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ORIGINAL RESEARCH

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Psychological impact of COVID-19 among undergraduate students in Jordan: A cross-sectional study

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Abstract

Background: Psychopathology could be brought on by an immune system disruption triggered by an infection. Psychiatric residual effects have been noted following prior coronavirus outbreaks.

Method: This study is a cross-sectional study that examined the psychopathological influence of the COVID-19 pandemic among survivor students compared to students who have never been diagnosed as positive COVID-19 patients (i.e., healthy students). Further, the study identified the relationship between socio-demographic profiles and mental health. To examine the significance of psychological health differences we used the DASS-21, to measure depression, anxiety, and stress scales. There were seven questions to assess each dimension within the psychological scales. The respondents were selected randomly via online sources and completed the online self-reporting questionnaire between August 23 and October 2, 2021.

Results: A total of 750 students completed the online questionnaire, with 677 participants (90.27% of those originally surveyed) included in the final analysis of this study. The mean score of the stress scale for healthy students ($M = 16.88$, SD = 12.3, $N = 537$) demonstrated a significantly lower mean compared to COVID-19 survival students ($M = 21.7$, SD = 11.01, $N = 140$), $t(675) = -4.22$, $p < 0.001$. The mean of the depression scale for healthy students ($M = 16.18$, SD = 11.94) demonstrated significantly lower mean compared to COVID-19 survival students ($M = 20.91$, SD = 11. 90), $t(675) = -4.18$, $p < 0.001$. The mean of the anxiety scale for healthy students ($M = 12.50$, SD = 10.72) demonstrated significantly lower mean compared to COVID-19 survival students ($M = 19.43$, SD = 11. 25), $t(675) = -6.74$, $p < 0.001$.

Conclusion: University students who were infected with COVID-19 had a traumatic experience, and thus developed psychological symptoms greater than students with no history of this infection.

KEYWORDS

anxiety, COVID-19, DASS-21, depression, stress

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1 | INTRODUCTION

The WHO declared the severe acute respiratory syndrome coronavirus (SARS-Cov-19) a public health emergency at the start of 2020. While a worldwide panic was observed, little was known about the psychological impact the pandemic would have.[1–3] COVID-19 is a highly transmissible virus that heightened global concerns about its effect, especially as symptoms may not be present immediately in patients, which can take up to 14 days or even longer in severe cases to appear after exposure.[3]

COVID-19 patients are supposed to self-isolate for at least 14 days, and during this period are expected to experience symptoms such as headache, fever, vomiting, pneumonia, or other symptoms.[3–7]

Jordan responded to the WHO public health emergency and forced a rigorous coercive comprehensive quarantine (nationwide curfew); citizens were to remain at home. Such an isolating instance is expected to raise levels of stress and anxiety. As quarantine is well-known in the medical field, it is rarely used in a comprehensive way with the public.[8,9]

In March 2020 students in Jordan stopped going to classrooms and shifted their study to online and distance learning due to the quarantine as the event was sudden and unexpected, which was unusual for students.[8,9] A few studies discussed the immediate impact of COVID-19 on students in Jordan, and some discussed the psychological status of the students during the curfew in Jordan, such as Al-Balas et al.[8] Al-Tammemi[1] Alqutob et al.[10] Akour et al.[11] Wang et al.[3] Alsoud and Harasis[9] and MoH.[12] To the best of authors' knowledge, no studies examined the psychological impact of COVID-19 on students in Jordan.

Psychological symptoms have been reported during coronavirus infections in the past, which led to predicting the possibility of associated symptoms with COVID-19.[13] This fact led to a high probability of psychological repercussions occurring from the COVID-19 pandemic.[3,14–16] We examined the psychopathological influence of COVID-19 in survivors students compared to students who have never been diagnosed as positive COVID-19 patients as well as the relationship between different socio-demographic profiles and mental health. The findings of this study are expected to help in addressing the source of psychological distress among COVID-19 student patients in Jordan. It is also expected to help local training programs for post COVID-19 student and patients to address issues experienced by vulnerable social groups.

2 | BACKGROUND

At the beginning of March 2020, Jordan received the first ever case of COVID-19 in the country, who was a Jordanian traveler from Italy. Afterwards, the number rose to 274 cases in less than 1 month. By the end of the following month (April 2020) Jordan announced that there were 453 people were diagnosed with COVID-19, and 8 patients died from the disease, according to the Jordanian MoH declaration.[8]

A curfew was enacted nationwide and continued for several months. Many sectors in the country were affected by this act, and a paralysis had stricken the country until June 2020, after the intermittent curfew had been adopted.[1,10] The effect of the lockdown was immense on the public in Jordan and globally, especially the psychological status of the public. The immediate effects were enormously high due to the pandemic.[11,17]

The various levels of psychological impact on academic staff at higher education institutions in Jordan highlighted the effect of the emergency, which required a shift of teaching methods from traditional onsite teaching to online and distance learning.[11] In an assessment of students' e-learning experience in Jordan during the COVID-19 pandemic, Alsoud and Harasis[9] reported that more than 81% of 463 students in their study did not expect a transfer to online and distance learning, and at the same time more than 65% of them were not prepared for the lockdown. However, there was no discussion of the psychological impact of the lockdown.

A recent study in Jordan examined the relationship between gender, age, and mental health among Jordanians during the COVID-19 era in more than 1500 participants. The results showed that higher stress significantly appeared in males compared to females. In contrast, anxiety and depression was significantly higher in females compared to males in Jordan.[14]

Raza et al. investigated the psychological impact of COVID-19 patients using DASS-21 in respect to age and gender in Pakistan. Here, 61 patients participated in the study, which concluded that counseling psychotherapy of COVID-19 female patients is highly recommended.[18]

Vaughan et al. investigated the psychometric properties of DASS-21 and provided experimental proof of its usability as a tool, especially for athletics during the COVID-19 pandemic using structure equation modeling. According to the results provided the tool was supported, which encouraged the researchers to examine the effects of the COVID-19 pandemic effect on athletes in sports.[19]

Khan et al.[20] measured the influence and COVID-19 pandemic on the wellbeing and mental health of college and university students in Bangladesh during curfew using DASS-21, and negative psychological consequence on students were observed to a high extent. Financial uncertainty, lack of food, and lower physical activity and exercise had significant association with depression, anxiety, and stress.[20]

Another study during the pandemic in Indonesia assessed anxiety in educational settings. It found that only one-third of adults reported having anxiety, whereas the majority of youngsters did. Additionally, compared to the working-age group, the community of school-age students reported higher levels of anxiety. Compared to men, women reported much higher levels of anxiety.[16]

In Bangladesh, according to Sifat,[21] one of the primary barriers to online education is student mental stress. Recently, a group of mental health professionals claimed that students are already being impacted by anxiety and stress.[21]

In Lebanon, there is a considerable association between student satisfaction and the prevalence of depression, anxiety, and stress, and

online learning has contributed to the rise of depression and anxiety disorders among undergraduate university students.[22]

Infection-induced immune system disruption has the potential to cause psychopathology, and psychiatric sequelae had been observed following previous coronavirus outbreaks. The spread of the recent pandemic may have psychiatric consequences. Mazza et al.[15] recommended assessing the psychopathology of COVID-19 survivors and broadening research on inflammatory biomarkers to diagnose and treat emerging psychiatric conditions. Considering the troubling effect of COVID-19 infection on mental health, and the current understanding on inflammation in psychiatry, observations have been made about how inflammation results in worse depression.[15]

3 | METHOD

3.1 | Design

This cross-sectional study measured the psychological effect of COVID-19 infection among Jordanian university students. It compared those who were infected and those who were not in Jordan using DASS-21. Furthermore, the study investigated the association between the sociodemographic profile of the participants and their mental health using and adopted DASS-21 Arabic version.

3.2 | Instrument

3.2.1 | Socio-demographical data

The students were asked to complete the socio-demographical data to yes or no statements and predefined short answers including age, gender, geographical distribution (city), marital status, smoking status, weight, height, regularity of physical exercise, family size, college major, educational status (2 years' degree college student, bachelor student, master student, PhD student), and level of study (1st year student, 2nd year student, 3rd year student, … etc.).

3.2.2 | The depression, anxiety, and stress scale (DASS)

The DASS is a set of three self-reporting subscales. These subscales are meant to measure emotional states of depression, anxiety, and stress. The DASS-21 questionnaire is available online for public use, and there is no need for special permission to use it.[23] In short, this questionnaire includes 21 questions with 7 questions to measure each dimension (depression, anxiety, and stress). The respondents' answers were summed as overall scores for each dimension (stress, anxiety, and depression). Interpretation of DASS scores are available in Table 1. Further, this questionnaire is validated to be used among students.[23,24]

TABLE 1 Interpretation of DASS scores.[23]

	Normal	Mild	Moderate	Severe	Extremely severe
Depression	0–9	10–13	14–20	21–27	28+
Anxiety	0–7	8–9	10–14	15–19	20+
Stress	0–14	15–18	19–25	26–33	34+

3.2.3 | Sample

A list of students from health sciences related departments in a number of randomly selected governmental universities in Jordan were obtained. Then, instructors of the classes in those departments were asked to deliver the questionnaire to selected students using simple randomization by using student numbers in the class sheet. Each class counted for 80–120 students, in which almost one-third of those students were included in the study. Randomization of the students was carried out, who were then allocated into either one of two groups. The respondents' were divided into two groups according to their responses. The first group included students with a history of COVID-19 or current patients. While the second group included the non-COVID-19 respondents.

The sample size was determined by using a sample size calculation for two means (independent sample) using power and sample size calculation software and by considering sensitivity and specificity of the test at 5% possible prevalence rate.[25] The overall number of eligible students was 5887 and the estimated sample size was 295. Due to the high attrition or failure rate, which might reach in some cases 75%, the researchers recruited more than 1200 students to participate in this study.

Participation was personal preference of choice (voluntary), and no incentives of any means were provided to the students. Also, students had the freedom to exit the online self-reporting questionnaire at any time. The aim of the study and the institutional ethical approval were clearly mentioned at the top of the first section of the online self-reporting questionnaire. To ensure confidentiality, anonymity was guaranteed, and no personal information was included in the online self-reporting questionnaire.

The students completed the online self-reporting questionnaire between August 23 and October 2, 2021 (Approximately 5 weeks for data collection). Online sources were adopted as they are among the best approaches to address this age group, especially since most of the students at the time are being taught via online and distance learning. The online link of the self-reporting questionnaire was disseminated to the students via various Jordanian colleges and universities official platforms (e.g., Microsoft teams, and Modular Object-Oriented Dynamic Learning Environment). This step was carried out to ensure randomization and that only the intended population would participate in the current study. The students were asked two questions in the online self-reporting questionnaire about whether or not they had ever been diagnosed as COVID_19 positive, and if they responded

"yes" then a prompt asked then how long ago was the diagnosis (days, weeks, months, or more than a year).

3.2.4 | Calculation and categorization of depression, anxiety, and stress

To calculate the three psychological states for each participant (depression, anxiety, and stress) DASS-21 includes seven questions for each dimension. The respondents were asked to select a number from 0 to 3 as a weight for the 21 questions, and the answers indicated if the statement applied to them during the past week or not (the number 0 meant it did not apply to them at all whilst 3 meant it applied to them very much/most of the time). According to the DASS-21 manual,[23] the final score is calculated by the weight (answers) of each dimension (psychological state) summed and then multiplied by two. Each participant's final score of the three states were categorized into normal, moderate, mild, severe, and extremely severe according to Table 1. Further, analysis was performed using SPSS version 25 and all tests carried out in this study were 2-Sided (*t*-test and analysis of variance [ANOVA]).

3.2.5 | Ethical consideration

The respondents had to be at least 14 years according to the DASS manual,[23] for those who were under 18 years old (14–18), informed consent from a parent or the legal guardian was obtained. We explained the aims, purpose of the study, and all questions were clearly identified to the parent\legal guardian. Moreover, all responders had to have no severe physical or psychological problems to be treated. This study was approved by the institutional review board at Al-Balqa Applied University (approval number 26\3\2\1032). Further, we also confirm that all methods were performed in accordance with the relevant guidelines and regulations.

4 | RESULTS

A total of 750 students completed the online questionnaire (a response rate of 62.5%), and data from participants was deleted if there were any missing input for questions from the main 21 DASS questions. A total of 677 (90.27%) participants were included in the analysis of this study. And a total of 73 (9.73%) participants were removed from the analysis due to insufficient 21 DASS answers, this rate of missing data is acceptable especially since the questionnaire was distributed to students through their university teachers (i.e., professors). For that, we believe the students were enthusiastic to answer all of the 21 questions in the questionnaire. Also, its worthy to mention that there were no incentives (prices, awards ...etc.) were ever given to any participants by any means.

4.1 | Sociodemographical data

A total of 174 males and 503 females completed the questionnaire, and the age ranged between 15 and 58. The range was expected to be large due to the inclusion criteria, which was for undergraduate and graduate students (MSc and PhD students) over the age of 14. Most of the participants were students in a 2-year diploma degree, 477 (66%). A total of 336 participants (49.6%) were from Irbid, a city in the north of Jordan, see Figure 1. Only 112 (16.2%) of the participants were non-smokers and 17 (2.5%) were ex-smokers. Also, 289 (42.7%) were occasional exercisers (Light exercisers). A total of 407 (60.1%) participants were categorized as healthy weight (BMI Ranged between 18.51 and 24.9) based on the BMI ranges according to NHS and the American cancer society. The mode frequency of the

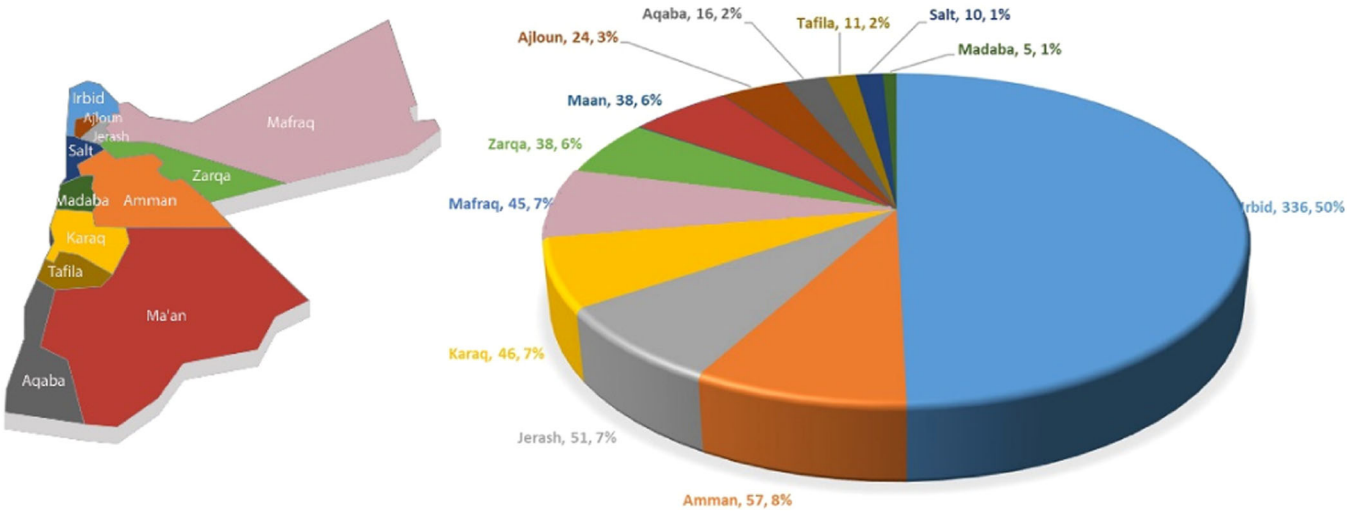

FIGURE 1 Participants students' geographical distribution according to the province.

family size is seven. Most students were single ($n = 585$, 86.4%), and most of them were health majors ($n = 447$, 66%) such as medicine, pharmacy, nursing, medical records, physical therapy etc. A total of 261 (38.6%) of the students participated in this study were in their 1st year of study. Table 2 provides more thorough sociodemographic data about the study participants.

4.2 | Statistical tests

An independent sample *t*-test (2-sided) was performed for each psychometric scale (stress, depression, and anxiety) according to the event of COVID-19 (responses of "yes" or "no"). The mean of the stress scale for students who had never been diagnosed as COVID-19 positive ($M = 16.88$, SD = 12.3, $N = 537$) demonstrated a significant lower mean of stress on the scale compared to students who had been diagnosed as positive with COVID-19 ($M = 21.7$, SD = 11.01, $N = 140$), $t(675) = -4.22$, $p < 0.001$. Table 3 shows the mean and standard deviation of the three psychometric scales for each of the two COVID-19 incidence groups. The mean of depression scale for the students who had never been diagnosed as COVID-19 positive ($M = 16.18$, SD = 11.94) demonstrated a significant lower mean compared to the mean scale for the students who had been diagnosed as positive with COVID-19 ($M = 20.91$, SD = 11. 90), $t(675) = -4.18$, $p < 0.001$. The mean of anxiety scale for the students who had never been diagnosed as COVID-19 positive ($M = 12.50$,

TABLE 2 Demographics of the participants.

	Frequency (%) 677 (100%)	Stress mean (SD) 17.88 (12.20)	Depression mean (SD) 17.16 (12.07)	Anxiety mean (SD) 13.94 (11.18)
Gender				
Male	174 (25.7)	16.20 (12.08)	16.37 (12.04)	11.83 (10.76)
Female	503 (74.3)	18.46 (12.2)	17.43 (12.09)	14.66 (11.24)
Age[a]				
14–18	27 (4.0)	17.48 (10.71)	18.00 (11.16)	17.04 (10.52)
19–30	612 (90.4)	17.71 (12.28)	17.01 (12.12)	13.60 (11.14)
31–40	30 (4.4)	20.07 (12.49)	18.20 (12.65)	15.80 (11.68)
41–50	7 (1.0)	22.57 (7.00)	20.00 (10.07)	19.71 (9.69)
51–58	1 (0.1)	34.00 (0)	32.00 (0)	40.00 (0)
Marital status				
Single	585 (86.4)	17.90 (12.21)	17.46 (12.11)	14.10 (11.13)
Married	86 (12.7)	17.35 (12.49)	14.56 (11.60)	12.26 (11.42)
Missing	6 (0.9)			
Smoker				
No	548 (80.9)	17.50 (12.06)	16.76 (11.89)	13.74 (11.11)
Yes	112 (16.5)	19.79 (12.74)	19.34 (12.84)	15.43 (11.83)
Ex-Smoker	17 (2.5)	17.53 (12.64)	15.76 (11.75)	10.35 (8.01)
BMI[b]				
Underweight (<18.5)	76 (11.2)	17.84 (13.02)	17.03 (12.32)	13.92 (11.30)
Healthy weight (18.51–24.9)	407 (60.1)	17.15 (12.44)	16.62 (12.27)	13.53 (11.14)
Overweight (24.91–29.9)	127 (18.8)	19.45 (11.09)	18.43 (11.73)	14.85 (10.86)
Obese 29.91<	63 (9.3)	18.89 (11.53)	17.94 (11.21)	14.48 (12.23)
Total	673 (99.4)			
Missing	4 (0.6)			
Exercise				
Yes regular	78 (11.5)	16.44 (12.88)	15.31 (12.52)	12.67 (11.53)
Yes, but not regular	191 (28.2)	16.69 (12.25)	15.52 (11.93)	12.58 (11.18)

(Continues)

TABLE 2 (Continued)

	Frequency (%) 677 (100%)	Stress mean (SD) 17.88 (12.20)	Depression mean (SD) 17.16 (12.07)	Anxiety mean (SD) 13.94 (11.18)
Lightly, occasionally	289 (42.7)	17.44 (11.69)	16.96 (11.23)	13.61 (10.33)
Not at all	119 (17.6)	21.78 (12.22)	21.50 (13.05)	17.75 (12.19)
Family size				
2 Members	21 (3.1)	15.71 (11.7)	15.24 (11.99)	12.67 (10.7)
3 Members	37 (5.5)	17.3 (11.38)	15.51 (11.45)	12.59 (11.4)
4 Members	33 (4.9)	15.64 (11.08)	14.24 (11.04)	10.91 (10.26)
5 Members	77 (11.4)	19.9 (13.59)	19.32 (12.96)	15.19 (11.55)
6 Members	123 (18.2)	17.33 (12.2)	16.7 (11.85)	13.46 (11.35)
7 Members	157 (23.2)	18.19 (11.66)	17.4 (11.74)	14.09 (10.76)
8 Members	94 (13.9)	19.68 (12.48)	18.81 (12.63)	16.13 (11.72)
9 Members	54 (8.0)	16.11 (12.78)	16.04 (12.25)	13.78 (11.78)
10 Members	38 (5.6)	14.37 (12.01)	13.89 (12.13)	10.95 (9.85)
11 Members	22 (3.2)	16.73 (11.75)	16.09 (10.96)	12.45 (9.5)
12 Members	5 (0.7)	26.4 (5.18)	29.6 (5.18)	17.6 (11.61)
13 Members	11 (1.6)	20.91 (14.79)	21.27 (14.32)	20 (14.06)
Missing	5 (0.7)			
Educational status				
School student (>15)	13 (1.9)	16.62 (10.56)	16.15 (11.44)	15.08 (10.76)
2 Years Diploma Student	447 (66.0)	17.46 (12.29)	16.68 (11.85)	14.17 (11.35)
B. Sc. Student	191 (28.2)	19.02 (12.24)	18.57 (12.6)	13.46 (10.8)
MSc Student	18 (2.7)	13.78 (9.40)	13.11 (10.72)	9.67 (8.07)
Ph.D. Student	8 (1.2)	25.00 (10.80)	21.25 (13.73)	20.00 (15.57)
Major				
Medical major	447 (66.0)	17.71 (12.13)	16.98 (11.92)	14.09 (11.22)
Nonmedical major	226 (33.4)	18.1 (12.38)	17.44 (12.4)	13.58 (11.15)
Missing	4 (0.6)			
Level of study				
1st year	261 (38.6)	16.69 (12.46)	16.17 (12.03)	13.1 (11.22)
2nd year	257 (38.0)	18.3 (11.97)	17.29 (11.84)	14.37 (11.02)
3rd year	76 (11.2)	18.34 (12.32)	18.42 (12.79)	14.13 (11.75)
4rth year	40 (5.9)	20.6 (12.18)	18.8 (12.22)	15.2 (11.27)
5th year	6 (0.9)	23.33 (12.63)	23.33 (11.64)	16.67 (9.61)
6th year	11 (1.6)	19.45 (13.21)	16.73 (15)	11.27 (9.85)
Missing	26 (3.8)			

[a]Age mean (SD): 21.77 (4.61); youngest participant 15 year old; Oldest participant 58 year old.

[b]BMI ranges according to NHS & American cancer society.

SD = 10.72) demonstrated a significant lower mean compared to the mean scale of the students who had been diagnosed as positive with COVID-19 ($M = 19.43$, SD = 11. 25), $t(675) = -6.74$, $p < 0.001$. Table 4 shows frequency and proportions of each of the psychometric scales (stress, depression, and anxiety) for each incidence category (yes, no). Further, Figure 2 shows the proportions of sunburst for each of the psychometric scales according to the COVID-19 incidence (Survivals).

Four sociodemographic factors were highlighted as their mean scores were significantly different in our database (a total of 677 participants were included, see Table 5). The means of depression, stress and anxiety scales were significantly different between the four groups on exercise using ANOVA test (depression $F(3, 673) = 7.12$, $p < 0.001$, stress $F(3, 673) = 5.25$, $p < 0.001$, and anxiety $F(3, 673) = 6.11$, $p < 0.001$). The depression scores was significantly higher on the smoking factor using independent sample t-test for smoker students ($M = 19.34$, SD = 1. 21) than depression scores mean for the nonsmoker students ($M = 16.76$, SD = 11.89), $t(658) = -2.05$, $p < 0.04$, see Figure 3. Gender mean scores were significantly different for two scores, stress, and anxiety. Male stress scores ($M = 16.20$, SD = 12. 08) was significantly lower than female stress scores ($M = 18.46$, SD = 12.20), $t(675) = -2.11$, $p < 0.04$, see Figure 4. Further, male anxiety scores ($M = 11.83$, SD = 10.76) were significantly lower than female anxiety scores ($M = 14.66$, SD = 11.24), $t(675) = -2.9$, $p \leq 0.004$, Figure 5. Married students' depression scores ($M = 14.56$, SD = 11.60) were significantly lower than single students' scores ($M = 17.46$, SD = 12.11), $t(669) = 2.09$, $p < 0.04$, see Figure 6.

TABLE 3 Covid-19 survival students' prevalence.

	Have you ever been diagnosed as COVID-19 positive	Mean (SD)
Stress	No[a]	16.88 (12.3)
	Yes[b]	21.7 (11.01)
Depression	No[a]	16.18 (11.94)
	Yes[b]	20.91 (11.9)
Anxiety	No[a]	12.5 (10.72)
	Yes[b]	19.43 (11.25)

[a]N = 537;
[b]N = 140.

5 | DISCUSSION

In the current study, we investigated the difference of three emotional statuses: stress, depression, and anxiety, between two groups of students in Jordan using the DASS-21 psychological scale.

TABLE 4 Cross tabulations.

Stress categories, and COVID-19 incidence cross tabulation			
	Have you ever been diagnosed as COVID-19 positive		
	No	Yes	Total
Normal frequency (%)	264 (49.16)	48 (43.29)	312
Mild stress frequency (%)	49 (9.12)	13 (9.29)	62
Moderate stress frequency (%)	72 (13.41)	21 (15)	93
Severe stress frequency (%)	84 (15.64)	30 (21.43)	114
Extreme severe stress frequency (%)	68 (12.66)	28 (20)	96
Total	537	140	677
Depression categories, and COVID-19 incidence cross tabulation			
Normal, frequency (%)	188 (35.01)	27 (19.29)	215
Mild depression, frequency (%)	52 (9.68)	15 (10.71)	67
Moderate depression, frequency (%)	113 (21.04)	35 (25)	148
Severe depression, frequency (%)	65 (12.10)	20 (14.29)	85
Extreme severe depression, frequency (%)	119 (22.16)	43 (30.71)	162
Total	537	140	677
Anxiety categories, and COVID-19 incidence cross tabulation			
Normal, frequency (%)	213 (39.66)	22 (15.71)	235
Mild anxiety, frequency (%)	32 (5.96)	7 (5.00)	39
Moderate anxiety, frequency (%)	99 (18.44)	24 (17.14)	123
Severe anxiety, frequency (%)	51 (9.50)	12 (8.57)	63
Extreme severe anxiety, frequency (%)	142 (26.44)	75 (53.57)	217
Total	537	140	677

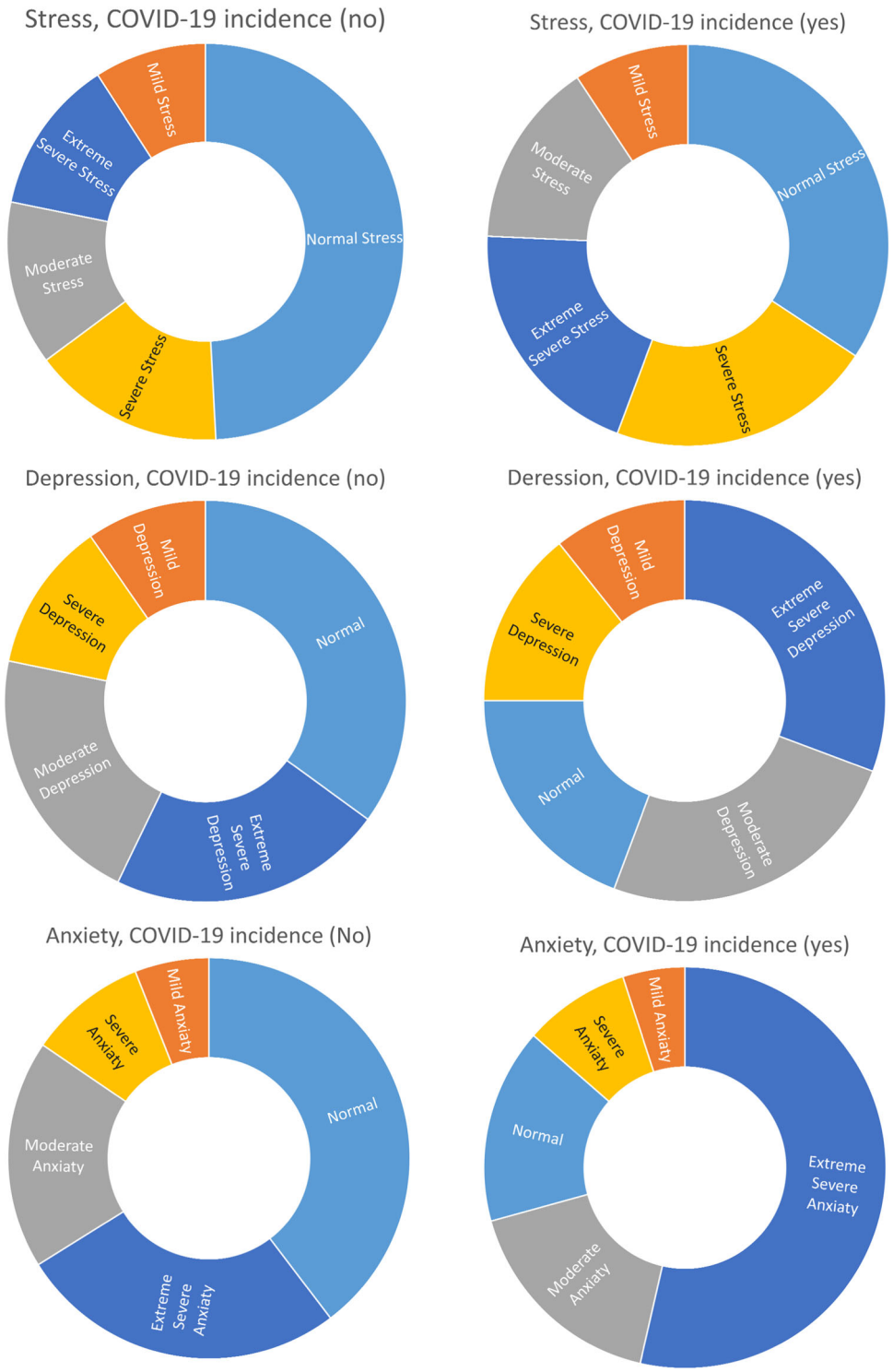

FIGURE 2 Incidence proportions (sunburst) of each of the psychometric scales (stress, depression, and anxiety) according to the COVID-19 incidence (yes, no).

The first group consisted of healthy students, who were never diagnosed with COVID-19, whereas the second group consisted of students with this diagnosis. The mean difference between the two groups was statistically significant for the three psychological scales. Such findings suggest that the impact of COVID-19 is vast and may not be as clear as previously imagined. This result is consistent with a study which found that stress levels are higher among university students after the pandemic.[26] Furthermore, a systematic review of post-traumatic stress syndrome (PTSD) after the COVID-19 pandemic found that PTSD in the public after communicable disease

TABLE 5 Independent sample *t*-tests.

Smoking	Depression scores by smoking status							
	N	Mean	*T* Value	DF	*p* Value	Mean difference	Lower	Upper
Yes	548	16.76	−2.07	658	0.039	−2.58	−5.04	−0.13
No	112	19.34						
Gender	Stress scores by gender							
Male	174	16.2	−2.11	675	0.035	−2.26	−4.36	−0.16
Female	503	18.46						
Gender	Anxiety scores by gender							
Male	174	11.83	−2.11	675	0.004	−2.84	−4.76	−0.92
Female	503	14.66						
Marital status	Depression scores by marital Status							
Single	585	17.46	2.09	669	0.037	2.9	0.17	5.63
Married	86	14.56						

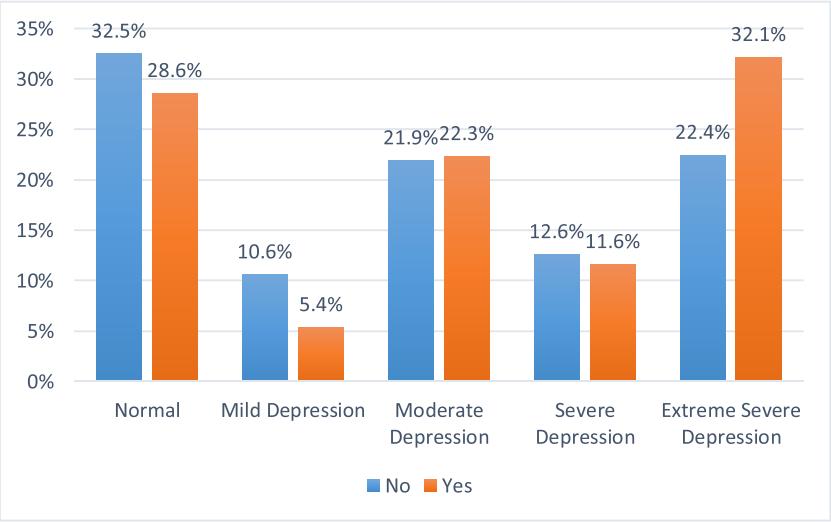

FIGURE 3 DASS-21 depression scores categories according to smoking status (%).

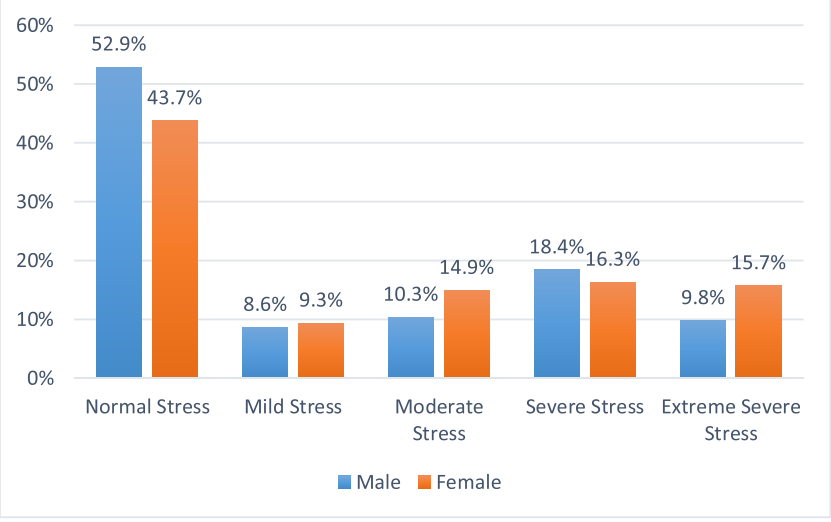

FIGURE 4 DASS-21 stress scores categories according to gender (%).

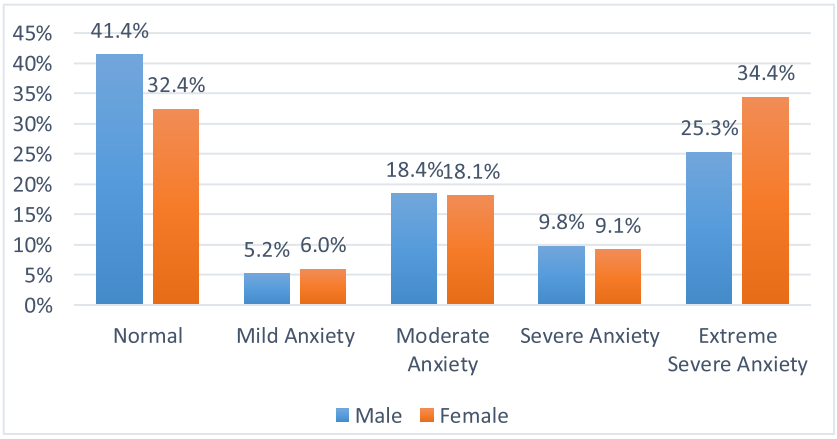

FIGURE 5 DASS-21 anxiety scores categories according to gender (%).

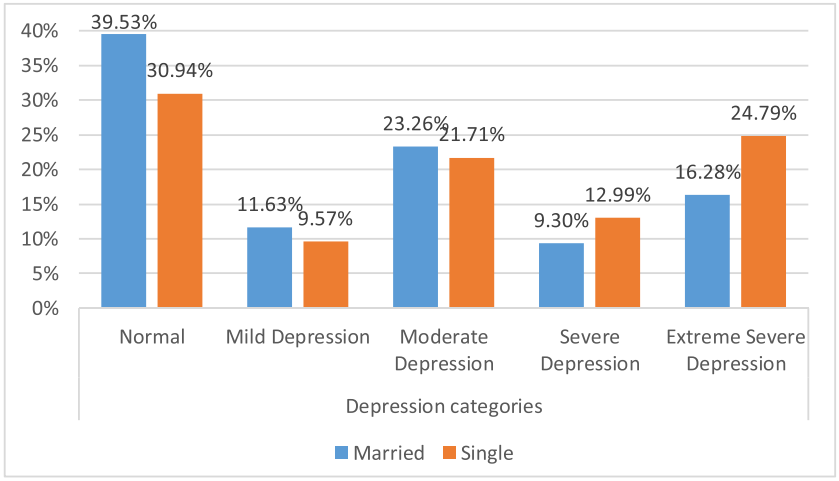

FIGURE 6 DASS-21 depression scores categories according to marital status (%).

pandemics increased by one-fifth and revealed post pandemic PTSD as a highly important public health concern after communicable disease pandemics.[27] One possible explanation of these results is that imposing a range of difficult restrictions on student's lives to prevent the spread of COVID-19 had a detrimental impact on how students live. This caused a lot of emotional and psychological problems such as loneliness and stress.[28]

According to Mazza et al.,[15] younger patients showed higher levels of depression. In this study, survivors of COVID-19 expressed higher degree of depression and anxiety. These findings also bear a resemblance to our study findings indicating the effect of the COVID-19 pandemic on the public, especially for the younger populations. One of the stressors, for example, new teaching methods that are unconventional and unfamiliar to students in developing countries like Jordan present new hurdles that university students must adjust to and overcome. The COVID-19 outbreak was another problem for university lecturers and students, forcing the quick creation of new e-learning formats. The need to adapt to these new ways of learning is likely to have altered students' sense of stress.[29]

The study results are comparable with Khan et al.[20] pertaining to exercise, as in our study the mean scores of three psychological scales are significantly different between different exercise lifestyles. Khan et al.[20] measured DASS-21 scores of college and university students in Bangladesh during curfew and found that there was significant association between exercise and the three psychological scales. Nowadays, to the latest knowledge of the authors, there is a shortage of such studies assessing students' post pandemic psychological impact on physical activity. Fitness centers, leisure centers, and public areas were closed, sports leagues and activity sessions were discontinued, and new social isolation guidelines and self-imposed quarantine restrictions limited what individuals could do outside of their residences and who they could exercise with. Unintentionally, these alterations constrained the kind of physical exercise that people may take part in.

There was a considerable high prevalence of depression among student smokers in this study. Post pandemic studies of smoking, COVID-19 symptoms, and disease severity are readily available.[30,31] Lockdown and curfew triggered higher smoking habits and tobacco

consumption among the general population in France, Italy, and Germany.[32–34] Our research revealed that those who were experiencing severe depression smoked more cigarettes.

In a recent study in Jordan, DASS-21 stress scores were significantly higher in males compared to females in contrast to our results. Also, depression scores were significantly higher among Jordanian females compared to males. In our study mean depression scores were not significant based on gender. This might be due to the younger age-group included in this study compared to others. Also, anxiety scores were significantly higher among Jordanian females, which were the same as our results.[14]

One of the most recent studies described gender disparities in the psychological impact of COVID-19 in Spain, which indicated the high differences based on gender in the psychological impact of stress and anxiety.[35] However, in a gender variations study of the psychological impact of COVID-19 quarantine conducted in 59 countries, these differences are not present.[36] There is observable evidence of the psychological impact on wellbeing in the literature due to different factors during the COVID-19 pandemic.[37]

In the present study, married students revealed a lower mean depression score than single students. Similarly, the association between single marital status and greater levels of stress may in part be explained by the absence of a couple's social support system, which reduces stress. According to one study, long-term relationships modify hormones in a way that lowers stress, and unmarried students are more sensitive to psychological stress than their married peers.[38] However, these finding contrasts with a recent student study of the COVID-19 pandemic's impact on psychological health and wellbeing among quarantined students in Bangladesh.[20]

6 | CONCLUSION

In this study, it was detected that university students, who were infected with SARS-CoV-2, had a traumatic experience, and thus developed psychological symptoms greater than students with no history of this infection. Gender, exercise, and smoking were notable among the highest influencing factors on the psychological well-being of students. In addition, the presence of social support decreased the impact of this pandemic on those infected. The impact of COVID-19 is enormous and may last a lifetime as a traumatic experience among students. It is therefore imperative to educate and raise awareness of prevention by sharing experiences with others to improve health outcomes. Qualified health professionals such as psychologists, physicians, nurses and other healthcare providers who work in the university clinics, and specialist healthcare institutions close to the students could play a role as counselors to alleviate the impact of COVID-19. More research is required to address the psychological and social impact of COVID-19. One of the limitations of this study was the inclusion of only students, and other community members should also be investigated such as teachers, healthcare providers, workers, etc. Moreover, the long-term effects of the findings has not yet been investigated, and a future study to examine the longitudinal effects of the findings is recommended and currently under work. On the other hand, this study included 750 participants using a well-established and validated questionnaire. And the participants were from different cities in Jordan.

AUTHOR CONTRIBUTIONS

Loai Alfarajat: Conceptualization; data curation; formal analysis; methodology; software; supervision; visualization; writing—original draft; writing—review and editing. **Rafi Alnjadat**: Validation; visualization; writing—review and editing. **Aziza Salem**: Investigation; methodology; writing—original draft; writing—review and editing. **Ahmad Alnawafleh**: Resources; software; writing—review and editing. **Lourance Al Hadid**: Conceptualization; writing—original draft; writing—review and editing.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Corresponding authors had full access to all the data in this study and take complete responsibility for the integrity of the data and the accuracy of the data analysis. Data which support the findings of this study are available from the corresponding authors upon reasonable request.

TRANSPARENCY STATEMENT

The lead author Loai Alfarajat affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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