

# Effects of COVID-19 lockdown on the mental health of dental students: A longitudinal study

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## Abstract

**Objectives:** Many countries have enforced lockdowns on their populations due to the coronavirus disease 2019 (COVID-19) pandemic. This study aimed to assess the effects of the lockdown on dental students.

**Methods:** A longitudinal, repeated cross-sectional study was conducted to evaluate psychological problems experienced by dental students during the COVID-19 lockdown in Saudi Arabia. The dental students were selected from different universities using 2-stage cluster sampling. The validated Arabic version of the 21-item depression, anxiety, and stress scale questionnaire was distributed at the beginning and end of the lockdown. Mann–Whitney *U* and Kruskal–Wallis tests were used as appropriate. Chi-square test was used to compare the proportions between the sociodemographic data, and logistic regression analysis was used to identify variables associated with the students' responses.

**Results:** A total of 1287 respondents participated in this study (695 first-survey respondents, 592 second-survey respondents). There were longitudinally significant differences in the students' mental health outcomes based on gender, university, class year, and survey time during the COVID-19 lockdown. The lockdown increased the likelihood of female, single, and junior students experiencing stress. The students who lived alone recorded a high chance of elevated levels of depression, anxiety, and stress, which showed a significant longitudinal reduction during the lockdown. Moreover, the lockdown increased the likelihood of mental health problems among the students staying in households of two persons or two-five persons.

**Conclusions:** This study indicates the importance of considering the detrimental mental health consequences on dental students in the event of future pandemics.

## KEYWORDS

anxiety, COVID-19, dental student, depression, lockdown, mental health, psychological impact, Saudi Arabia, stress

## 1 | INTRODUCTION

The COVID-19 virus has characteristics that make it comparatively more contagious than other viruses.<sup>1</sup> Many countries, therefore, enforced lockdown which is an effective measure to prevent or minimize the impact of infectious disease outbreaks.<sup>2</sup> As of March 25, 2020, 1560 nations closed educational institutions worldwide prohibiting any on-campus activities.<sup>3</sup> The Saudi Arabian authorities reacted similarly, encouraged online teaching, and restricted students to their residential facilities, which changed the lives of the students drastically.<sup>4</sup> The lockdown involves loss of freedom, uncertainty of recovery, loneliness, insecurities about the future, and boredom. These conditions can lead to mental disorders such as anxiety, psychoses, and post-traumatic stress disorder.<sup>5,6</sup>

Dental education is one of the most stressful higher education programs because of the complex and broad demands of didactic, patient management and technical clinical skills.<sup>7</sup> Higher rates of depression and anxiety are prevalent among students with a low socioeconomic status. This is evident even with available financial support from schools as there are additional financial demands, including the need for expensive dental tools and textbooks, which can be a stressful burden.<sup>8</sup> The aforementioned factors may trigger symptoms such as anxiety, depression, emotional fatigue, and low academic achievement in dental students, resulting in burn-out.<sup>7</sup>

The students in Saudi Arabia enroll the dental colleges upon completion of a pre-dental preparatory academic year after high school. Admission to dental colleges in Saudi Arabia is based mainly on cognitive variables collected from exams scores during high school and grade point average obtained during the pre-dental preparatory year.<sup>9</sup> Non-cognitive traits assessed by preadmission interviews have been shown to correlate with academic achievements in dental students.<sup>9,10</sup> It has been reported that the self-esteem of younger students and undergraduate college students is lower than postgraduate students, which makes them more prone to mental health problems.<sup>11</sup> The literature reported controversial findings regarding the mental health illness among dental students throughout the entire curriculum.<sup>12,13</sup> Therefore, it is essential to offer early guidance and effective support and counseling assistance to dental students.<sup>3</sup> Nowadays, strategies to encourage students to manage their feelings during a health crisis and motivate them to maintain their physical and mental health are pressing issues for colleges and universities.<sup>14</sup>

Academic pressure to perform well adds to the potential mental health problems experienced by students, leading to reduced social interactions and support, and new stressors linked to COVID-19.<sup>15,16</sup> A previous study showed

elevated levels of depression, anxiety, and stress among dental students during the initial phase of lockdown in Saudi Arabia, with female and junior students experiencing more stress.<sup>4</sup> Unfortunately, no studies have observed the effects of lockdown on the mental well-being of dental students at any university longitudinally. The primary aim of this study was, therefore to investigate the effects of lockdown on dental students and, more specifically, their mental well-being.

## 2 | METHODS

A longitudinal repeated cross-sectional study was conducted from April 14-26, 2020 (first survey) to May 23-June 20, 2020 (second survey) to assess the psychological problems experienced by dental students in Saudi Arabia during the COVID-19 lockdown. Ethical clearance was obtained from the Ethical Committee of the Scientific Research Unit at the College of Dentistry, Jazan University, before starting the study (Reference number: CODJU-2003F).

### 2.1 | Study design and study population

The required sample size for this study was 700 subjects, estimated based on power of 80%, and a 95% confidence interval (95% CI) for a prevalence of 50%. The study sample included dental college students from universities selected based on two-stage cluster sampling. To begin with, Saudi Arabia was divided into five subregions (East, West, North, South, and Center). In the second stage, a public dental college was chosen from every subregion. From the southern and central regions, two dental colleges were selected due to the high number of public dental colleges. Imam Abdulrahman Bin Faisal University represented the Eastern region; King Abdulaziz University represented the Western region; Hail University represented the Northern region; Jazan University and King Khalid University represented the Southern region, and King Saud University and Qassim University represented the center of the Kingdom. Hail University was excluded as only two students participated in the first survey.

### 2.2 | Data collection

The data were gathered using a Microsoft Forms questionnaire, which was distributed to the students via email or WhatsApp. The first survey was distributed at the beginning of the COVID-19 lockdown on April 14, followed by two reminders on April 19 and April 23. The second survey was distributed at the end of the lockdown on May 23,

followed by two reminders on May 29 and June 10. The questionnaire was available for 2 weeks. The dental students were informed of the aim of the study and that their participation was voluntary and anonymous. Each student was asked to provide sociodemographic information after obtaining informed consent.

The students' mental health was assessed using the validated Arabic-version questionnaire of 21-item depression, anxiety, and stress scale (DASS-21).<sup>17</sup> The DASS-21 is the only self-report scale designed to measure the negative emotional states of depression, anxiety, and stress of an individual at the same time.<sup>18</sup> The frequency of negative emotions was rated on a four-point Likert-type scale (0 – did not apply to me at all, 1 – applied to me to some degree or some of the time, 2 – applied to me to a considerable degree or a good part of the time, and 3 – applied to me very much or most of the time).

The score for each of the DASS-21 subscales, seven items per subscale, ranges of 0–28. After doubling the scores, depression, anxiety, and stress were ranked into five categories. The scores were interpreted as follows: normal (0–9 depression [D]; 0–7 anxiety [A]; 0–14 stress [S]), mild (10–13 D; 8–9 A; 15–18 S), moderate (14–20 D; 10–14 A; 19–25 S), severe (21–27 D; 15–19 A; 26–33 S), and extremely severe (28+ D; 20+ A; 34+ S).<sup>18</sup>

### 2.3 | Statistical analysis

The data were entered and analyzed using SPSS version 23 (IBM Corporation, Armonk, NY). Since all variables described in the questionnaire are categorical variables, data were summarized as proportions. Chi-square test and Fisher exact test were used to compare sociodemographic data (age, gender, marital status and number of family members they live with) with their responses. Logistic regression analysis was used to measure the association between dependent variables (stress, anxiety and depression) and independent variables (gender, marital status and class year number of family members they live with). A  $p < 0.05$  was considered statistically significant.

## 3 | RESULTS

### 3.1 | Demographic distribution of the respondents

A total of 697 students from different dental colleges completed the questionnaires during the first survey. Two students from one university were excluded, so the data from 695 respondents were included in the study. At the end of

**TABLE 1** Frequency and percentages distribution of students among demographic variables

Variable		%	N = 1287
Gender	Female	53.70	691
	Male	46.30	596
Marital status	Single	94.95	1222
	Married	4.66	60
	Divorced	.39	5
	Widowed	0	0
University	Jazan	23.07	297
	Alqasim	11.27	145
	King Khalid	3.11	40
	King Saud	29.84	384
	King Abdulaziz	13.44	173
	Imam Abdulahman Bin Faisal	19.27	248
Class year	1st year	18.03	232
	2nd year	20.44	263
	3rd year	18.96	244
	4th year	18.73	241
	5th year	23.85	307
Household	Alone	2.41	31
	2 persons	2.56	33
	2–5 persons	28.28	364
	>5 persons	66.74	859

the lockdown, 592 dental students participated in the second survey. Accordingly, 1287 respondents participated in the study in total. The majority of the respondents in the first and second surveys were female (53.7%). Among them, most of the students were unmarried or single and lived in a household comprising >5 persons. The results are summarized in Table 1.

### 3.2 | Mental health status of the dental students during the COVID-19 lockdown

Tables 2 and 3 show a comparison of the median scores of the DASS subscales of the first- and second-survey respondents. There were significant differences in the students' mental health outcomes based on gender, university, class year, and survey time (Table 2). Compared to the male students, the female students showed significant median scores for depression, anxiety, and stress at the beginning of the lockdown ( $p < 0.0001$ ), while at the end, the female students showed significant median scores for stress only ( $p < 0.05$ ). The students at some universities showed more depression and anxiety ( $p < 0.05$ ) and



TABLE 3 Median comparisons between depression, anxiety, and stress levels and gender, university location, class year, marital status, and household status

	At the beginning of lockdown						At the end of lockdown					
	Depression		Anxiety		Stress		Depression		Anxiety		Stress	
	Median	Range	Median	Range	Median	Range	Median	Range	Median	Range	Median	Range
Gender												
	Female	14.0**	42.0	6.0**	36.0	12.00**	36.0	12.0	8.00	42.0	18.0*	42.0
	Male	10.0	42.0	2.00	36.0	8.00	36.0	12.0	8.00	42.0	16.0	42.0
University												
	1 <sup>st</sup> year	10.0 <sup>Y</sup>	42.0	10.0 <sup>Y</sup>	36.0	4.00 <sup>Y</sup>	36.0	12.0 <sup>Y</sup>	8.00 <sup>Y</sup>	42.0	16.0 <sup>Y</sup>	42.0
	2 <sup>nd</sup> year	12.0	42.0	10.0	36.0	4.00	34.0	13.0 <sup>Y</sup>	8.00	40.0	16.0	42.0
	3 <sup>rd</sup> year	12.0	42.0	12.0	36.0	4.00	36.0	12.0	6.00	42.0	16.0	42.0
	4 <sup>th</sup> year	12.0	42.0	10.0	36.0	4.00	32.0	11.0	8.00	42.0	18.0	42.0
	5 <sup>th</sup> year	12.0	42.0	10.0	36.0	6.00	34.0	16.0	8.00	42.0	16.0	42.0
Marital status												
	Single	10.0	36.0	10.0	36.0	4.00	36.0	14.0	8.00	42.0	16.0	42.0
	Married	12.0	42.0	6.00	42.0	14.0	42.0	12.0	8.00	42.0	16.0	16.0
	Divorced	11.0	34.0	6.00	32.0	14.0	40.0	10.0	6.00	36.0	12.0	38.0
Household												
	Alone	24.0	24.0	2.00	4.00	14.0	16.0	6.00	4.00	14.0	16.0	18.0
	2 persons	34.0	36.0	15.0	24.0	26.0	34.0	23.0 <sup>YY</sup>	16.0 <sup>Y</sup>	36.0	27.0 <sup>YY</sup>	34.0
	3–5 persons	10.0	34.0	6.00	22.0	12.0	38.0	17.0	9.00	32.0	19.0	42.0
	>5 persons	12.0	42.0	4.00	42.0	14.0	42.0	16.0	10.0	42.0	18.0	42.0
		12.0	42.0	6.00	42.0	14.0	42.0	12.0	8.00	42.0	16.0	42.0

Mann–Whitney *U* test.

\*Significant at <0.05.

\*\*Significant at <0.0001.

Kruskal–Wallis test.

<sup>Y</sup>Significant at <0.05.

<sup>YY</sup>Significant at <0.0001.

TABLE 4 Ordinal logistic regression for depression, anxiety, and stress scale components with survey month, university location, and covariates

	At the beginning of lockdown						At the end of lockdown					
	Depression		Anxiety		Stress		Depression		Anxiety		Stress	
	EXP( $\beta$ )	95% CI	EXP( $\beta$ )	95% CI	EXP( $\beta$ )	95% CI	EXP( $\beta$ )	95% CI	EXP( $\beta$ )	95% CI	EXP( $\beta$ )	95% CI
Gender												
Female	2.03	1.54, 2.69**	2.43	1.78, 3.31**	2.34	1.74, 3.16	1.46	1.07, 1.98*	1.34	0.981, 1.83*	1.50	1.10, 2.05*
Male	Reference											
Class year												
1st year	1.15	0.741, 1.75	1.43	0.886, 2.30	1.02	0.650, 1.60	0.764	0.469, 1.25	.891	0.538, 1.48	0.940	0.564, 1.30
2nd year	1.14	0.727, 1.74	1.36	0.965, 2.21	0.941	0.597, 1.49	0.588	<b>0.383, 0.903*</b>	.959	0.485, 1.17	0.845	0.549, 1.30
3rd year	1.16	0.756, 1.80	1.58	0.965, 2.60	1.10	0.687, 1.78	0.682	0.443, 2.01	1.04	0.675, 1.62	1.23	0.800, 1.91
4th year	1.27	0.820, 1.95	1.38	0.844, 2.25	1.12	0.704, 1.78	1.30	0.835, 2.01	1.24	0.785, 1.97	1.31	.840, 2.05
5th year	Reference											
Marital status												
Single	1.71	0.743, 3.92	1.73	0.694, 4.33	2.55	0.963, 6.74	2.30	<b>1.13, 4.68*</b>	1.76	0.854, 3.61	1.96	0.961, 4.02
Married	Reference											
Household												
Alone	9.90	<b>2.79, 35.20**</b>	5.31	<b>1.41, 20.0*</b>	7.20	<b>2.02, 25.68</b>	4.55	<b>2.19, 9.47**</b>	4.04	<b>1.94, 8.41**</b>	5.88	<b>2.70, 12.81**</b>
2 persons	1.02	0.318, 3.44	1.63	0.511, 5.20	1.72	0.506, 5.86	2.80	<b>1.10, 7.14*</b>	2.60	0.979, 6.92	2.24	0.856, 5.85
2-5 persons	1.10	0.802, 1.50	1.00	0.711, 1.41	0.960	0.690, 1.34	1.88	<b>1.34, 2.63**</b>	1.57	<b>1.12, 2.20**</b>	1.62	<b>1.16, 2.26*</b>
>5 persons	Reference											

\*The ordinal regression test is significant at <0.05.

\*\*At <0.0001.

of different countries during the COVID-19 pandemic restrictions.<sup>19,20</sup> Furthermore, they are in line with studies about quarantined general population in the current and previous pandemics, which showed psychological outcomes and long-term consequences.<sup>21</sup>

Workload, performance pressure, clinical, and personal are among the highest stress-inducing sources for dental students.<sup>12,13</sup> In the present study, junior students were more likely to report psychological problems during the lockdown. These findings are in line with the existing literature which described that the stress of junior students is due to the high academic demands. During the lockdown, the clinical sessions were canceled for the senior students, but the high academic demands were maintained for junior students. Therefore, junior students experienced more stress compared to seniors during the lockdown.<sup>6,7,22</sup> In the current study, the academic year has ended during the lockdown. Nevertheless, in addition to the academic pressure, the extended lockdown period might have attributed to the psychological problems reported by junior dental students by the end of the lockdown. These results support the findings that longer duration of quarantine was associated with poorer mental health.<sup>21</sup>

Moreover, a significant finding of this study was that the lockdown increased the likelihood of the single students experiencing depression and stress during the lockdown compared to married students. This could be attributed to the fact that married individuals usually have family members to share their feelings with and receive support from them.<sup>23</sup> In contrast, another study noted that fewer symptoms were experienced by the single students and claimed that married students have more responsibilities, which elevates their stress levels. However, the single international students who lived alone and away from their home countries and families experienced more anxiety.<sup>24</sup>

It has been reported that college students who had many stressful life events or have been clinically diagnosed with a mental health illness would have higher rates of developing mental health problems.<sup>25</sup> A study following the outbreak of COVID-19 in China has reported that the stressful life experiences among college students can be mediated by resilience, social support, and adaptive coping strategies as effective intrapersonal and interpersonal protective factors.<sup>26</sup> This study showed a temporal adverse status of mental health throughout the COVID-19 lockdown. In addition to the students living alone, the extended lockdown increased the psychological distress among the students living in households of two-five persons compared to those staying in households of >5 persons. This variation could be because having more

family members means that students receive more social support. Also, this situation increases distractions in their surroundings which help in coping with stress, anxiety, and depression.<sup>4</sup> The results of this study support the literature, which showed that informal social support from family, friends, and peers improve self-concept and provide effective help during times of stress.<sup>25,27</sup>

Several factors may lead to gender difference in distress experienced during the pandemic. Among these factors, female dental students were reported to be more anxious about exam challenges, losing manual dexterity, and the possibility of contracting COVID-19.<sup>24</sup> In this study, the female students were more likely to experience depression, anxiety, and stress than the male students. This finding is in agreement with previous literature reported on quarantine.<sup>4,28</sup> Moreover, many pre-pandemic studies support this finding,<sup>8,11</sup> while some other studies contradict it.<sup>29</sup> This finding could be attributed to the hormonal change's females experience and their tendency to be more emotional regarding their social lives and the expression of feelings.<sup>30</sup> A study showed that women tend to stop their clinical work because of anxiety more than men.<sup>31</sup> However, in this study, the majority of the students in the first and second surveys were female, so that these results could be interpreted with caution.

While this study had some significant findings, it also had some limitations. During the two surveys, the sample population was not necessarily the same, and a cohort longitudinal study would pose the risk of experiencing panel attrition and risk in gathering data. Furthermore, having a good response from students in the Northern Region of the country would have yielded further insights into the subject matter. Another limitation is that objective assessment by mental health professionals might have revealed more accurate information than an online survey. Nevertheless, self-reporting of the psychological impact using an online format was the most affordable method during the COVID-19 lockdown.

## 5 | CONCLUSIONS

In conclusion, this study is considered the first in which the psychological effect of COVID-19 lockdown has been evaluated longitudinally on dental students. The lockdown has a temporal psychological impact on dental students. Some students, particularly those who lived alone, might be at higher risk of social isolation and the development of mental health problems during the lockdown. Female, single, and junior students were also likely to face negative mental health consequences. These observations on the students also need to be evaluated by a psychologist to

early identify the existence of stress, anxiety, and depression in the event of future lockdowns. Moreover, our findings can further inform the ongoing efforts of universities around the world to develop health system strategies to provide crisis-oriented psychological services for university students.

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