.99	1.77 ± 1.19	1.32 ± 1.17	1.36 ± 1.05	1.23 ± 1.02	1.09 ± 1.19	0.91 ± 1.10
Mustaqbal University/ Buraida Pvt College	1.14 ± 0.95	0.64 ± 0.93	0.71 ± 1.14	0.86 ± 1.03	0.71 ± 0.99	1.07 ± 1.33	1.00 ± 1.04
p value	0.510^{NS}	0.001^{***}	0.039[*]	0.435^{NS}	0.050[*]	0.295^{NS}	0.026[*]
Academic year							
First year	1.08 ± 0.89	1.16 ± 1.14	1.27 ± 1.12	1.30 ± 1.05	1.19 ± 1.17	1.19 ± 1.15	0.95 ± 1.13
Second year	1.25 ± 0.99	0.79 ± 0.93	0.92 ± 1.02	1.13 ± 0.99	1.00 ± 1.06	0.88 ± 1.19	0.79 ± 0.98
Third year	0.90 ± 1.05	1.21 ± 1.13	0.95 ± 1.05	1.13 ± 1.00	1.03 ± 1.16	0.82 ± 1.07	1.05 ± 1.15
Intern	1.40 ± 1.06	1.13 ± 1.14	1.02 ± 1.09	1.25 ± 1.13	1.15 ± 1.19	0.95 ± 1.04	1.15 ± 1.19
p value	0.151^{NS}	0.503^{NS}	0.519^{NS}	0.872^{NS}	0.888^{NS}	0.504^{NS}	0.641^{NS}
Area							
Rural	1.29 ± 1.06	1.47 ± 1.18	1.40 ± 1.05	1.53 ± 1.19	1.27 ± 1.23	1.07 ± 1.09	1.22 ± 1.26
Urban	1.08 ± 0.99	0.93 ± 1.02	0.88 ± 1.05	1.05 ± 0.93	1.02 ± 1.10	0.92 ± 1.11	0.91 ± 1.04
p value	0.264^{NS}	0.006^{**}	0.008^{**}	0.010^{**}	0.238^{NS}	0.451^{NS}	0.119^{NS}
Source of income							
Government job	1.07 ± 1.04	0.90 ± 1.02	0.93 ± 1.07	1.07 ± 1.00	0.88 ± 1.07	0.82 ± 0.98	0.87 ± 1.06
Private job	1.07 ± 0.91	1.16 ± 1.07	1.02 ± 0.99	1.16 ± 0.89	1.30 ± 1.17	1.05 ± 1.13	1.19 ± 1.16
Self employed	1.00 ± 1.05	1.05 ± 1.03	1.21 ± 1.08	1.32 ± 1.16	1.21 ± 1.23	0.63 ± 0.95	0.95 ± 1.08
Unemployed	1.78 ± 0.94	1.67 ± 1.37	1.33 ± 1.28	1.67 ± 1.28	1.22 ± 1.21	1.61 ± 1.33	1.11 ± 1.28
p value	0.043[*]	0.073^{NS}	0.497^{NS}	0.181^{NS}	0.278^{NS}	0.024[*]	0.528^{NS}
Are you afraid to be infected with COVID-19 due to profession?							
Slightly afraid	0.83 ± 0.85	1.00 ± 1.04	1.00 ± 1.04	1.02 ± 0.92	0.88 ± 1.13	0.74 ± 0.99	0.86 ± 1.05
Moderately afraid	1.39 ± 0.96	1.04 ± 1.04	1.04 ± 1.07	1.32 ± 1.02	1.07 ± 1.05	1.21 ± 1.03	1.07 ± 0.90
Very afraid	2.58 ± 0.79	1.50 ± 1.24	1.75 ± 0.96	2.25 ± 0.87	2.50 ± 1.00	1.58 ± 1.31	2.33 ± 0.89
Not at all	0.97 ± 0.92	1.12 ± 1.16	0.95 ± 1.09	1.07 ± 1.06	0.98 ± 1.05	0.88 ± 1.12	0.81 ± 1.15
p value	0.001^{***}	0.568^{NS}	0.126^{NS}	0.002^{**}	0.001^{***}	0.060^{NS}	0.001^{***}
Acquired sufficient knowledge on COVID-19 outbreak							
Not at all	1.41 ± 1.02	1.31 ± 1.12	1.15 ± 1.08	1.29 ± 1.03	1.25 ± 1.15	1.15 ± 1.13	1.00 ± 1.02
Minimal	1.00 ± 0.95	1.00 ± 1.10	0.82 ± 0.90	1.12 ± 0.95	1.03 ± 1.14	0.97 ± 1.06	1.21 ± 1.29
Moderate	1.41 ± 1.18	0.94 ± 1.19	1.18 ± 1.33	1.53 ± 1.18	1.12 ± 1.17	1.06 ± 1.39	1.00 ± 1.12
Very high	0.67 ± 0.76	0.90 ± 0.99	1.03 ± 1.09	0.97 ± 1.07	0.87 ± 1.14	0.53 ± 0.82	0.80 ± 1.13
p value	0.005^{**}	0.302^{NS}	0.519^{NS}	0.282^{NS}	0.490^{NS}	0.091^{NS}	0.558^{NS}

Higher mean value indicates higher level of anxiety and vice-versa. *P* value by ANOVA for more than two group and by independent sample *t* test for two group on the confirmation of normality assumption. *P* value <0.05 is considered to be statistically significant. **p* value <0.05, ***p* value <0.01, ****p* value <0.001; NS, statistically non-significant



Table 5: Distribution of level of anxiety (GAD-7 scale) according to various parameters of domain 1 and 2 of the questionnaire

	Level of Anxiety								Total		p value
	Mild		Moderate		Moderate to severe		Severe				
	n	%	n	%	n	%	n	%	n	%	
Gender											
Male	35	36.5	23	24.0	29	30.2	9	9.4	96	100.0	0.537 ^{NS}
Female	15	34.1	15	34.1	12	27.3	2	4.5	44	100.0	
University											
Qassim University	28	45.9	16	26.2	15	24.6	2	3.3	61	100.0	0.140 ^{NS}
Prince Sattam University	1	9.1	3	27.3	4	36.4	3	27.3	11	100.0	
Al Baha University	5	29.4	5	29.4	5	29.4	2	11.8	17	100.0	
King Saud University	3	20.0	6	40.0	4	26.7	2	13.3	15	100.0	
King Abdul Aziz University	5	22.7	6	27.3	10	45.5	1	4.5	22	100.0	
Mustaqbal University/Buraida Pvt College	8	57.1	2	14.3	3	21.4	1	7.1	14	100.0	
Academic year											
First year	11	29.7	10	27.0	15	40.5	1	2.7	37	100.0	0.158 ^{NS}
Second year	9	37.5	9	37.5	5	20.8	1	4.2	24	100.0	
Third year	13	33.3	12	30.8	12	30.8	2	5.1	39	100.0	
Intern	17	42.5	7	17.5	9	22.5	7	17.5	40	100.0	
Area											
Rural	10	22.2	13	28.9	16	35.6	6	13.3	45	100.0	0.076 ^{NS}
Urban	40	42.1	25	26.3	25	26.3	5	5.3	95	100.0	
Source of income											
Government job	25	41.7	16	26.7	15	25.0	4	6.7	60	100.0	0.523 ^{NS}
Private job	14	32.6	12	27.9	15	34.9	2	4.7	43	100.0	
Self-employed	7	36.8	5	26.3	6	31.6	1	5.3	19	100.0	
Unemployed	4	22.2	5	27.8	5	27.8	4	22.2	18	100.0	
Are you afraid to be infected with COVID-19 due to profession?											
Slightly afraid	18	42.9	13	31.0	9	21.4	2	4.8	42	100.0	0.001 ^{***}
Moderately afraid	7	25.0	10	35.7	10	35.7	1	3.6	28	100.0	
Very afraid	0	0.0	1	8.3	5	41.7	6	50.0	12	100.0	
Not at all	25	43.1	14	24.1	17	29.3	2	3.4	58	100.0	
Acquired sufficient knowledge on COVID-19 outbreak											
Not at all	15	25.4	20	33.9	19	32.2	5	8.5	59	100.0	0.437 ^{NS}
Minimal	14	41.2	8	23.5	8	23.5	4	11.8	34	100.0	
Moderate	7	41.2	3	17.6	5	29.4	2	11.8	17	100.0	
Very high	14	46.7	7	23.3	9	30.0	0	0.0	30	100.0	

p value by Chi-square test. P value <0.05 is considered to be statistically significant. *** p value <0.001; NS, statistically non-significant

identified as the main sources of stress among college students. Present study also states that the students from rural area had statistically greater anxiety level.

To prevent the spreading of the infection amongst the students and teachers, the Saudi government had ordered a countrywide schools and universities closure as an emergency measure. Though these efforts and decisive actions are highly praiseworthy and necessary, there are also concerns that distance learning, home confinement, and school suspension may have adverse effects on

students' mental and physical health.³⁵ Students from King Abdul Aziz University and Prince Sattam University showed statistically higher anxiety score when comparing the GAD-7 questions.

Some findings have also shown that loss of income and large-scale isolation measures have led to mental health problems among migrant workers during COVID-19 outbreaks.³⁶ In this present study also, students whose parents were unemployed during pandemic were found to be more stressed compared to others. Various studies have reported that female have higher level of anxiety

when compared to males.^{37,38} In this study, no relation was found between gender, academic year, and anxiety level.

Additionally, a series of issues such as frustration and boredom, fear of contagion, lack of private space at home, and inadequate information would continue to arise and escalate during the COVID-19 outbreak.³⁵ Anxiety levels were significantly higher among students who slightly feared contacting the disease because of their profession (42.9%). Because of distance education, there might be changes in the communication between the students and teachers. As a result, the students might feel isolated which can be an important source of pressure for students. This might lead to inadequate knowledge regarding the COVID-19 pandemic, and thereby increasing the stress among the students.³⁹ Also, healthcare professionals experiencing increased psychological pressure have found rise in their confidence with the availability of vaccine. Reports have suggested that there has been decrease in the anxiety and stress levels post vaccination.⁴⁰ The questionnaire-based bias and the sample size are the likely limitations of this study, which the author is aware about. However, in spite of these limitations, this study illustrates the various causes for the increased anxiety levels among the dental hygiene students.

To facilitate for the psychological well-being of healthcare professionals and optimal treatment for patients, it is important to have the knowledge on the psychological impact of the pandemic on them. Education institutions can minimize the psychological stress among students by increased professional counselling and optimum academic advising especially during such pandemic outbreaks. Therefore, studies considering COVID-19-outbreak-related worries and emotional reactions among healthcare professionals from different populations and countries are required.⁴¹⁻⁴³

CONCLUSION

Anxiety is considered as an important factor for healthcare students that may influence negatively on their personal and academic life. The present results demonstrate that dental hygiene students suffered from some form of anxiety ranging from mild anxiety to severe anxiety, reporting that they frequently felt nervous and were scared that something terrible would happen. Offering immediate treatment has proven to be beneficial to prevent serious consequences. Thus, student counseling programs must be employed by all universities and students must be intervened when they face physical, behavioral, or mental health challenges.

DECLARATIONS

Ethics approval and consent to participate: Submitted questionnaire were considered as a consent by the students to participate in this study. This study was approved by the Institutional Ethics Committee of Qassim University, Saudi Arabia.

Availability of data and materials: The data sets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

REFERENCES

1. COVID-19 and conflict: seven trends to watch-special briefing 4/the COVID-19 pandemic and deadly conflict, 24 March 2020. Available from: <https://www.crisisgroup.org/global/sb4-covid-19-and-conflict-seven-trends-watch> [Accessed on April 20, 2020].
2. Zhu N, Zhang D, Wang W, et al. A novel coronavirus from patients with pneumonia in China, 2019. *N Engl J Med* 2020;382(8):727-733. DOI: 10.1056/NEJMoa2001017.
3. Mahase E. China coronavirus: WHO declares international emergency as death toll exceeds 200. *British Medical Journal* 2020;368:m408. DOI: 10.1136/bmj.m408.
4. Wang C, Horby PW, Hayden FG, et al. A novel coronavirus outbreak of global health concern. *Lancet* 2020;395(10223):470-473. DOI: 10.1016/S0140-6736(20)30185-9.
5. Pan A, Liu L, Wang C, et al. Association of public health interventions with the epidemiology of the COVID-19 outbreak in Wuhan, China. *Journal of the American Medical Association* 2020;323(19):1915-1923. DOI: 10.1001/jama.2020.6130.
6. Maunder R. The experience of the 2003 SARS outbreak as a traumatic stress among frontline healthcare workers in Toronto: lessons learned. *Philos Trans R Soc Lond B* 2004;359(1447):1117-1125. DOI: 10.1098/rstb.2004.1483.
7. Greenberg N, Docherty M, Gnanapragasam S, et al. Managing mental health challenges faced by healthcare workers during covid-19 pandemic. *British Medical Journal* 2020;368:m1211. DOI: 10.1136/bmj.m1211.
8. Al-Rabiaah A, Tamsah MH, Al-Eyadhy AA, et al. Middle East Respiratory Syndrome-Corona Virus (MERS-CoV) associated stress among medical students at a university teaching hospital in Saudi Arabia. *J Infect Public Health* 2020;13(5):687-691. DOI: 10.1016/j.jiph.2020.01.005.
9. Wong TW, Gao Y, Tam WWS. Anxiety among university students during the SARS epidemic in Hong Kong. *Stress Health* 2007;23(1): 31-35. DOI: 10.1002/smi.1116.
10. Cao W, Fang Z, Hou G, et al. The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry Res* 2020;287:112934. DOI: 10.1016/j.psychres.2020.112934.
11. Saddik B, Hussein A, Sharif-Askari F, et al. Increased level of anxiety among medical and non-medical university students during the COVID-19 pandemic in the United Arab Emirates. *Risk Manag Healthc Policy* 2020;13:2395. DOI: 10.2147/RMHP.S273333.
12. Michaels D, Wagner GR. Occupational safety and health administration (OSHA) and worker safety during the COVID-19 pandemic. *Journal of the American Medical Association* 2020;324(14):1389-1390. DOI: 10.1001/jama.2020.16343.
13. Volgenant CMC, de Soet JJ. Cross-transmission in the dental office: does this make you ill? *Curr Oral Health Rep* 2018;5(4):221-228. DOI: 10.1007/s40496-018-0201-3.
14. Halboub ES, Al-Maweri SA, Al-Jamaei AA, et al. Knowledge, attitudes, and practice of infection control among dental students at Sana'a University, Yemen. *J Int Oral Health* 2015;7(5):15-19. PMID: 26028896.
15. Sahu P. Closure of universities due to Coronavirus disease 2019 (COVID-19): impact on education and mental health of students and academic staff. *Cureus* 2020;12:e7541. DOI: 10.7759/cureus.7541.
16. Siddhartha S, Adil AH, Mulla M, et al. Usage of social media among undergraduate university students. *Eur J Mol Clin Med* 2020; 7(8):1605-1617. https://ejmcm.com/pdf_4335_715ec1cf43d58db0b2d879aef88af541.html.
17. Spitzer RL, Kroenke K, Williams JBW, et al. A brief measure for assessing generalized anxiety disorder: the GAD-7. *Arch Intern Med* 2006;166(10):1092-1097. DOI: 10.1001/archinte.166.10.1092.
18. Basudan S, Binanzan N, Alhassan A. Depression, anxiety and stress in dental students. *Int J Med Educ* 2017;8:179-186. DOI: 10.5116/ijme.5910.b961.
19. Islam S, Akter R, Sikder T, et al. Prevalence and factors associated with depression and anxiety among first-year university students in Bangladesh: a cross-sectional study. *Int J Ment Health Addict* 2020. DOI: 10.1007/s11469-020-00242-y.
20. World Health Organization. WHO guidelines: Management of physical health conditions in adults with severe mental disorders. 2018. Retrieved from: https://www.who.int/mental_health/evidence/guidelines_severe_mental_disorders_web_note_2018/en/ [Accessed February 15, 2020].

21. Rotenstein LS, Ramos MA, Torre M, et al. Prevalence of depression, depressive symptoms, and suicidal ideation among medical students: a systematic review and meta-analysis. *Journal of the American Medical Association* 2016;316(21):2214–2236. DOI: 10.1001/jama.2016.17324.
22. Abdel Rahman AG, Al Hashim BN, Al Hiji NK, et al. Stress among medical Saudi students at College of Medicine, King Faisal University. *J Prev Med Hyg* 2013;54(4):195–199. PMID: 24779279.
23. Ali Taha A, AA El-shereef E, Mohammed Abdullah TI, et al. Social anxiety disorder and its correlates among female students at Taif University, Saudi Arabia. *Res Psychol Behav Sci* 2017;5:50–56. DOI: 10.12691/rpbs-5-2-3.
24. Hakami RM, Mahfouz MS, Adawi AM, et al. Social anxiety disorder and its impact in undergraduate students at Jazan University, Saudi Arabia. *Ment Illn* 2018;9(2):7274. DOI: 10.4081/mi.2017.7274.
25. Mulla M. Impact of oral diseases and conditions on oral health-related quality of life: a narrative review of studies conducted in the Kingdom of Saudi Arabia. *Cureus* 2021;13(9):e18358. DOI: 10.7759/cureus.18358.
26. Rutter LA, Brown TA. Psychometric properties of the generalized anxiety disorder scale-7 (GAD-7) in outpatients with anxiety and mood disorders. *J Psychopathol Behav Assess* 2017;39(1):140–146. DOI: 10.1007/s10862-016-9571-9.
27. Jordan P, Shedden-Mora MC, Löwe B. Psychometric analysis of the Generalized Anxiety Disorder scale (GAD-7) in primary care using modern item response theory. *PLoS One* 2017;12(8):e0182162. DOI: 10.1371/journal.pone.0182162.
28. Löwe B, Decker O, Müller S, et al. Validation and standardization of the Generalized Anxiety Disorder Screener (GAD-7) in the general population. *Med Care* 2008;46(3):266–274. DOI: 10.1097/MLR.0b013e318160d093.
29. Terrill AL, Hartoonian N, Beier M, et al. The 7-item generalized anxiety disorder scale as a tool for measuring generalized anxiety in multiple sclerosis. *Int J MS Care* 2015;17(2):49–56. DOI: 10.7224/1537-2073.2014-008.
30. Seo J-G, Park S-P. Validation of the Generalized Anxiety Disorder-7 (GAD-7) and GAD-2 in patients with migraine. *J Headache Pain* 2015;16(1):97. DOI: 10.1186/s10194-015-0583-8.
31. Mayer FB, Santos IS, Silveira PS, et al. Factors associated to depression and anxiety in medical students: a multicenter study. *BMC Med Educ* 2016;16(1):282. DOI: 10.1186/s12909-016-0791-1.
32. Yusoff MSB, Abdul Rahim AF, Baba AA, et al. The impact of medical education on psychological health of students: a cohort study. *Psychol Health Med* 2013;18(4):420–430. DOI: 10.1080/13548506.2012.740162.
33. Hope V, Henderson M. Medical student depression, anxiety and distress outside North America: a systematic review. *Med Educ* 2014;48(10):963–979. DOI: 10.1111/medu.12512.
34. Mulla M, Moothedath M, Tareen SU, et al. Assessment of traumatic injury awareness in school teachers in Saudi Arabia. *Turkish Online Journal of Qualitative Inquiry* 2021;12(8):1939–1944. <https://www.tojqi.net/index.php/journal/article/view/4305/2962>.
35. Chernomas WM, Shapiro C. Stress, depression, and anxiety among undergraduate nursing students. *Int J Nurs Educ Scholarsh* 2013;10(1):255–266. DOI: 10.1515/ijnes-2012-0032.
36. Wang G, Zhang Y, Zhao J, et al. Mitigate the effects of home confinement on children during the COVID-19 outbreak. *Lancet* 2020;395(10228):945–947. DOI: 10.1016/S0140-6736(20)30547-X.
37. Liu ZH, Zhao YJ, Feng Y, et al. Migrant workers in China need emergency psychological interventions during the COVID-19 outbreak. *Global Health* 2020;16(1):75. DOI: 10.1186/s12992-020-00608-w.
38. Baldwin DS, Anderson IM, Nutt DJ, et al. Evidence-based pharmacological treatment of anxiety disorders, post-traumatic stress disorder and obsessive-compulsive disorder: a revision of the 2005 guidelines from the British Association for Psychopharmacology. *J Psychopharmacol* 2014;28(5):403–439. DOI: 10.1177/0269881114525674.
39. Franko DL, Striegel-Moore RH, Bean J, et al. Self-reported symptoms of depression in late adolescence to early adulthood: a comparison of African-American and Caucasian females. *J Adolesc Health* 2005;37(6):526–529. DOI: 10.1016/j.jadohealth.2004.08.028.
40. Karayürek F, Çebi AT, Gülses A, et al. The impact of COVID-19 vaccination on anxiety levels of Turkish dental professionals and their attitude in clinical care: a cross-sectional study. *Int J Environ Res Public Health* 2021;18(19):10373. DOI: 10.3390/ijerph181910373.
41. Hurst CS, Baranik LE, Daniel F. College student stressors: a review of the qualitative research. *Work Stress* 2013;29(4):275–285. DOI: 10.1002/smi.2465.
42. Boyraz G, Legros DN, Tigershtrom A. COVID-19 and traumatic stress: the role of perceived vulnerability, COVID-19-related worries, and social isolation. *J Anxiety Disord* 2020;76:102307. DOI: 10.1016/j.janxdis.2020.102307.
43. Kang L, Li Y, Hu S, et al. The mental health of medical workers in Wuhan, China dealing with the 2019 novel coronavirus. *Lancet Psychiatry* 2020;7(3):e14. DOI: 10.1016/S2215-0366(20)30047-X.