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Anxiety and Depression Status among Mutah University Students, Jordan. A Cross-Sectional Study

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ABSTRACT: Anxiety and depression are among the most prevalent mental health concerns among university students worldwide, particularly in the post-pandemic academic landscape. This study investigated the levels and associated factors of anxiety and depression among undergraduate students at Mutah University, Jordan, following the return to in-person learning. A cross-sectional survey was conducted with 783 students selected through multistage systematic random sampling. Data were collected using a structured, interviewer-administered questionnaire comprising demographic items, the Kuwait University Anxiety Scale (KUAS), and the Patient Health Questionnaire-9 (PHQ-9).

The mean anxiety score was 63.00 ± 10.93 out of 80 (severe anxiety level), and the mean depression score was 9.37 ± 3.74 out of 27 (Mild depression level). Male students reported significantly higher anxiety level than female students with $p < 0.001$. Anxiety score among smokers was significantly higher than non-smokers with $p < 0.001$. Non-drinkers had significantly higher anxiety scores than students who reported drinking alcohol ($p < 0.001$) with medium effect size, the faculty difference in anxiety ($p = 0.014$) did not remain significant after Bonferroni adjustment, even though statistically significant with but practically negligible as Cohen's $d = -0.18$, also family income of more than 2,000 (JD) compared to the category of 1,000-1,499 was remained statistically significant after Bonferroni adjustment (p -value = 0.016). Depression level was significantly associated with sex $p < 0.001$; yet with modest effect, regarding faculty type (scientific vs humanitarian) the difference was statistically significant with $p < 0.001$ (real but modest). There is a significant difference in the mean PHQ-9 score between the family income of the category of > 2000 JD and those of < 500 JD ($p = 0.048$) and the category of 1,000-1,499 JD ($p = 0.015$). Also, KUAS score was significantly differ between the family income of more than 2000 JD and those of 1,000-1,499 JD ($p = 0.016$). Anxiety and depression scores were strongly and positively correlated ($r = 0.565$, $p < 0.001$).

These findings using validated instruments with a large random sample from a single public university contributes to the broader literature on student mental health and offers evidence-based implications for strengthening tailored, culturally responsive mental health strategies within the Jordanian higher education system.

1. INTRODUCTION:

Mental health disorders, particularly anxiety and depression, have become a major global public health concern among university students. These disorders frequently emerge during late adolescence and early adulthood, a developmental window in which social, cognitive, and emotional change increases vulnerability. University students are especially susceptible given the convergence of academic workload, financial insecurity, social pressure, digital fatigue, and post-pandemic uncertainty (Li et al. 2022; Wang et al. 2021; Amaro et al. 2024). A systematic review by Xiong et al. (2020) identified young adults and university students as among the populations most at risk during the COVID-19 pandemic, during which depression and anxiety symptoms increased markedly. Similarly, a meta-analysis by Xiao et al. (2020) reported rising depressive symptoms in low- and middle-income countries (LMICs), where access to mental health services remains limited. Research published in the *International Journal of Mental Health and Addiction* has described a substantial correlation between fear of COVID-19 and psychopathological symptoms among university students (Mohd Kassim et al. 2021). Studies from Europe, Asia, and the Middle East have similarly confirmed rising psychological distress in this population over the past five years (Ochnik et al. 2021; Pieh et al. 2020; Ramón-Arbués et al. 2020; Tabor et al. 2021; Kamaludin et al. 2020; Dafogianni et al. 2022). These conditions are associated not only with high prevalence but also with decreased academic performance, social isolation, substance use, and suicidal ideation (Low et al. 2023; Woon et al. 2021).

University students in LMICs are particularly vulnerable due to compounding socioeconomic and institutional factors. Academic disruption, limited mental health literacy, and the COVID-19 pandemic have each been shown to increase psychological distress in countries such as Malaysia (Manap et al. 2019; Kamaludin et al. 2020; Muhammad et al. 2020). During strict lockdowns, students exhibited pronounced anxiety, depression, and fatigue (Bunyan 2020; Loo 2020). Research from Europe further highlights emotional education as a protective mechanism that strengthens coping skills among university students (Valente and Almeida 2020), and in Portugal, Amaro et al. (2024) found a high prevalence of depressive symptoms consistent with global trends, reinforcing the need for institutional mental health approaches.

Mental health problems among university students in the Middle East and North Africa (MENA) region are increasingly reported but remain poorly examined in policy and practice. Academic pressure, family expectations, gender roles, and mental health stigma continue to act as barriers to help-seeking behaviour (Hamdan-Mansour et al. 2009; Dalky and Gharaibeh 2018). In Jordan specifically, this problem is compounded by a lack of recent, large-scale empirical research. Prior work has tended to focus on narrow groups such as medical students or students at private institutions, and often fails to account for the psychological impact of the pandemic (Azad et al. 2017; Mirza et al. 2021). This gap limits the ability of universities and policymakers to design contextually relevant interventions and mental health services.

Mutah University offers an important context for examining this problem given its diverse academic faculties and student population. Despite its significance, research on student mental health at this institution remains limited. A comprehensive examination of anxiety and depression levels among its students, and of how these relate to demographic, academic, and behavioral factors, is both timely and necessary. Such data are essential for informing targeted mental health awareness initiatives, early intervention programs, and institutional support services.

The present study therefore evaluates the levels and severity of anxiety and depression among undergraduate students at Mutah University, Jordan, and explores their association with key sociodemographic and behavioural factors. By employing validated instruments with a large random sample from a single public university, this research contributes to the broader literature on student mental health and offers evidence-based implications for strengthening psychological support services within the Jordanian higher education system.

Literature Review

Depression and anxiety are among the most serious public health concerns for adolescents and young adults. The World Health Organization (WHO 2022) reports that mental disorders affect one in eight people globally, and that depression is now the

leading cause of disability among young people. The WHO Mental Health Action Plan (2013–2020) (WHO 2013) and the more recent World Mental Health Report (WHO 2022) both emphasize the need to re-engineer mental health systems toward early intervention, particularly within education. These pressures are compounded for university students, who face multiple concurrent stressors, academic load, financial strain, uncertainty about the future, and social change during a developmental period that already elevates mental health risk and calls for institutional support (Scott et al. 2016; Wainberg et al. 2017).

Recent global research consistently shows that the incidence of anxiety and depression among university students exceeds that of the general population. A meta-analysis by Bruffaerts et al. (2018) found that mental health problems among first-year college students significantly affected academic performance. Also, a significant part of first year medical students had ongoing psychiatric problems that were connected with multiple demographic, behavioural and social factors (Abdallah & Gabr 2014; Choudhary et al. 2019). Lun et al. (2018), in Hong Kong, reported that more than 40% of students had clinically significant depression or anxiety. Singh et al. (2017) similarly reported a high burden of psychological distress among Indian students, while research from China identified academic competition, gender, and health-related behaviours as strong predictors of psychological symptoms (Gao et al. 2020; Gao et al. 2021). Findings on gender patterns vary by context: female students have often been reported to experience higher depression and anxiety than male students in several cultural settings (Fernández-Rodríguez et al. 2019; Zhou et al. 2024), underscoring the importance of considering local and cultural context when interpreting gender differences in psychological distress.

Lifestyle factors such as physical inactivity, excessive screen time, and sleep disturbance have also been strongly associated with anxiety and depression. Xiang et al. (2020) and Stapp et al. (2022) found that physically active students reported lower psychological distress, a pattern consistent with WHO (2022) guidance on physical activity and sedentary behaviour and with national reports from the United States (Department of Health and Social Care 2018) and Australia (Usher and Curran 2017). Isotemporal substitution models have further shown that replacing sedentary behaviour with even light-intensity physical activity can reduce depressive and anxiety symptoms among young adults (Zhou et al. 2024; Chao et al. 2022); while this study did not directly measure physical activity, this literature provides useful context for policy implications and future research.

The COVID-19 pandemic substantially altered the landscape of student mental health. Increases in anxiety, depression, and stress have been reported worldwide in connection with lockdowns, online education, economic insecurity, and social isolation (Xiong et al. 2020; Dafogianni et al. 2022; Bull et al. 2020; Vindegaard & Benros 2020). University students were particularly affected, reporting reduced social engagement, impaired academic motivation, and restricted access to mental health services. In China and Malaysia, students under extended lockdowns or academic disruption reported substantial increases in clinical symptoms (Kamaludin et al. 2020; Muhammad et al. 2020; Zhou et al. 2024), prompting WHO (2022) to call for systematic reform of youth-centered psychological support in educational settings.

In Jordan and the wider MENA region, anxiety and depression among students are increasingly recognized but remain under-researched. Earlier work identified academic stress, cultural stigma, and limited institutional support as key contributors to student distress (Hamdan-Mansour et al. 2009; Dalky and Gharaibeh 2018); however, most existing studies are narrow in scope, often focusing on a single faculty or institution type (Mirza et al. 2021), and rarely capture the full range of sociodemographic and behavioral risk factors or the psychological effects of the post-pandemic return to in-person learning. There is therefore a clear need for recent, large-scale investigation of the levels and predictors of student mental health in Jordan. Mutah University, a major public institution with a diverse student body, has not previously been studied in this context, despite considerable evidence from global and regional literature implicating variables such as gender, faculty type, family income, smoking, and alcohol consumption. This study aims to fill that gap and to inform policy and intervention strategies for mental health among Jordanian university students.

Objectives

- To measure the levels of anxiety and depression using validated instruments (KUAS and PHQ 9).
- To explore differences in anxiety and depression scores based on sociodemographic variables such as gender, academic faculty, and family income.
- To examine the association between health-related behaviours (smoking and alcohol use) and mental health outcomes.
- To investigate the correlation between anxiety and depression scores among university students.

Hypotheses

- H1: There is a significant difference in anxiety and depression levels between male and female students
- H2: Students from humanitarian faculties report significantly higher anxiety and depression scores compared to students from scientific faculties.
- H3: Students who smoke exhibit significantly higher anxiety and depression levels than non-smokers do.
- H4: Students who consume alcohol report significantly higher anxiety and depression scores than non-drinkers.
- H5: Monthly family income is significantly associated with students' anxiety and depression scores.
- H6: There is a statistically significant positive correlation between anxiety and depression scores among students.

2. MATERIALS AND METHODS

Sampling Technique: A cross-sectional observational study was conducted at Mutah University, Jordan, from 21 July to 10 October 2023. The target population comprised all enrolled undergraduate students (N=36000) at the time of the study. A multistage systematic random sampling technique was used. In the first stage, faculties were grouped as scientific (7 Colleges) or humanitarian (7 Colleges) and a total of 14 faculties were selected. In the second stage, academic years from first to the sixth year and classes were selected randomly. In the third stage, students were selected from the registry list of each selected class by systematic random sampling technique with a sampling interval of $k = 9$, starting from a random number. A total of 825 students were approached; 42 declined and 783 completed the questionnaire, giving a response rate of 95%.

Eligibility required that participants be Jordanian residents aged 18 years or older and enrolled at Mutah University. The required sample size was calculated using Epi Info (95% confidence level, expected frequency 50%, 5% margin of error, design effect 1.0), giving a minimum of 384 participants. The final sample of 783 exceeded this minimum.

Data collection: Data were collected through face-to-face interviews using a structured questionnaire in Arabic, which was chosen to ensure consistency of responses and to accommodate varying literacy levels. Three trained medical students and two research assistants who received 5 hours of training on the instruments and on standardized, neutral administration conducted interviews. Interviews took place in a private area on campus and lasted about 10 minutes. The questionnaire had three sections: demographic and behavioural data (age, sex, academic year, faculty type, smoking, alcohol use, monthly family income); the Arabic Kuwait University Anxiety Scale (KUAS; 20 items, 4-point scale, total 20–80; Abdel-Khalek 2000); and the Arabic Patient Health Questionnaire-9 (PHQ-9; 9 items, scored 0–3, total 0–27; Kroenke et al. 2001). The questionnaire was pilot-tested on 80 students, who were not included in the final sample (Cronbach's alpha 0.852 for the KUAS and 0.916 for the PHQ-9).

Ethics and Consent: The Ethics Approval Committee of the Faculty of Medicine, Mutah University (reference 2023. MS.13, approved the study (10th June 2023). Participation was voluntary. Each student received a full explanation of the study aims and procedures, was told that they could refuse or withdraw at any time without consequence, and gave written informed consent before the interview. Because data were collected by interview, responses were not anonymous to the interviewer; they were kept confidential by recording no names or student ID numbers, and the data were stored on password-protected computers accessible only to the research team. Students who requested support, or whose responses suggested severe distress, were given information about the university counselling service.

Table 1. Interpretation of Total Score Depression Severity (PHQ-9)

PHQ-9 Score	Depression Severity	Proposed Treatment Actions
0–4	None–minimal	Patient may not need depression treatment
5–9	Mild	Clinical judgment about treatment, based on duration of symptoms and functional impairment
10–14	Moderate	Clinical judgment about treatment, based on duration of symptoms and functional impairment
15–19	Moderately Severe	Treat using antidepressants, psychotherapy, or a combination
20–27	Severe	Treat using antidepressants with or without psychotherapy

Score Categorization: PHQ-9 scores were classified as none–minimal (0–4), mild (5–9), moderate (10–14), moderately severe (15–19) and severe (20–27) (Table 1). KUAS scores were classified into three categorical levels based on pre-printed score thresholds: lowest level of anxiety (scores below 33), moderate level of anxiety (scores between 33 and 49), and highest level of anxiety (any score 50 and above out of 80) (Abdel-Khalek 2000). Participants were categorized accordingly, and the number and percentage in each category are reported in Table (2). These categories describe symptom levels on screening scales and are not clinical diagnoses.

Statistical Analysis: Data were analysed using SPSS version 24.0. Descriptive statistics were calculated for all variables. Normality was assessed with the Shapiro–Wilk test ($p = 0.108$ for the KUAS, $p = 0.117$ for the PHQ-9), and parametric tests were used. Group differences were tested using independent-samples t-tests and one-way ANOVA with post hoc comparisons (Tukey HSD and Bonferroni). Pearson's correlation was used to examine the relationship between KUAS and PHQ-9 scores. Because 12 t-tests were performed (Table 4), a Bonferroni-adjusted significance level of $0.05/12 (\approx 0.004)$ was applied to these comparisons; for other analyses the significance level was $p < 0.05$. Effect sizes were reported as Cohen's d and interpreted as small (0.2), medium (0.5) and large (0.8).

3. RESULTS AND DISCUSSION

A total of 783 students participated in this study. Females comprised 54.3% ($n = 425$) and males 45.7% ($n = 358$) of the sample. Most students (61.8%) were enrolled in a humanitarian faculty, roughly one-quarter (25.4%) reported smoking, and 11.0% reported consuming alcohol. Approximately half of the sample reported a monthly family income between 500 and 999 Jordanian dinar (JD), as shown in Table 2.

Table 2. Descriptive analysis of students' socio-demographic characteristics

Variable	Category	n	%
Sex	Male	358	45.7
	Female	425	54.3
Faculty type	Scientific	299	38.2
	Humanitarian	484	61.8
Smoking status	No	584	74.6

	Yes	199	25.4
Drinking alcohol	No	697	89.0
	Yes	86	11.0
Monthly family income (JD)	<500	93	11.9
	500–999	385	49.2
	1,000–1,499	111	14.2
	1,500–1,999	91	11.6
	>2,000	103	13.2

The mean age of participants was 20.32 years ($SD = 1.97$). The mean anxiety score was 63.00 ± 10.93 out of 80 (severe anxiety level), and the mean depression score was 9.37 ± 3.74 out of 27, corresponding to a mild level of depression on average, as shown in Table 3.

Table 3. Age, KUAS total score and PHQ total score (Mean $\pm$ SD)

	Age (years)	KUAS total score (Total Score = 80)	PHQ total score (Total Score = 27)
Mean	20.32	63.00	9.37
SD	1.97	10.93	3.74

Regarding the PHQ-9 score; Table 4 shows that male students scored significantly higher than female students ($M = 10.32$, $SD = 3.19$ vs. $M = 8.57$, $SD = 3.99$), with $p < 0.001$, yet with modest effect (Cohen's $d = 0.48$). However, male students scored significantly higher than female students regarding the KUAS score ($M = 68.86$, $SD = 6.19$ vs. $M = 58.05$, $SD = 11.50$), with $p < 0.001$ with clearly meaningful significance (Cohen's $d = 1.14$).

Students enrolled in humanitarian faculties reported significantly higher depression ($M = 9.72$, $SD = 3.79$) than those in scientific faculties ($M = 8.81$, $SD = 3.61$; $p < 0.001$) (real but modest) with Cohen's $d = -0.24$. However, the anxiety score among humanitarian faculties was statistically significantly higher ($M = 63.76$, $SD = 11.01$ vs. $M = 61.78$, $SD = 10.61$; $p = 0.014$), but practically negligible as Cohen's $d = -0.18$ (Below the small threshold (0.20)).

Smoking status was significantly associated with anxiety: smokers scored higher on the KUAS ($M = 65.25$, $SD = 10.37$) than non-smokers ($M = 62.23$, $SD = 11.01$; $p < 0.001$) but with Marginal significance-real but modest (Cohen's $d = -0.28$), though the difference in PHQ-9 scores between smokers and non-smokers did not reach the significance level ($p = 0.092$). Concerning alcohol use, non-drinkers students reported a significant higher score on the KUAS ($M = 63.63$, $SD = 10.63$) than alcohol drinkers ($M = 57.86$, $SD = 11.92$; $p < 0.001$) (Cohen's $d = -0.49$), while the difference in PHQ-9 score by drinking status was not significant ($p = 0.242$), as shown in Table 4.

Table 4. Comparison of the effect of socio-demographic characteristics on KUAS total score and PHQ total score of students using t-test

Variable		Group	N	Mean (SD)	t	p-value	Cohen's d
PHQ total score		Male	358	10.32 (3.19)	6.71	<0.001	0.48
		Female	425	8.57 (3.99)			
KUAS total score		Male	358	68.86 (6.19)	15.83	<0.001	1.14
		Female	425	58.05 (11.50)			
PHQ total score		Scientific	299	8.81 (3.61)	-3.34	<0.001	-0.24
		Humanitarian	484	9.72 (3.79)			
KUAS total score		Scientific	299	61.78 (10.61)	-2.47	0.014	-0.18
		Humanitarian	484	63.76 (11.01)			
PHQ total score		Non-smoker	584	9.24 (3.80)	-1.69	0.092	-0.14
		Smoker	199	9.76 (3.56)			
KUAS total score		Non-smoker	584	62.23 (11.01)	-3.38	<0.001	-0.28
		Smoker	199	65.25 (10.37)			
PHQ total score		Non-drinker	697	9.43 (3.71)	1.17	0.242	0.13
		Drinker	86	8.93 (4.00)			
KUAS total score		Non-drinker	697	63.63 (10.63)	-4.68	<0.001	-0.49
		Drinker	86	57.86 (11.92)			

After Bonferroni adjustment ($\alpha \approx 0.004$), sex differences in both PHQ-9 and KUAS, the faculty difference in PHQ-9, the smoking difference in KUAS, and the alcohol difference in KUAS remained significant. The faculty difference in KUAS ($p = 0.014$) did not remain significant after adjustment, and its effect size was below the small threshold ($d = -0.18$).

One-way ANOVA (post hoc analysis: Tukey HSD) revealed significant differences in both PHQ-9 ($F\text{-test} = 3.21$, $p = 0.013$) and KUAS ($F\text{-test} = 2.74$, $p = 0.028$) scores across the five categories of monthly family income, as shown in Table 5. A, B. There is a significant difference in the mean PHQ-9 score between the Monthly family income of the category of more than 2000 JD and those of less than 500 JD ($p = 0.048$) and the category of 1,000-1,499 JD ($p = 0.015$). Also, there is a significant difference in the mean KUAS score between the Monthly family income of the category of more than 2000 JD and those of 1,000-1,499 JD ($p = 0.016$). Both scores PHQ-9 and KUAS still significant even after Bonferroni correction.

Table 5. A. One-way ANOVA: Multiple Comparisons: Monthly family income

Score	df	Mean Square	F	p-value
PHQ Total Score	4	44.65	3.21	0.013
KUAS Total Score	4	324.95	2.74	0.028

Table 5. B. One-way ANOVA: Tukey HSD: Monthly family income

Dependent Variable	(I) Monthly family income	(J) Monthly family income	Mean Difference (I-J)	p-value	Bonferroni post hoc test
PHQ Total Score	>2,000 (JD)	<500	1.48826	0.043	0.048*
		500-999	0.88130	0.208	0.345
		1,000-1,499	1.62949	0.013	0.015*
		1,500-1,999	1.21637	0.157	0.236
KUAS Total Score	>2,000 (JD)	<500	3.21004	0.238	0.395
		500-999	2.14011	0.390	0.766
		1,000-1,499	4.70786	0.014	0.016*
		1,500-1,999	2.97407	0.318	0.578

*. The mean difference is significant at the 0.05 level. JD: Jordanian dinar

Finally, Pearson correlation analysis showed a statistically significant, positive correlation between anxiety and depression scores ($r = 0.565$, $p < 0.001$), indicating that a higher anxiety level (KUAS) was significantly correlated with a higher level of depression (PHQ).

3.4 Discussion

These findings highlight significant mental health challenges among students at Mutah University, Jordan. A positive, statistically significant correlation between anxiety and depression scores ($r = 0.565$, $p < 0.001$) supports Hypothesis 6, indicating that students with elevated anxiety are also likely to report depressive symptoms. This is consistent with prior work documenting a strong connection between these two conditions (Ibrahim et al. 2013; Hamaideh 2017; Abdel Wahed and Hassan 2017) and echoes a South African study reporting a related, though nonlinear, relationship between anxiety and depression (Bantjes et al. 2023). The overlap may reflect shared upstream drivers, including academic workload, financial pressure, and social strain.

In support of Hypothesis 1, male students reported significantly higher anxiety and depression than female students. This finding runs counter to much of the international literature, in which female students more often report greater psychological distress (Stallman 2010; Abdel Wahed and Hassan 2017; Saadeh et al. 2021). This divergence warrants careful interpretation rather than a single explanation. Possible contributors in the Jordanian context include gendered social expectations around financial provision and future employment, which may place disproportionate psychological pressure on male students; potential differences in help-seeking and symptom reporting, since stigma around disclosing distress may operate differently by gender in this population; and the fact that the questionnaire was interviewer-administered, which could differentially affect how male and female respondents reported sensitive symptoms. Because this study cannot adjudicate between these explanations, the sex difference observed here should be treated as a notable, context-specific finding that merits dedicated follow-up — for example through qualitative work or measures of gendered stressors — rather than being generalized beyond this sample.

Hypothesis 2 was also supported: students in humanitarian faculties reported higher anxiety and depression than those in scientific faculties. This aligns with the argument that students in fields with greater post-graduation uncertainty and less structured career pathways may experience elevated psychological distress (Dachew et al. 2015; Sani et al. 2012).

Smoking was associated with higher anxiety (KUAS) but not with depression (PHQ-9), which is consistent with earlier studies linking smoking to anxiety (Blanco et al. 2010; Jini et al. 2017). Unexpectedly, students who reported drinking alcohol had lower anxiety scores than non-drinkers, and alcohol use was not associated with depression; Hypothesis 4 was therefore not supported. This is opposite to findings in other settings. Because alcohol use is stigmatized and legally restricted in Jordan, under-reporting by students who drink is plausible, particularly in a face-to-face interview, and the drinker group was small ($n = 86$). This finding should be interpreted with caution and tested in studies using anonymous self-completed questionnaires. However, the significance level still borderline (small) after adjustment; as Cohen's $d = -0.49$.

Smoking's association with anxiety mirrors previous findings identifying it as a consistent correlate of anxiety and depressive symptoms (Blanco et al. 2010; Jini et al. 2017), though the non-significant PHQ-9 finding for smokers, and the non-significant result for alcohol and depression, diverge from some literature suggesting a dose–response relationship between substance use and depressive symptoms (de Boer et al. 2023). Given that alcohol use is both stigmatized and legally restricted in Jordan, self-reported drinking status in an interviewer-administered survey should be interpreted with caution, as under-reporting is plausible.

Family income was significantly associated with both anxiety and depression scores. Post hoc comparisons showed that students from families earning more than 2,000 JD per month had higher scores than some other groups: higher PHQ-9 scores than those in the <500 JD group (mean difference 1.49, $p = 0.048$) and the 1,000–1,499 JD group (1.63, $p = 0.015$), and higher KUAS scores than the 1,000–1,499 JD group (4.71, $p = 0.016$). The pattern was therefore not a simple gradient, and differences with the other income groups were not significant. Higher distress among higher-income students is counterintuitive, since low income is more commonly cited as a stressor. One possible explanation is greater academic and social performance expectations in these families (Kaplan et al. 2008; Marcus et al. 2012), but this study cannot test that explanation.

Overall, these results confirm that student mental health outcomes are shaped by a complex interplay of academic, economic, personal, and social factors, echoing conclusions drawn by Ibrahim et al. (2013) and Naser et al. (2020). Notably, despite the easing of COVID-19 restrictions and the return to in-person learning, psychological distress remained substantial, suggesting that the pandemic's effects on student life may be lasting (Xiong et al. 2020; Kamaludin et al. 2020).

These findings point to a clear need for university administrations and public health authorities in Jordan to develop culturally appropriate, evidence-based mental health support systems. Potential interventions include counseling services, peer mentoring programs, academic stress-management workshops, and behaviour-modification campaigns targeting substance use. Longitudinal research is also needed to clarify the lasting impact of pandemic-related disruption and to evaluate the effectiveness of interventions over time.

Limitations:

- **Cross-sectional design:** Associations were measured at one point in time, so temporal order and causation cannot be established. This includes the strong correlation between anxiety and depression ($r = 0.565$).
- **Single institution:** Participants came from one public university, so the findings may not apply to private universities or other regions of Jordan; multicentre studies are needed.
- **Self-report and interviewer administration:** Responses on sensitive topics, especially alcohol use, may be affected by social desirability and under-reporting.
- **Response and selection bias:** The response rate was 95%, and students who declined may differ from those who took part. 42 students refused to participate.
- **Multiple testing:** A Bonferroni-adjusted threshold was applied to the t-tests and post hoc income comparisons, but the overall number of analyses still carries some risk of chance findings, especially for small effects.
- **Screening instruments:** The KUAS and PHQ-9 measure symptom levels and do not provide clinical diagnoses.

- Unmeasured confounders: variables with documented associations to student mental health in the broader literature — including physical activity, sleep quality, screen time, and academic performance were not measured and could not be adjusted for.
- Multiple comparisons: several statistical tests were conducted across sociodemographic and behavioural variables without correction for multiple comparisons, which may inflate the overall risk of Type I error.

4. CONCLUSION

This study found high mean anxiety and mild mean depression scores among students at Mutah University. Male students, students in humanitarian faculties and students who smoked had higher anxiety scores, and male students and humanitarian faculty students had higher depression scores. Students from the highest income group (>2,000 JD) had higher scores than some other income groups, and non-drinkers had higher anxiety than students who reported drinking, a finding that should be interpreted cautiously. The strong positive correlation between anxiety and depression supports integrated mental health interventions. Because the study was cross-sectional and single-site, longitudinal and multicentre research is needed to confirm these findings.

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CONFLICT OF INTEREST: The authors declare that there is no conflict of interest

ETHICS STATEMENT: This study was approved by the Ethics Approval Committee of the Faculty of Medicine, Mutah University (reference number 2023. MS.13). Approval date (10th June 2023). Participant information was kept confidential and anonymous throughout the study. All participants provided written informed consent prior to participation, which was entirely voluntary.

DATA AVAILABILITY STATEMENT: Data supporting the findings of this study are available from the corresponding author upon reasonable request.

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REFERENCES

- [1] Abdallah AR, Gabr HM (2014) Depression, anxiety and stress among first year medical students in an Egyptian public university. *International Research Journal of Medical and Medical Sciences* 2:11-19.
- [2] Abdel Wahed WY, Hassan SK (2017) Prevalence and associated factors of stress, anxiety and depression among medical Fayoum University students. *Alexandria Journal of Medicine* 53:77-84.
- [3] Abdel-Khalek AM (2000) The Kuwait University Anxiety Scale: Psychometric properties. *Psychological Reports* 87:478-492.
- [4] Amaro P, Fonseca C, Afonso A, Jacinto G, Gomes L, Pereira H, ... Pinho LG (2024) Depression and anxiety of Portuguese university students: A cross-sectional study about prevalence and associated factors. *Depression and Anxiety* 2024:5528350.
- [5] Azad N, Shahid A, Abbas N, Shaheen A, Munir N (2017) Anxiety and depression in medical students of a private medical college. *Journal of Ayub Medical College Abbottabad* 29:123-127.
- [6] Bantjes J, Kessler M, Lochner C, Breet E, Bawa A, Roos J, ... Stein DJ (2023) The mental health of university students in South Africa: Results of the national student survey. *Journal of Affective Disorders* 321:217-226.
- [7] Blanco C, Okuda M, Markowitz JC, Liu SM, Grant BF, Hasin DS (2010) The epidemiology of chronic major depressive disorder and dysthymic disorder. *Journal of Clinical Psychiatry* 71:1645-1656.
- [8] Bruffaerts R, Mortier P, Kiekens G, Auerbach RP, Cuijpers P, Demyttenaere K, ... Kessler RC (2018) Mental health problems in college freshmen: Prevalence and academic functioning. *Journal of Affective Disorders* 225:97-103.

- [9] Bull FC, Al-Ansari SS, Biddle S, Borodulin K, Willumsen JF (2020) World Health Organization 2020 guidelines on physical activity and sedentary behaviour. *British Journal of Sports Medicine* 54:1451-1462.
- [10] Bunyan J (2020) PM: Malaysia under movement control order from Wed until March 31. *The Malay Mail*.
- [11] Chao L, Ma R, Jiang W (2022) Movement behaviours and anxiety symptoms in Chinese college students: A compositional data analysis. *Frontiers in Psychology* 13:952728.
- [12] Choudhary S, Sharma AK, Jabeen N, Magotra R (2019) Study of incidence of depression, anxiety and stress among the first year medical students in government medical college. *JK Science* 21:76-80.
- [13] Dachew BA, Bisetegn TA, Gebremariam RB (2015) Prevalence of mental distress and associated factors among undergraduate students of University of Gondar, Northwest Ethiopia. *PLOS ONE* 10:e0119464.
- [14] Dafogianni C, Pappa D, Mangoulia P, Kourti FE, Koutelekos I, Dousis E, ... Zartaloudi A (2022) Anxiety, stress and the resilience of university students during the first wave of the COVID-19 pandemic. *Healthcare* 10:2573.
- [15] Dalky H, Gharaibeh A (2018) Depression, anxiety, and stress among college students in Jordan and their need for mental health services. *Nursing Forum* 54:205-212.
- [16] de Boer N, Vermeulen J, Lin B, van Os J, Ten Have M, de Graaf R, ... Luykx JJ (2023) Longitudinal associations between alcohol use, smoking, genetic risk scoring and symptoms of depression. *Psychological Medicine* 53:1409-1417.
- [17] Fernández-Rodríguez C, Soto López T, Cuesta Izquierdo M (2019) Needs and demands for psychological care in university students. *Psicothema* 31:254-261.
- [18] Gao C, Sun Y, Zhang F, Zhou F, Dong C, Ke Z, ... Sun H (2021) Prevalence and correlates of lifestyle behavior, anxiety and depression in Chinese college freshmen. *International Journal of Nursing Sciences* 8:347-353.
- [19] Gao W, Ping S, Liu X (2020) Gender differences in depression, anxiety, and stress among college students: A longitudinal study from China. *Journal of Affective Disorders* 263:292-300.
- [20] Hamaideh SH (2017) Alexithymia among Jordanian university students: Its prevalence and correlates with depression, anxiety, stress, and demographics. *Perspectives in Psychiatric Care* 54:274-280.
- [21] Hamdan-Mansour AM, Halabi JO, Dawani HA (2009) Depression, hostility, and substance use among university students in Jordan. *Mental Health and Substance Use* 2:52-63.
- [22] Ibrahim AK, Kelly SJ, Adams CE, Glazebrook C (2013) A systematic review of studies of depression prevalence in university students. *Journal of Psychiatric Research* 47:391-400.
- [23] Jini D, Tariku GH, Zerihun AA, Bisrat ZS, Adissu GG (2017) Mental distress and its associated factors among students of Mizan Aman Health Science College, Ethiopia. *Journal of Medical Science* 17:61-67.
- [24] Kamaludin K, Chinna K, Sundarasan S, Khoshaim HB, Nurunnabi M, Baloch GM, ... Hossain SFA (2020) Coping with COVID-19 and movement control order (MCO): Experiences of university students in Malaysia. *Heliyon* 6:e05339.
- [25] Kaplan GA, Shema SJ, Leite CMA (2008) Socioeconomic determinants of psychological well-being. *Annals of Epidemiology* 18:531-537.
- [26] Kassim MAM, Tze NPP, Mohamed NH, Kamu A, Chong MH, Ayu F, ... Ibrahim N (2021) Relationship between fear of COVID-19, psychopathology and sociodemographic variables in Malaysian population. *International Journal of Mental Health and Addiction* 19:1234-1245.
- [27] Kroenke K, Spitzer RL, Williams JB (2001) The PHQ-9: Validity of a brief depression severity measure. *Journal of General Internal Medicine* 16:606-613.
- [28] Li W, Zhao Z, Chen D, Peng Y, Lu Z (2022) Prevalence and associated factors of depression and anxiety symptoms among college students: A systematic review and meta-analysis. *Journal of Child Psychology and Psychiatry* 63:1222-1230.
- [29] Loo C (2020) CMCO ends June 9, Recovery MCO from June 10 to Aug 31 (Updated). *The Sun Daily*.
- [30] Low EZ, O'Sullivan NJ, Sharma V, et al. (2023) Assessing medical students' perception and educational experience during COVID-19 pandemic. *Irish Journal of Medical Science* 192:1015-1020.
- [31] Lun KW, Chan CK, Ip PK, Ma SY, Tsai WW, Wong CS, ... Wong TW (2018) Depression and anxiety among university students in Hong Kong. *Hong Kong Medical Journal* 24:466-472.
- [32] Manap R, Hamid SA, Ghani MA (2019) Depression, anxiety and stress among undergraduate students. *e-BANGI* 16:1-7.
- [33] Marcus M, Yasamy MT, van Ommeren MV, Chisholm D, Saxena S (2012) Depression: A global public health concern. *World Health Organization* 1:6-8.
- [34] Mirza AA, Baig M, Beyari GM, Halawani MA, Mirza AA (2021) Depression and anxiety among medical students: A brief overview. *Advances in Medical Education and Practice* 12:393-398.

- [35] Muhammad I, Shahudin F, Hooper VJ, Akram W, Abdul Ghani R (2020) The psychological impact of coronavirus on university students and its socio-economic determinants in Malaysia. SSRN 3720759.
- [36] Naser AY, Dahmash EZ, Al-Rousan R, Alwafi H, Alrawashdeh HM, Ghoul I, ... Dagash R (2020) Mental health status of the general population, healthcare professionals, and university students during 2019 coronavirus disease outbreak in Jordan. *Brain and Behavior* 10:e01730.
- [37] Ochnik D, Rogowska AM, Kuśnierz C, Jakubiak M, Schütz A, Held MJ, ... Wierzbik-Strońska M (2021) A comparison of depression and anxiety among university students in nine countries during the COVID-19 pandemic. *Journal of Clinical Medicine* 10:2882.
- [38] Pieh C, Budimir S, Probst T (2020) Corrigendum to "The effect of age, gender, income, work, and physical activity on mental health during coronavirus disease (COVID-19) lockdown in Austria." *Journal of Psychosomatic Research* 139:110278.
- [39] Ramón-Arbués E, Gea-Caballero V, Granada-López JM, Juárez-Vela R, Pellicer-García B, Antón-Solanas I (2020) The prevalence of depression, anxiety and stress and their associated factors in college students. *International Journal of Environmental Research and Public Health* 17:7001.
- [40] Saadeh H, Saadeh M, Almobaideen W, Al Refaei A, Shewaikani N, Al Fayez R, Traboulsi M (2021) Effect of COVID-19 quarantine on the sleep quality and the depressive symptom levels of university students in Jordan. *Frontiers in Psychiatry* 12:605676.
- [41] Sani M, Mahfouz MS, Bani I, Alsomily AH, Alagi D, Alsomily NY, Asiri S (2012) Prevalence of stress among medical students in Jizan University, Kingdom of Saudi Arabia. *Gulf Medical Journal* 1:19-25.
- [42] Scott KM, Lim C, Al-Hamzawi A, Alonso J, Bruffaerts R, Caldas-de-Almeida JM, ... Kessler RC (2016) Association of mental disorders with subsequent chronic physical conditions. *JAMA Psychiatry* 73:150-158.
- [43] Singh M, Goel NK, Sharma MK, Bakshi RK (2017) Prevalence of depression, anxiety and stress among students of Punjab University, Chandigarh. *National Journal of Community Medicine* 8:666-671.
- [44] Stallman HM (2010) Psychological distress in university students: A comparison with general population data. *Australian Psychologist* 45:249-257.
- [45] Stapp EK, Paksarian D, He JP, Glaus J, Conway KP, Merikangas KR (2022) Mood and anxiety profiles differentially associate with physical conditions in US adolescents. *Journal of Affective Disorders* 299:22-30.
- [46] Tabor E, Patalay P, Bann (2021) Mental health in higher education students and non-students: Evidence from a nationally representative panel study. *Social Psychiatry and Psychiatric Epidemiology* 56:879-882.
- [47] Usher W, Curran C (2017) Predicting Australia's university students' mental health status. *Health Promotion International* 34:312-322.
- [48] Valente S, Almeida L (2020) Educação emocional no Ensino Superior. *Revista de Psicologia, Educação e Cultura* 9:15-30.
- [49] Vindegaard N, Benros ME (2020) COVID-19 pandemic and mental health consequences: Systematic review of the current evidence. *Brain, Behavior, and Immunity* 89:531-542.
- [50] Wainberg ML, Scorza P, Shultz JM, et al. (2017) Challenges and opportunities in global mental health: A research-to-practice perspective. *Current Psychiatry Reports* 19:28.
- [51] Wang C, Wen W, Zhang H, Ni J, Jiang J, Cheng Y, ... Liu W (2021) Anxiety, depression, and stress prevalence among college students during the COVID-19 pandemic. *Journal of American College Health* 71:2123-2130.
- [52] Woon LSC, Leong Bin Abdullah MFI, Sidi H, Mansor NS, Nik Jaafar NR (2021) Depression, anxiety, and the COVID-19 pandemic: Severity of symptoms and associated factors among university students after the end of the movement lockdown. *PLOS ONE* 16:e0252481.
- [53] World Health Organization (2013) Mental health action plan 2013–2020. apps.who.int/iris/handle/10665/89966.
- [54] World Health Organization (2016) Investing in treatment for depression and anxiety leads to fourfold return. www.who.int/news/item/13-04-2016-investing-in-treatment-for-depression-and-anxiety-leads-to-fourfold-return.
- [55] World Health Organization (2022) World mental health report: Transforming mental health for all. www.who.int/teams/mental-health-and-substance-use/world-mental-health-report.
- [56] Xiang MQ, Tan XM, Sun J, Yang HY, Zhao XP, Liu L, ... Hu M (2020) Relationship of physical activity with anxiety and depression symptoms in Chinese college students during the COVID-19 outbreak. *Frontiers in Psychology* 11:582436.

- [57] Xiao X, Zhu X, Fu S, Hu Y, Li X, Xiao J (2020) Psychological impact of healthcare workers in China during COVID-19 pneumonia epidemic. *Journal of Affective Disorders* 274:405-410.
- [58] Xiong J, Lipsitz O, Nasri F, Lui LMW, Gill H, Phan L, ... McIntyre RS (2020) Impact of COVID-19 pandemic on mental health in the general population: A systematic review. *Journal of Affective Disorders* 277:55-64.
- [59] Zhou Y, Huang Z, Liu Y, Liu D (2024) The effect of replacing sedentary behavior with different intensities of physical activity on depression and anxiety in Chinese university students: An isothermal substitution model. *BMC Public Health* 24:1388.