Original Research Article

PREVALENCE AND PREDICTORS OF DEPRESSION, ANXIETY AND STRESS AMONG PHARMACY STUDENTS UMM AL-QURA UNIVERSITY, SAUDI ARABIA

ABSTRACT

Introduction:

There is an increasing concern about the effect of mental diseases on academic performance, especially in the medical field. However, there is a very limited study done on depression, anxiety, and stress among pharmacy students in Makkah. The study aimed to determine the prevalence and predictors of depression, anxiety, and stress among pharmacy students from Umm Al-Qura University, Makkah.

Methods:

A cross-sectional study was conducted among pharmacy students from both genders and both pharmacy programs (B-Pharm and Pharm D) at Umm Al-Qura University, Makkah in 2018/2019. A standardized data collection sheet was used to collect the personal, socio-demographic data. It included the Depression Anxiety and Stress Scale (DASS-21), the authentic leadership questionnaire, Schutte Self-Report Emotional Intelligence (SSREI) scale. Descriptive and inferential statistics were done. Stepwise multiple logistic regression analyses were conducted.

Results:

The prevalence of depression, anxiety, and stress among pharmacy students were high; 62.8%, 59.0%, and 49.2%, respectively. Male students had a significantly higher prevalence of depression compared to females. Younger students suffered more from stress compared to older students. In regression analysis, academic stress was associated with increased depression, anxiety, and stress levels. General life satisfaction is a predictor for decreasing depression, anxiety, and stress levels. A longer duration of physical exercise is another predictor for lowering depression and stress. Higher emotional intelligence is a predictor of low stress.

Conclusion:

The prevalence of depression, anxiety, and stress was high among pharmacy students. Academic stress was the first predictor for depression, anxiety, and stress. General life satisfaction and duration of physical exercise are predictors for decreasing depression and stress levels. Conduction of screening programs is needed for the detection of depression, anxiety, and stress among pharmacy students, with the proper management of the cases. Psychosocial and academic support services need to be available to help pharmacy students to deal with academic stress and avoid mental illnesses. Encourage practicing of a longer duration of physical activities is needed.

Keywords: Depression, Anxiety, Stress, Prevalence, Predictors, Pharmacy students.

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Introduction

Mental health is one of the most important determinants of quality of life and life satisfaction. Poor mental health is a complex and common psychological problem among university students in both developed and developing countries. [1] Mental disorders ranked as the ninth cause of global burden of disease, 2017, and accounted for about 15% of the global burden of diseases, with their burden being higher than from all cancers. Mental illnesses are complicated, multi-factorial disorders that occur due to the interaction of personal and environmental conditions.[2]

Depression and anxiety are the commonest mental illnesses in the world. Depression is presented by sadness, anxiousness, hopelessness, feeling of guilty, worthlessness, restlessness, loss of interests, fatigue, difficulty in concentration, reduced memory, insomnia or hypersomnia, eating problems, suicidal feelings or attempts. Anxiety is an unfavorable condition presented by fear accompanied by unwanted physical manifestations. It has negative impact on the daily function. [2]

Emotional Intelligence (EI) helps individuals to able to capture the differences in identifying, processing and regulating emotions. The researchers have identified a significant link between the ability to manage emotions and the mental health of individuals.[3] General findings suggest that some forms of EI play a role in protecting individuals against stress and helping to better adaptation. If stress persists for a long time or is of high intensity, an individual may collapse and may even lead to the development of physical and mental disorders.[4, 5]

Health care schools have been long been recognized as having numerous stressors that can affect the well-being of students. [6, 7] Generally, students from medical fields have reported to be more suffering from anxiety, depression and stress. [8] A study done to identify the prevalence of psychological morbidity of depression, anxiety, and stress among male medical students at Najran University, Saudi Arabia, and reported high levels of such illnesses. [9]

There are increasing concerns about the importance of mental health in academic life, especially among health care students. However, there is a very limited studies done on depression, anxiety and stress among pharmacy students in Makkah. The study aimed to determine the prevalence and predictors of depression, anxiety and stress among pharmacy students from Umm Al-Qura University (UQU), Makkah.

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Methods

A cross-sectional study was conducted among pharmacy students at UQU, Makkah, during the educational year 2018/2019. Pharmacy students from both genders who completed the first year from both programs of Bachelor of Pharmacy (B Pharm) or Doctor of Pharmacy (Pharm D), who accepted to participate were recruited. A multi-stage stratified random sampling technique was used. Stratification considered the gender, educational program (Pharm-D or B-Pharm), and educational year. The sample size was determined using the formula for calculation sample from the cross sectional study. (10, 11)

$$n = \frac{Z^2 * p * q}{L^2}$$

Where "n" is the minimal calculated sample, "Z" is a constant =1.96 at 95% confidence level, and "P" was assumed to be 50 % (as the most conservative sample because there was no previous similar study in Makkah), and "q" = 1-p = 0.5. So, the minimal estimated sample size to accomplish a precision of 0.05%, at 95% Confidence Interval (CI) was 384 students, which was exceeded to reach 400 participants for the stratification purpose.

The study was conformed to the ethical standards of the Helsinki Declaration and approved by the Institutional Review Board (IRB) of King Abdulaziz University (KAU), with a Reference Number: 151-18 dated 22/3/2018. The ethical approval was obtained also from the Ethics Committee Board of Pharmacy at Umm Al-Qura University, with a project number of 14907 dated 22/3/2018. Administrative approvals were taken. Pharmacy students at Umm Al-Qura University were informed with a brief description of the study. An informed written consent was completed from each accepted student when they enrolled in the study. There is confidentiality and freedom of participation.

The data collection sheet contains the followings:

1- Personal & socio-demographic data (age, gender, marital status, etc.)

2-Habits like smoking and exercise practicing.

3-General life satisfaction: A question asked about general life satisfaction was included.

4- Depression Anxiety and Stress Scale 21 (DASS-21): It is a self-report instrument consisting of 21 Questions with seven items in each scale. It is used to measure the negative emotional states of anxiety, stress, and depression. The responses are given on a 4-point of severity to rate the extent to which they have experienced each state over the past weeks, ranging from zero if "totally disagree" to 3 if "totally agree".

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The total DASS score and each subscale were calculated. Finally, two multiplied the overall score of the DASS for matching with the original long version (DASS-42). The symptom severity levels ranged from "normal" to "extremely serious".[12] According to the reliability scores (using Cronbach's alpha) the overall DASS-21 reliability is 0.93 (at the normative sample). This reliability scores are 0.88, 0.90 and 0.93 for depression, anxiety and stress, respectively. [13] Moreover, DASS-21 had overall good construct validity of 0.79.[14]

5- Authentic Leadership Scale: It consists of 16 questions with 4 subscales measures which are: Self-awareness, internalized moral, balanced processing and relational transparency and each subscale consists of 4 questions. The responses recorded by 5- point Likert scale ranging from 1 for "strongly disagree" to 5 for "strongly agree".

6-Schutte Self-Reported Emotional Intelligence (SSREI): It is a scale of 5-point response scale ranging from 1 "strongly disagree" to 5 "strongly agree", containing a total of 33 questions asking about 4 sub-scales. These subscales are: Emotion Perception (EP), Managing Self-Relevant Emotions (MSE), Managing Others' Emotions (MOE) and Utilizing Emotion (UE). Higher scoring of the scale representing greater levels of EI trait. Total EI score was calculated and the score ≥ 110 was considered high EI.

All statistical analysis was performed by SPSS version 22 (IBM, Armonk, NY, USA).

Descriptive statistics was done. Inferential statistics were used and Chi-square ($\chi 2$) was calculated to compare between categorical variables. Odds Ratios (ORs) and 95 % Confidence Intervals were determined. Furthermore, a stepwise multiple logistic regression model was constructed to determine the significant predictors of depression, anxiety and stress after controlling of confounding factors. Adjusted Odds Ratios (aORs), and 95 % Confidence Intervals (CI) were calculated. The level of significance for all statistical tests was set at P value ≤ 0.05.

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Results

The prevalence of depression, anxiety, and stress among pharmacy students according to symptom intensity (ranging from normal to extremely severe level) were 62.8%, 59.0%, and 49.2%, respectively. For students categorized with depression, 18%, 24.8%, 9%, and 11% suffered from mild, moderate, severe, and extremely severe degrees, respectively. Regarding anxiety, 7.5%, 20.8%, 12.2%, and 18.5% of them suffered from the same degrees, respectively. Concerning stress, 13.2%, 17.8%, 10.5% and 7.8% had the same levels, respectively.

Figure (1) illustrates that females recorded a lower prevalence of depression (60.7%) compared to male students (66.9%). However, females had higher percentages of severe and extremely severe levels compared to males. The rate of both severe and extremely severe was 22.6% among females compared to only 14.6% among males. A highly statistically significant difference was present.

Female students reported a higher overall anxiety prevalence (60%) compared to males (57.9%). Moreover, both severe to extremely severe anxiety stress levels reported more among females (33.7%) than males (24.6%). However, there is a statistically significant difference between both genders regarding anxiety ($P > 0.05$). Figure (2).

Figure (3) demonstrates the prevalence and the intensity of stress among pharmacy students at UQU. Female students had a higher level of overall stress (50.7%) compared to males (46.2%). Moreover, severe to extremely severe stress levels were also more among female students (23.3%) compared to males (7.6%). A highly statistically significant difference was present ($X^2 = 15.79$, $P < 0.01$).

It is apparent from table (1) that younger students (≤ 21 years) had a higher prevalence of depression (69.9%) compared to the older (59.9%). Age was statistically associated with depression (OR=1.78; 95% CI: 1.18-2.69). GPA was negatively associated with depression (X^2= 6.52, $P < 0.05$). Good achievers (had GPA ≥ 3.5 out of 4) had a significantly lower prevalence of depression (53.7%) than others (67.0%) did. On the other hand, gender, marital status, fathers' and mothers' education, and residency had no significant association with depression. Students who suffered from academic stress had a much higher rate of depression (69.3%) compared to others (37.0), with a highly statistically significant difference ($P < 0.001$). On the other hand,

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students who had a general life satisfaction were significantly less prone to depression (OR=0.26; 95% CI: 0.15-0.44).

Table (2) shows that neither physical activity nor the number of practicing days per week had any significant association with depression. On the other hand, concerning the duration of physical activity, students who practiced exercise ≥ 30 minutes/day reported a significantly lower prevalence of depression compared to others (X^2= 5.85, P ≤ 0.05). Furthermore, Smoking was not associated with depression (P > 0.05).

Concerning anxiety, table (3) shows that younger students (≤ 21 years) had a higher prevalence of anxiety (64%) compared to others (54.7%). However, there is no statistically significant difference (P> 0.05). Moreover, gender, marital status, type of program, and educational year did not have any statistical association with anxiety. Furthermore, fathers' and mothers' education and residency had no significant association anxiety (P > 0.05). Students who had academic stress reported a much higher rate of anxiety compared to others (OR=5.46; 95% CI: 3.17-9.40). On the other hand, students who had a general life satisfaction were significantly less liable to have anxiety (OR=0.39; 95% CI: 0.24-0.63) compared to others.

It is apparent from table (4) that smoking had no statistical association with anxiety. There is also no significant association between practicing physical activity, number of exercise per day, or the duration of exercising with presence of anxiety (P > 0.05).

Table (5) demonstrates that stress was not significantly associated (X^2= 0.74, P > 0.05) with gender. On the other hand, younger students had a higher prevalence (58.6%) of stress compared to older (41.1%), with a highly statistically significant difference (X^2= 12.16, P <0.001). Each of marital status, type of program, educational year, GPA, father and mother's educational levels and the residency had no statistical association with stress (P > 0.05). However, students who suffered from academic stress were about 5 times more liable to diagnosed with stress (OR= 5.33; 95% CI: 2.95-9.61). Similarly, students who had exam anxiety were about 3 times more liable to stress compared to others (OR= 2.82; 95% CI: 1.68-4.73). On the other hand, students who reported general life satisfaction were less prone to stress compared to others (OR= 0.36; 95% CI: 0.23- 0.57).

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Table (6) shows that each of smoking, physical activity and the number of days of physical activity (per week) were not statistically associated with the presence of stress ($P > 0.05$). However, there is a statistically significant association between stress and the duration of physical activity ($X^2 = 8.98$, $P < 0.05$).

After controlling confounding factors in logistic regression analyses, table (7) shows that the first predictor of depression was having academic stress (aOR=3.32; 95% CI=1.94-5.67), followed by male gender (aOR=1.74, 95% CI=1.02 - 2.96). The following predictors were general life satisfaction which had a protective effect (aOR=0.30; 95% CI= 0.17, 0.53), and the duration of physical exercise (≥ 30 minutes/ day). It is apparent also from the table that the first predictor of anxiety was the presence of academic stress (aOR=4.82; 95% CI=2.78, 8.37). The second predictor was having positive general life satisfaction as it is a protective factor against anxiety (aOR=0.47; 95% CI=0.28, 0.78). Regarding stress, logistic regression model showed that the first predictor of stress was having academic stress (aOR=4.93; 95% CI=2.62 -9.29). This is followed by high EI score ≥110 (aOR= 0.94; 95% CI= 0.21- 0.72), good general life satisfaction (aOR= 0.72, 95% CI= 0.30 - 0.81), older age (aOR= - 0.48; 95% CI=0.40 - 0.96) and duration of practicing exercise for ≥ 30 minutes (aOR=-1.27, 95% CI= 0.11 - 0.70).

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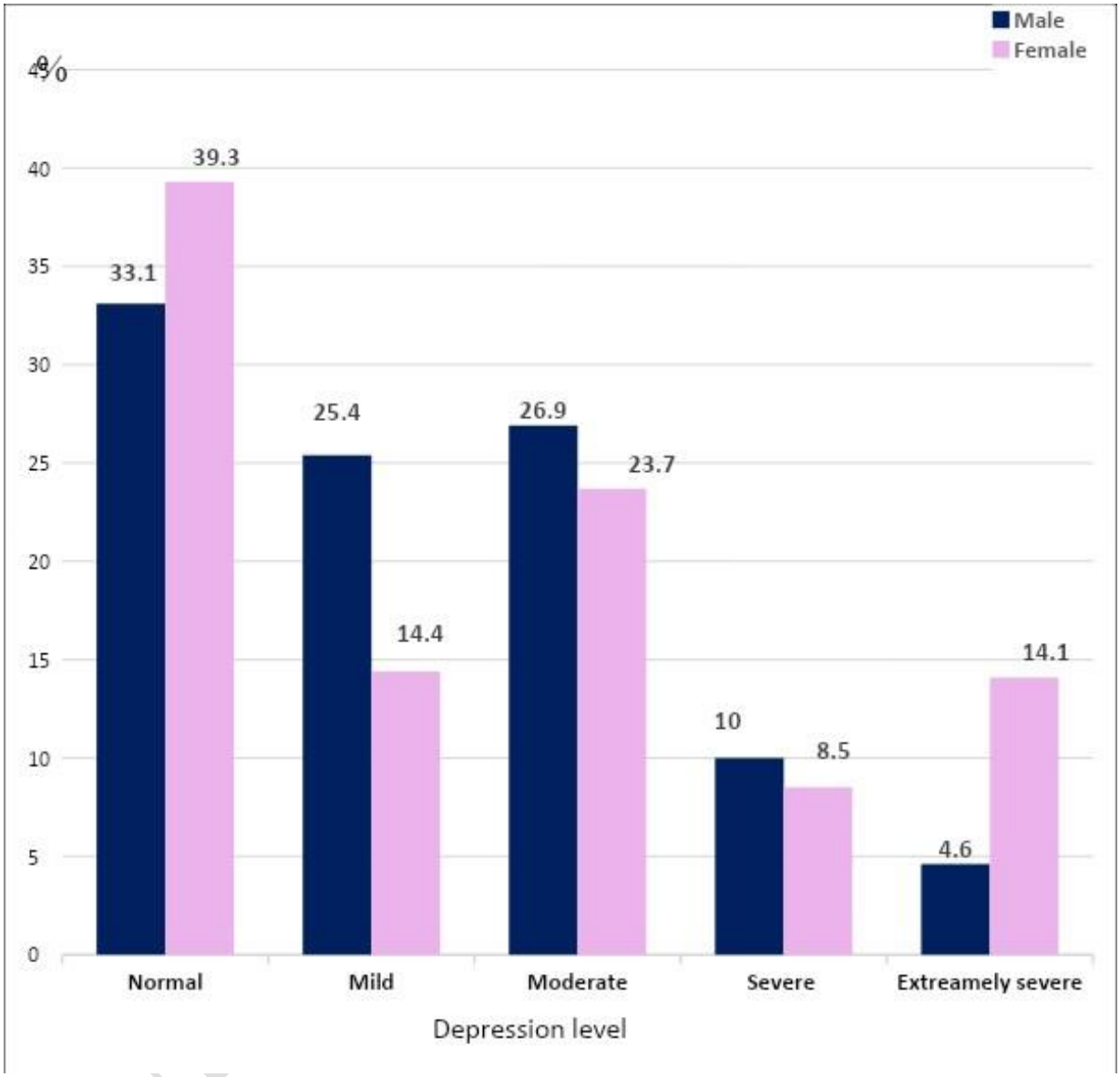
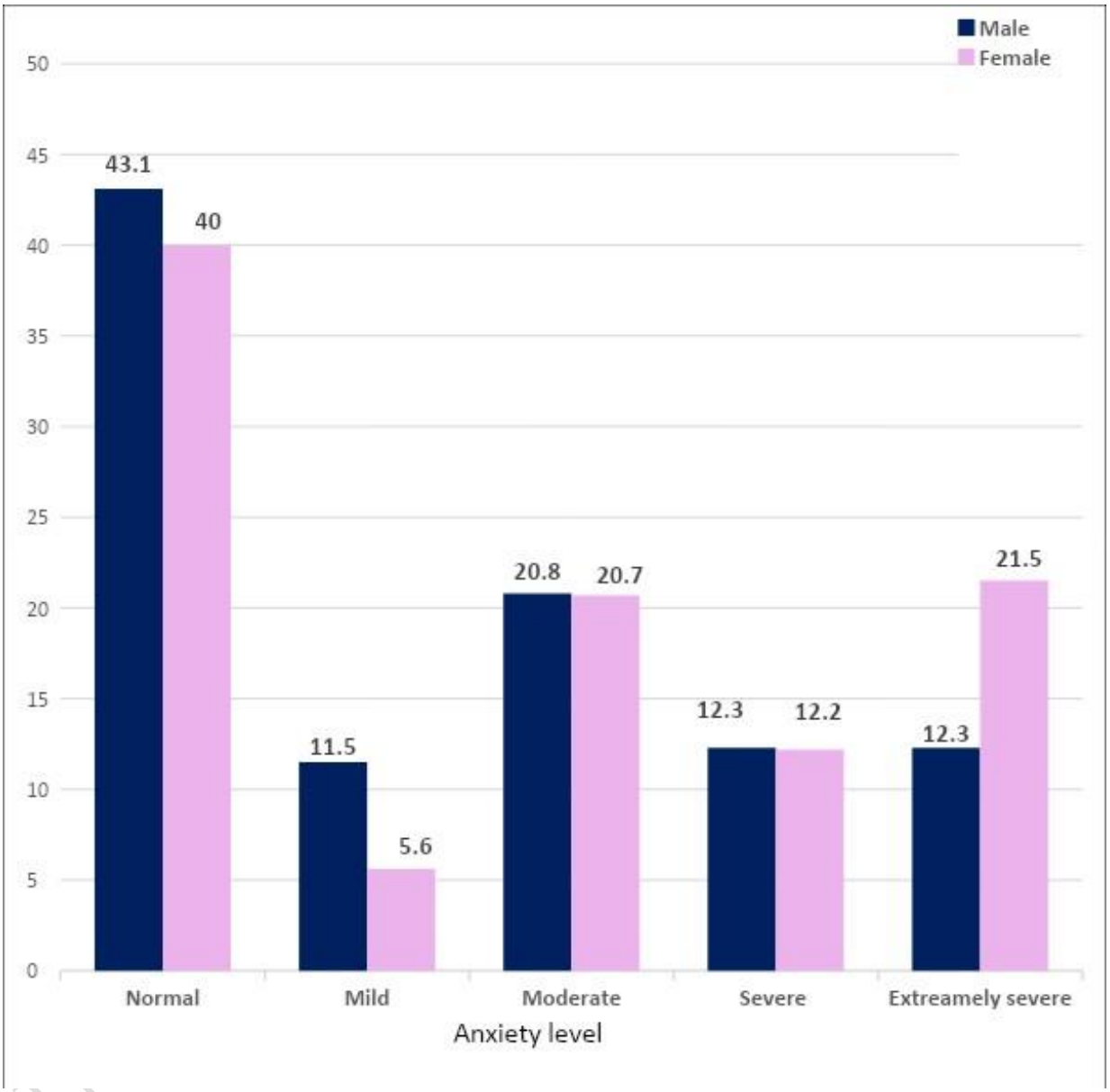


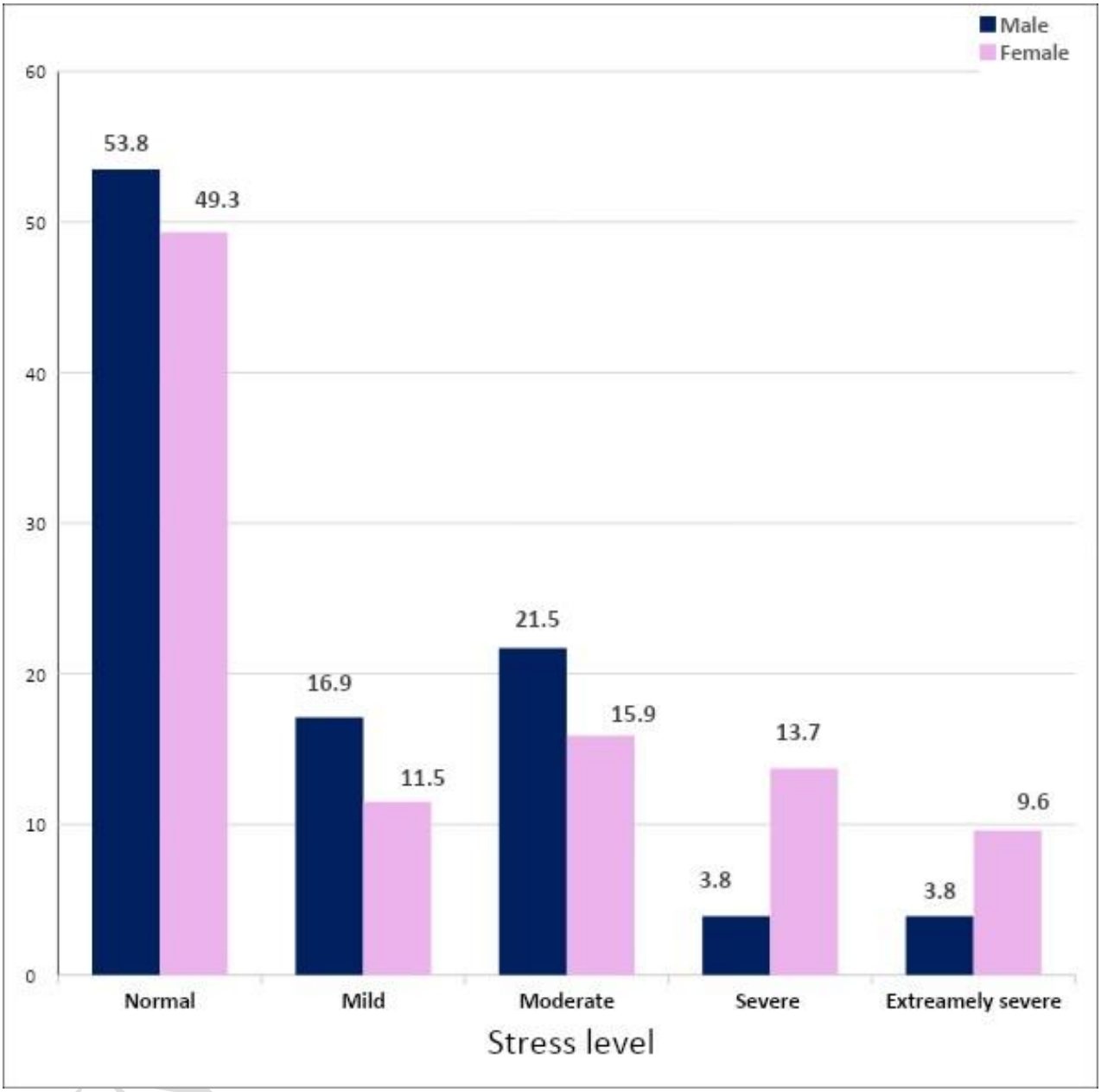
X^2 = 14.45, P = 0.006

Figure (1): Prevalence & intensity of depression among pharmacy students according to gender, Umm AL-Qura University.



X^2 = 8.38, P = 0.07

Figure (2): Prevalence & intensity of anxiety among pharmacy students according to gender, Umm Al-Qura University.



X^2 = 15.79, P = 0.003

Figure (3): Prevalence & intensity of stress among pharmacy students according to gender, Umm Al-Qura University.

Table (1): Relationship between depression and personal and socio-demographic characteristics of pharmacy students at Umm Al-Qura University.

Depression	**Abnormal (N = 251)**	**Normal (N= 149)**	X^2	***P-value***	**OR**	**95% C.I**
Variable	**No (%)**	**No (%)**				
Gender						
Male	87 (66.9%)	43 (33.1%)	1.43	*0.23*	0.76	0.47, 1.21
Female	164 (60.7%)	106 (39.3%)				
Age						
21 ≥	130 (69.9%)	56 (30.1%)	7.58	*0.006*	0.56	0.35- 0.83
21<	(56.5%) 121	(43.5%) 93				
Marital status						
Single	238 (62.6%)	142(37.4%)	0.05	*0.83*	1.10	0.45 - 3.27
Married	13 (65%)	7 (35%)				
Type of program						
[Basic years[RC	114 (62.3%)	69 (37.7%)	1.48	0.47	1	
B-Pharm	75 (67%)	37 (33%)			1.23	0.75-2.01
Pharm-D	62 (59%)	43 (41%)			0.87	0.53-1.42
Educational year						
Second [RC]	55 (63.2%)	32 (36.8%)	3.64	0.45	1	
Third	59 (61.5%)	37 (38.5%)			0.93	0.51-1.69
Fourth	44 (59.5%)	30 (40.5%)			0.85	0.45-1.61
Fifth	66 (61.1%)	42 (38.9%)			0.91	0.51-1.63
Sixth	27 (77.1%)	8 (22.9%)			1.96	0.80-4.83
Grade Point Average (GPA)						
<3.5	185 (66.8%)	92 (33.2%)	6.52	*0.01*	0.57	*0.37 - 0.87*
≥3.5	66 (53.7%)	57(46.3%)				

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Father education						
< University	106 (60.9%)	68 (39.1%)	0.44	0.50	1.14	0.75 - 1.76
≥University	145 (64.2%)	81 (35.8%)				
Mother education						
< University	114 (60.3%)	75 (39.7%)	0.90	0.34	1.21	0.81, 1.79
≥University	137 (64.9%)	74 (35.1%)				
Residency						
With family	238 (62.8%)	141 (37.2%)	0.01	0.93	0.96	0.39-2.99
Not with family	13 (61.9%)	8 (38.1%)				
Academic stress						
Yes	221 (69.3%)	98 (30.7%)	28.72	*0.00*	0.26	0.15- 0.43
No	30 (37%)	51 (63%)				
General life satisfaction						
Yes	160 (55.4%)	129 (44.6%)	24.31	*0.00*	3.66	2.14 ,6.53
No	91 (82 %)	20 (18%)				

OR: Odd ratios, RC: Referent category

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Table (2): Relationship between depression and habits and lifestyle of pharmacy students at Umm Al-Qura University

Depression	**Abnormal (N = 251)**	**Normal (N= 149)**	X^2	**P-value**	**OR**	**95% C.I**
Variable	**No (%)**	**No (%)**				
Smoking						
Yes	22 (52.4%)	20 (47.6%)	2.16	*0.14*	0.62	0.83, 2.98
No	229 (64%)	129 (36%)				
Physical Activity						
Yes	99 (59.6%)	67 (40.4%)	1.17	*0.28*	0.79	0.83 ,1.98
No	152 (65%)	82 (35%)				
Number of exercise Days						
≥3 days/ week	54 (41.2%)	77 (58.8%)	1.33	0.51	0.50	0.21 , 2.04
<3 days / week	12 (34.3%)	23 (65.7%)			0.96	0.45 , 2.03
Not practice (RC)	83 (35.5%)	151 (64.5%)			1	
Duration of exercising						
≥30 min/ day	76 (55.5%)	61(44.5%)	6.20	*0.05*	0.68	0.54 , 1.06
<30 min /day	23 (76.7%)	7 (23.3%)			1.86	0.77 , 4.51
Not practice (RC)	152 (65.2%)	81 (34.8%)			1	

OR: Odd ratios, RC: Referent category

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Table (3): Relationship between anxiety and personal and socio-demographic characteristics of pharmacy students at Umm Al-Qura University

Anxiety	**Abnormal (N= 236)**	**Normal (N=164)**	X^2	***P-value***	**OR**	**95% C.I**
Variable	**No (%)**	**No (%)**				
Gender						
Male	74 (56.9%)	56 (43.1%)	0.34	*0.55*	1.13	0.73 , 1.71
Female	162 (60%)	108 (40%)				
Age						
≤ 21	119 (64%)	67 (36%)	3.56	*0.06*	0.67	0.44 , 1
>21	117 (54.7%)	96 (45.3%)				
Marital status						
Single	228 (60 %)	152 (40%)	3.14	*0.08*	0.44	0.15 , 1.18
Married	8 (40%)	12 (60%)				
Type of program						
Basic years(RC)	109 (59.6%)	74 (40.4%)	0.20	*0.90*	1	
B-Pharm	67 (59.8%)	45 (40.2%)			0.99	0.99
Pharm-D	60 (57.1%)	45 (42.9%)			1.10	1.10
Educational year						
Second(RC	34 (39.1%)	53 (60.9%)	2.56	*0.63*	1	
Third	40 (41.7%)	56 (58.3%)			1.11	1.11
Fourth	36 (48.6%)	38 (51.4%)			1.10	1.10
Fifth	41 (25%)	67 (62%)			0.95	0.95
Sixth	13 (7.9%)	22 (62.9%)			0.92	0.92
Grade Point Average (GPA)						
<3.5	163 (58.8%)	114 (41.2%)	0.01	*0.93*	1.02	0.67 ,1.61
≥3.5	73 (59.3%)	50 (40.7%)				

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Father education						
< University	100 (57.5%)	74 (42.5%)	0.29	*0.58*	1.11	0.75 -1.68
≥University	136 (60.2%)	90 (39.8%)				
Mother education						
< University	110 (58.2%)	79 (41.8%)	0.09	*0.75*	1.06	0.71 -1.54
≥University	126 (59.7%)	85 (40.3%)				
Residency						
With family	226 (59.6%)	153 (40.4%)	1.18	*0.27*	0.61	0.22 - 1.62
Not with family	10 (47.6%)	11 (52.4%)				
Academic stress						
Yes	214 (67.1%)	105 (32.9%)	42.56	*0.000*	0.188	0.10-0.31
No	22 (27.2%)	59 (72.8%)				
General life satisfaction						
Yes	154 (53.1%)	136 (46.9%)	15.16	*0.000*	2.47	1.54- 4.20
No	82 (74.5%)	28 (25.5%)				
OR: Odd ratios, RC: Referent category						

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Table (4): Relationship between anxiety and habits and lifestyle of pharmacy students at Umm Al-Qura University

Anxiety	Abnormal (N= 236)	Normal (N=164)	X^2	P-value	OR	95% C.I
Variable	**No (%)**	**No (%)**				
Smoking						
Yes	27 (64.3%)	15 (35.7%)	0.54	*0.46*	0.78	0.37-1.58
No	209 (58.4%)	149 (41.6%)				
Physical Activity						
Yes	70 (42.2%)	96 (57.8%)	0.16	0.69	1.08	0.72- 1.69
No	94 (40.2%)	140 (59.8%)				
Number of exercise Days						
≥3 days/ week	74 (56.5%)	57 (43.5%)	1.01	0.60	1.30	0.62- 2.73
<3 days / week	23 (65.7%)	12 (34.3%)			1.50	0.69- 3.27
Not practice (RC)	139 (59.4%)	95 (40.6%)			1	
Duration of exercising						
≥30 min/ day	75 (54.7%)	62 (45.3%)	2.64	0.26	0.82	0.53-1.25
<30 min /day	21 (70%)	9 (30 %)			1.55	0.68- 3.53
Not practice (RC)	140 (60.1%)	93(39.9%)			1	

OR: Odds ratio, RC: Referent category

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Table (5): Relationship between stress and personal and socio-demographic characteristics of pharmacy students at Umm Al-Qura University.

Stress	**Abnormal (N=197)**	**Normal (N=203)**	**X^2**	***P-value***	**OR**	**95% C.I**
Variable	**No (%)**	**No (%)**				
Gender						
Male	60 (46.2%)	70 (53.8%)	0.74	*0.39*	1.20	0.77- 1.85
Female	137 (50.7%)	133 (49.3%)				
Age						
≤ 21	109 (58.6%)	77 (41.4%)	12.16	*0.00*	0.49	0.32, 0.72
>21	88 (41.1%)	126 (58.9%)				
Marital status						
Single	185 (48.7%)	195(51.3%)	0.97	*0.32*	1.58	0.59- 4.68
Married	12 (60%)	8 (40%)				
Type of program						
Basic years (RC)	90 (49.2%)	93 (50.8%)	0.46	*0.79*	1	
B-Pharm	57 (50.9%)	55 (49.1%)			1.07	0.67- 1.71
Pharm-D	56 (53.3%)	49 (46.7%)			1.18	0.67- 1.71
Educational year						
Second (RC)	38 (43.7%)	49 (56.3%)	5.73	*0.21*	1	
Third	52 (54.2%)	44 (45.8%)			1.52	0.85- 2.73
Fourth	37 (50%)	37 (50%)			1.08	0.59- 1.99
Fifth	62 (57.4%)	46 (42.6%)			1.74	0.98- 3.07
Sixth	14 (40%)	21 (60%)			0.89	0.39- 1.91
Grade Point Average (GPA)						
<3.5	142 (51.3%)	135 (48.7%)	1.46	*0.23*	0.76	0.50- 1.18
≥3.5	55 (44.7%)	68 (55.3%)				

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Father education						
< University	87 (50%)	87 (50%)	0.07	*0.79*	0.95	0.64-1.43
≥University	116 (51.3%)	110 (48.7%)				
Mother education						
< University	88 (46.6%)	101(53.4%)	1.03	*0.31*	1.22	0.81- 1.83
≥University	109 (51.7%)	102 (48.3%)				
Residency						
With family	186 (49.1%)	193 (50.9%)	0.08	*0.76*	1.14	0.40- 2.88
Not with family	11 (52.4%)	10 (47.6%)				
Academic stress						
Yes	181 (56.7%)	138 (43.3%)	35.35	*0.00*	0.18	0.09- 0.33
No	16 (19.8%)	64 (80.2%)				
General life satisfaction						
Yes	123(42.6%)	166 (57.4%)	18.64	*0.00*	2.69	1.73-4.41
No	74 (66.7%)	37 (33.3%)				

OR: Odd ratios, RC: Referent category

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Table (6): Relationship between stress and habits and lifestyle of pharmacy students at Umm Al-Qura University

Stress	**Abnormal (N=197)**	**Normal (N=203)**	**X^2**	***P-value***	**OR**	**95% C.I**
Variable	**No (%)**	**No (%)**				
Smoking						
Yes	23 (54.8%)	19 (45.2%)	0.57	*0.45*	0.78	0.39-1.48
No	174 (48.6%)	184 (51.4%)				
Physical Activity						
Yes	78 (47%)	88 (53%)	0.58	*0.45*	1.17	0.78-1.78
No	119 (50.9%)	115(49.1%)				
Number of exercise Days						
≥3 days/ **week**	57 (43.5%)	74(56.5%)	4.44	*0.11*	0.76	0.49-1.16
<3 days / week	22 (62.9%)	13 (37.1%)			1.66	0.80-3.46
Not practice (RC)	118 (50.4%)	116 (49.6%)			1	
Duration of exercising						
≥30 min/ day	57(41.6%)	80 (58.4%)	8.68	*0.01*	0.68	0.45 – 1.05
<30 min /day	21 (70%)	9 (30%)			2.23	0.98 – 5.09
Not practice (RC)	119 (51.1%)	114(48.9%)			1	

OR: Odds ratio, RC: Referent category

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Table (7): Logistic regression analyses of the predictors of depression, anxiety and stress among pharmacy students at Al-Qura University

Depression				
Variable	**B**	***P-value***	**aOR**	**95 % C.I**
(**Academic stress** (Yes	1.20	0.000	3.32	1.94 - 5.67
Gender (male)	0.56	0.05	1.74	1.02 - 2.96
General life Satisfaction	- 1.19	0.000	0.30	0.17 - 0.53
Duration of exercising				
<30 min/day ≥30 min/day Not practice (RC)	- 0.45 - 1	0.26 0.04	0.58 0.37 1	0.22 - 1.49 0.14 - 0.96
Constant	**1.96**			

Anxiety				
Variable	**B**	**P-value**	**aOR**	**95 % C.I**
Academic Stress	1.57	0.000	4.82	2.78 - 8.37
General life Satisfaction	- 0.76	0.003	0.47	0.28 - 0.78
Constant	**-1.14**			
Stress				
Variable	**B**	**P-value**	**aOR**	**95 % C.I**
(**Academic Stress** (Yes	1.60	0.000	4.93	2.62 - 9.29
(**Total EI** (EI ≥110	-0.94	0.003	0.40	0.21 - 0.72

General life Satisfaction	-0.72	0.005	0.49	0.30 - 0.81
(**Age** (≥ 21	-0.48	0.029	0.62	0.40 - 0.96
Duration of exercising				
min 30 > min 30 ≤ Not practicing RC	-0.9 -1.27	0.05 0.007	0.40 0.28 1	0.17- 0.98 0.11- 0.70
Constant	**1.69**			

aOR: adjusted Odds Ratio **CI: Confidence interval**

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Discussion

Global mental health is of growing concern, with increasing benefits from worldwide efforts for the sustainable development of mental health programs.[2] Analysis of DASS in the current study revealed that the overall prevalence of depression, anxiety, and stress among pharmacy students were 62.8 %, 59.0 %, and 49.2 %, respectively. Such rates are somewhat high. Previous studies showed also that the students from the medical field, as medicine and pharmacy, generally reported high levels. Abdel Wahed, et al. conducted a study using the same tool among medical students from Fayoum University, Egypt. They reported that the corresponding rates were 60.8%, 64.3%, and 62.4%, respectively.[8] Their rates are comparable to our rates regarding depression and anxiety. However, they reported a higher rate of stress compared to our study. The cause of such discrepancy may be due to differences in the target populations or cultural differences. Similarly, the study from Najran University, 2017, found that the prevalence of depression, anxiety, and stress among male medical students were 59%, 71%, and 61%, respectively.[9] However, Hashmi, et al., conducted a study in Pakistan using the Aga Khan University Anxiety and Depression Scale (AKUADS), and found that symptoms of anxiety and depression were exist among 45.5% of medical students. [15] The cause of the much lower rate from the Pakistani compared to the current study may be due to differences between the target populations or the used tools.

Regarding gender, our results showed that female pharmacy students had a higher level of stress and anxiety compared to males. Females may be more vulnerable to negative emotion compared to males with an increased risk of anxiety and stress. [2] A study among Danish medical students found that females reported higher levels of stress compared to male medical students, but the differences were not significant.[16] Similar result obtained among 4000 doctor of pharmacy (Pharm.D) students. [17]

In the present study, there was a significant association between gender and depression. Males had a higher depression score than females. This result goes in line results of the result of Cheung, et al., (2015) who found that male nursing students from Hong Kong suffered more from depression than females.[18] On the other hand, the study of Bore, et al., found that Australian female medical students reported higher levels of depression compared to males, but the differences were not significant.[19] Moreover, Demirbatir, et al., also found an insignificant association between gender with stress, anxiety, and depression among 1088 Turkish medical and music college students.[20] The sex differences revealed from our results and the previous studies may be due to multifactorial causes. Females are better at recognizing emotions and expressing themselves more easily, explaining the different behavioral responses which may lead to increased psychological disorders

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among them.[21] Furthermore, some theories explained the gender difference in the prevalence of stress and anxiety that it could be due to two main biological factors. The first factor is due to stress hormones disorders (adrenaline and cortisol); which affect stress and anxiety level. The second factor is related to sex hormones (estrogen and progesterone). The complex of estrogen and progesterone across the menstrual cycle may increase vulnerability to develop anxiety disorders among females.[22], [23], [24] In addition, females may suffer more from stress because they are looking for the ideal personality. However, male students are more able to control impulses and more able to minimize stress.[25] Furthermore, the relation of environmental factors such as social, cultural, and economic differences may also affect the DASS score.[26]

Concerning age, younger students (≤ 21) in the current study suffered more from each of depression, anxiety and stress. Students in their early years in the medical fields may have an increased academic pressure, many studying hours, and having a complexity of the learned subjects. Then they tried to adapt to their college environment. Cheung, et al., found that age was associated with stress and anxiety among Hong Kong nurses.[27] Furthermore, a meta-analysis (2018) done for 27 cross-sectional studies composed of 8,918 nurse students. They reported that younger students have the highest depression prevalence score. [28]

On the other hand, some studies found the opposite association between age and phycological distress among healthcare students. The study of Abdel Wahed, et al. suggested that older medical students suffered more from stress, anxiety, and depression.[8] Furthermore, the study of Shamsuddin, et al., found that older students aged between 20–24 years are more likely to be depressed, anxious, and stressed than younger students < 20 years.[29] The cause of such discrepancies between the previous results and ours may be attributed to differences between the target populations.

The current study's results found that married had a higher prevalence of depression and stress compared to single students (but not show any statistically significant association). The study of Cheung, et al., also found that higher depression levels among married nursing residence.[27] The lower rates of psychological traits among single than married students may be due to social support which single students are surrounded with (e.g. caring and support from family and friends). [30]

Our results agree with the results from the previous studies. An American study done among 374 university students at Franciscan University also didn't find any significant relationship between marital status and DASS.[31] Similarly, another Egyptian study done among first year medical students didn't find any association between marital status and level of DASS.[32] Furthermore, a Ghanaian study failed to find a relationship between marital status and depression level among 270 college students. [33] On the other hand, an Iranian study conducted among 10,000 adults at Yazd

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Greater Area in 2019 found a significant difference among married as they recorded higher DASS level compared to others. [34] This discrepancy between the current and the Iranian study may be due to differences between both target populations.

Our results showed that academic achievement had a statistically significant negative association with depression. Students with a higher GPA (GPA ≥ 3.5/4) had a lower level of depression compared to others. This may be because students with lower GPA may be afraid of academic failure and this can negatively influence the student's psychological health. Our result coincides with the previous studies that found that high depression level was correlated with poorer academic performance among college students.[35] Our results showed that academic stress had significant positive association with depression, anxiety and stress. Academic stress was also the first predictor (aOR= 3.44; 95%CI: 2.01-5.88) of the increased DASS. These findings stand in the same line with ideas of the previous studies that suggested that students' academic stress is a significant predictor for depression. Similarly, Kang, et al., (2013) suggested that nursing and undergraduate students who were suffering from a high level of academic stress had a higher level of depression.[36]

The current study revealed that physically active students had lower levels of stress and depression. This result coincides with the study from Hong Kong . [27] Students who exercised ≥ 30 minutes /day suffered significantly from lower levels of stress and depression compared to others. Duration of physical activity is also one of the predictors of DASS. Correspondingly, Zwan, et al., (2013) conducted a randomized controlled trial (RCT) among 76 adults at the University of Amsterdam. They reported that 20 minutes of physical exercise decreased the stress and stress-related symptoms such as symptoms of anxiety and depression; when carried out in a self-directed way. [37] Anxiety and Depression Association of America (ADAA) recommended physical activity as one of stress coping techniques; as it reduce stress hormones, i.e. (adrenaline and cortisol) while stimulating the production of endorphins. This can lead to high euphoric state, during or after exercising which reduces anxiety and depressed mood.[38] Additionally, physical activity have an important social benefit, as it also have positive effect on DASS.[39]

Our finding verified that DASS was negatively correlated with EI. Students obtained a higher EI score had lower levels of both depression and stress. Similarly, the study of Meng, et al., (2018) suggested that high EI improved the perceived stress among nursing students.[40] The study of Ibrahim et al., (2017) suggested that having higher EI negatively associated with stress.[6] Likewise, Foster et al., (2018) suggested that EI had a significant negative correlation with stress level between pharmacy and nursing undergraduate students.[41] The study of Ruiz-Aranda, et al., (2014) found that health-care students with high EI had lower stress level; which positively influencing life satisfaction and happiness.[42]

Current study suggested that general life satisfaction had a negative association with depression, stress and anxiety. It is one of the negative predictors of these three mental illnesses after controlling other confounding factors. Previous studies showed similar findings. Stankov suggested

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that higher level of depression correlated with low level of life satisfaction among Asian adolescents.[43] Our results could be explained by the mediator role of self-esteem which enhanced by emotional awareness and social support, and this enhanced by abilities which can recognize and manage emotions resulting in an increased life satisfaction also case decreasing psychological distresses (2013).[44]

Conclusion

The prevalence of depression, anxiety, and stress among pharmacy students were high (62.8%, 59.0%, and 49.2%, respectively). In bivariate analysis, the male students had a significantly higher prevalence of depression compared to females. Younger students suffered more from stress compared to older participants. In regression analysis, general life satisfaction is an important predictor for decreasing depression, anxiety, and stress levels. Duration of exercise is a significant predictor for decreasing anxiety and stress levels. Academic stress is an important predictor for increasing depression, anxiety, and stress levels. Screening programs for detection of depression, anxiety, and stress among pharmacy students are needed, with the proper management of the cases. Proper psychosocial and academic support services need to be available in faculty of pharmacies (and other medical fields) to help students to deal and cope with stresses for avoiding mental illnesses. Future longitudinal studies are required.

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References

1. Mofatteh M. Risk factors associated with stress, anxiety, and depression among university undergraduate students. AIMS Public Health. 2021;8 (1):36-65.
2. Ibrahim NK. Epidemiology of Mental Health Problems in the Middle East. Handbook of Healthcare in the Arab World. 2021:133-49.
3. Arndt J, Fujiwara E. Interactions between emotion regulation and mental health. Austin Journal of Psychiatry and Behavioral Sciences. 2014;1(5):1-8.
4. Littlejohn P. The missing link: using emotional intelligence to reduce workplace stress and workplace violence in our nursing and other health care professions. Journal of Professional Nursing. 2012;28(6):360-8.
5. Kelly EJ, Kaminskienė N. Importance of emotional intelligence in negotiation and mediation. International Comparative Jurisprudence. 2016;2 (1):55-60.
6. Ibrahim NK, Algethmi WA, Binshihon SM, Almahyawi RA, Alahmadi RF, Baabdullah MY. Predictors and correlations of emotional intelligence among medical students at King Abdulaziz University, Jeddah. Pakistan Journal of Medical Sciences. 2017;33 (5):1080-5.
7. Alaaddin RN, Ibrahim NK, Kadi M. Leadership Skills and their Associated Factors among Pharmacy Students at Umm Al-Qura University, Makkah, Saudi Arabia. Journal of Pharmaceutical Research International. 2021;33(50A):63-76.
8. Wahed WYA, Hassan SK. Prevalence and associated factors of stress, anxiety and depression among medical Fayoum University students. Alexandria Journal of medicine. 2017;53(1):77-84.
9. Asiri S, Asiri A, Ulahannan S, Alshiek M. Prevalence of depression, anxiety and stress among male medical students at Najran University, Saudi Arabia. Prevalence. 2018;4(8): 94-99.
10. Wang WEI. Clinical Epidemiology-basic principles and practical applications. Edited by Wang WEI Beijing: Higher Education Press Publication. 2012;101.
11. Ibrahim NK, Alamoudi BM, Baamer WO, Al-Raddadi RM. Self-medication with analgesics among medical students and interns in King Abdulaziz University, Jeddah, Saudi Arabia. Pak J Med Sci. 2015;31(1):14-8.
12. Lovibond SH, Lovibond PF. Manual for the depression anxiety stress scales: Psychology Foundation of Australia; 1996.
13. Henry JD, Crawford JR. The short-form version of the Depression Anxiety Stress Scales (DASS-21): Construct validity and normative data in a large non-clinical sample. British journal of clinical psychology. 2005;44(2):227-39.
14. Gloster AT, Rhoades HM, Novy D, Klotsche J, Senior A, Kunik M, et al. Psychometric properties of the Depression Anxiety and Stress Scale-21 in older primary care patients. Journal of affective disorders. 2008;110 (3):248-59.
15. Hashmi AM, Aftab MA, Naqvi SH, Sajjad W, Mohsin M, Khawaja IS. Anxiety and depression in Pakistani medical students: a multicenter study. Health Med. 2014;8 (7):813-20.
16. Haldorsen H, Bak NH, Dissing A, Petersson B. Stress and symptoms of depression among medical students at the University of Copenhagen. Scandinavian journal of public health. 2014;42 (1):89-95.
17. Votta RJ, Benau EM. Predictors of stress in doctor of pharmacy students: results from a nationwide survey. Currents in Pharmacy Teaching and Learning. 2013;5 (5):365-72.
18. Cheung T, Wong SY, Wong KY, Law LY, Ng K, Tong MT, et al. Depression, anxiety and symptoms of stress among baccalaureate nursing students in Hong Kong: a cross-sectional study. International journal of environmental research and public health. 2016;13(8):779.
19. Bore M, Kelly B, Nair B. Potential predictors of psychological distress and well-being in medical students: a cross-sectional pilot study. Advances in medical education and practice. 2016;7:125.
20. Demirbatir E, Helvaci A, Yilmaz N, Gul G, Senol A, Bilgel N. The psychological well-being, happiness and life satisfaction of music students. Psychology. 2013;4 (11):16.
21. Kret ME, De Gelder B. A review on sex differences in processing emotional signals. Neuropsychologia. 2012;50 (7):1211-21.
22. Maduka IC, Neboh EE, Ufelle SA. The relationship between serum cortisol, adrenaline, blood glucose and lipid profile of undergraduate students under examination stress. African health sciences. 2015;15(1):131-6.
23. Maeng LY, Milad MR. Sex differences in anxiety disorders: interactions between fear, stress, and gonadal hormones. Hormones and behavior. 2015;76:106-17.
24. Li SH, Graham BM. Why are women so vulnerable to anxiety, trauma-related and stress-related disorders? The potential role of sex hormones. The Lancet Psychiatry. 2017;4(1):73-82.
25. Stankovska G, Dimitrovski D, Angelkoska S, Ibraimi Z, Uka V. Emotional Intelligence, Test Anxiety and Academic Stress among University Students. Bulgarian Comparative Education Society. 2018; 16: 157-64.
26. Miller DI, Halpern DF. The new science of cognitive sex differences. Trends in cognitive sciences. 2014;18(1):37-45.

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27. Cheung T, Yip PS. Depression, anxiety and symptoms of stress among Hong Kong nurses: a cross-sectional study. International journal of environmental research and public health. 2015;12(9):11072-100.
28. Tung Y-J, Lo KK, Ho RC, Tam WSW. Prevalence of depression among nursing students: a systematic review and meta-analysis. Nurse education today. 2018;63:119-29.
29. Shamsuddin K, Fadzil F, Ismail WSW, Shah SA, Omar K, Muhammad NA, et al. Correlates of depression, anxiety and stress among Malaysian university students. Asian journal of psychiatry. 2013;6(4):318-23.
30. Mullan Harris K, Lee H, DeLeone FY. Marriage and health in the transition to adulthood: Evidence for African Americans in the Add Health Study. Journal of Family Issues. 2010;31(8):1106-43.
31. Beiter R, Nash R, McCrady M, Rhoades D, Linscomb M, Clarahan M, et al. The prevalence and correlates of depression, anxiety, and stress in a sample of college students. Journal of affective disorders. 2015;173:90-6.
32. Abdallah AR, Gabr HM. Depression, anxiety and stress among first year medical students in an Egyptian public university. Int Res J Med Med Sci. 2014;2(1):11-9.
33. Asante KO, Andoh-Arthur J. Prevalence and determinants of depressive symptoms among university students in Ghana. Journal of affective disorders. 2015;171:161-6.
34. Mirzaei M, Ardekani SMY, Mirzaei M, Dehghani A. Prevalence of depression, anxiety and stress among adult population: results of yazd health study. Iranian journal of psychiatry. 2019;14(2):137.
35. DeRoma VM, Leach JB, Leverett JP. The relationship between depression and college academic performance. College Student Journal. 2009;43(2):325-35.
36. Kang YS, Choi SY, Ryu E. The effectiveness of a stress coping program based on mindfulness meditation on the stress, anxiety, and depression experienced by nursing students in Korea. Nurse education today. 2009;29(5):538-43.
37. Van Der Zwan JE, De Vente W, Huizink AC, Bögels SM, De Bruin EI. Physical activity, mindfulness meditation, or heart rate variability biofeedback for stress reduction: a randomized controlled trial. Applied psychophysiology and biofeedback. 2015;40(4):257-68.
38. Kumar S, Bhukar JP. Stress level and coping strategies of college students. Journal of Physical Education and Sports Management. 2013;4(1):5-11.
39. Hughes JR, Crow RS, Jacobs DR, Mittelmark MB, Leon AS. Physical activity, smoking, and exercise-induced fatigue. Journal of behavioral medicine. 1984;7(2):217-30.
40. Meng L, Qi J. The effect of an emotional intelligence intervention on reducing stress and improving communication skills of nursing students. NeuroQuantology. 2018;16(1): 157-64.
41. Foster K, Fethney J, Kozlowski D, Fois R, Reza F, McCloughen A. Emotional intelligence and perceived stress of Australian pre-registration healthcare students: A multi-disciplinary cross-sectional study. Nurse Educ Today. 2018;66:51-6.
42. Ruiz-Aranda D, Extremera N, Pineda-Galan C. Emotional intelligence, life satisfaction and subjective happiness in female student health professionals: the mediating effect of perceived stress. Journal of psychiatric and mental health nursing. 2014;21(2):106-13.
43. Stankov L. Depression and life satisfaction among European and Confucian adolescents. Psychological Assessment. 2013;25(4):1220 -34.
44. Takeda F, Noguchi H, Monma T, Tamiya N. How possibly do leisure and social activities impact mental health of middle-aged adults in Japan?: an evidence from a national longitudinal survey. PloS one. 2015;10(10) - 15.

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