

# Stress and depression of university students in Egypt during the COVID-19 pandemic

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## Research Article

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# Abstract

**Background:** Mental health issues have been increasing globally, especially among university students. The pandemic of COVID-19 has aggravated this pre-existing and serious problem. This study aimed to assess the stress and depression levels and mental health status of Egyptian university students during the COVID-19 pandemic.

**Methods:** A cross-sectional online survey was conducted on medical and non-medical Egyptian university students. A total of 1470 participants completed the electronic anonymous online survey containing Patient Health Questionnaire-9 (PHQ-9) and Perceived Stress Scale(PSS).

**Results:** Of the 1470 participants, 10.9% have moderately severe depression and 6.1% have severe depression. Moreover, 77.6% reported moderate stress, 16.3% reported low stress, and 6.2% reported high stress. There was strong positive correlation between depression and stress among participants ( $r = 0.815$ ) ( $p < 0.001$ ). The significant predictors for depression were age between 18 and 20 years, female sex, presence of chronic diseases, and presence of friends or relatives diagnosed with COVID-19. The significant predictors for stress were age between 18 and 20 years, female sex, presence of friends or relatives diagnosed with COVID-19, and medical faculties.

**Conclusions:** During the COVID-19 pandemic, a majority of university students of Egypt showed moderate to high level of stress, and about one-third of them had moderate to severe depression. Younger age, female sex and having a relative or friend diagnosed with COVID-19 were significant predictors for high stress level and depression. Psychological interventions for university students during the COVID-19 pandemic are strongly recommended to promote their mental health and improve academic achievement.

## Background

The coronavirus disease (COVID-19) became a pandemic and affected people worldwide. The increased risk of mental disease is an unexpected consequence of these protective efforts. Indeed, one of the most significant and long-lasting repercussions of the COVID-19 epidemic is its severe impact on residents' mental health and well-being. A number of meta-analysis studies of general population samples suggested an increase in mental illness rates during the COVID-19 pandemic (1). The World Health Organization has designated the fast spread of the new COVID-19 as a pandemic on 11<sup>th</sup> March (2). There have been 4,425,485 confirmed COVID-19 cases and 302,059 deaths globally as of May 16, 2020. Egypt was one of the most affected countries in the Eastern Mediterranean region, with eleven thousand two hundred and twenty eight confirmed cases and 592 deaths (3).

Mental health issues are increasing around the world. Moreover, during the COVID-19 pandemic, university students are highly affected with these preexisting issues. Different strategies have been recommended to correlate stress and mental health (4). Mental health problems are more common among university students. Furthermore, the COVID-19 pandemic and related public health efforts negatively affected students' lives, leading to even more severe psychological consequences (5).

As a result, a public health emergency was imposed in many countries, including Egypt, for preventing the spread of the infection. These emergency instructions have resulted in social isolation that lead to global feels of depression and anxiety, fears of infection, disruptions in supply chain, financial problems, corrupted travel plans, and future fears (6,7). Several Chinese epidemiological studies during the COVID-19 pandemic found a high prevalence of psychiatric problems among the general public. A large online survey of 56,679 individuals from 34 Chinese regions found that 27.9% developed depression, 31.6% showed anxiety, 24.4% suffered stress (24.4%), and 29.2% reported insomnia (8). Academic stressors are any academic demands that cause a student's behavior to change, such as environmental, social, or inner demands. However, learning and examination and performance competitiveness, particularly acquiring a large amount of information in a short period, would result in varying degrees of academic overload or pressure. Despite the fact that the COVID-19 pandemic has affected all planned courses, online learning still provides college students with the same academic burden as before. After leaving school, college students who are close to their classmates may have separation anxiety. Emerging issues during the COVID-19 pandemic, such as clashing family patterns, changes in eating and sleeping habits, separation from peers, and loneliness, may have adverse effects on college students (9). Previous meta-analyses reported that sample's inclusion criteria do not usually need moderate to severe symptoms (clinically increased mental distress). Several meta-analyses focused at mental illness in nursing or medical students who would be highly affected during the COVID-19 pandemic due to stress from frontline clinical work and therefore, increased estimated prevalence. Several meta-analyses failed to rationalize causes of variability in prevalence estimates between different studies. The response to COVID-19 pandemic is lower in Egypt and moderate to low income countries due to inadequate infection control measures, improper surveillance systems, low laboratory capacities, and low public health resources (10,11).

Well-being includes the physical, mental, and social elements of health rather than solely indicating the absence of disease. "The presence of positive feelings and moods (e.g., contentment, happiness), the absence of negative emotions (e.g., depression, anxiety), satisfaction with life, contentment, and positive functioning, as well as the ability to preserve autonomy, are all part of mental health." Globally, there has been a considerable deterioration in mental health in the general population during the last several decades (12).

Stress is defined as an interaction between a person and the environment which the person feels as exhausting or beyond his resources, harming his wellbeing. Stress has a significant impact on the predisposition, development, and expression of mental conditions. Therefore, it is necessary to determine the sources of stress in order to determine the appropriate solutions that minimize the negative consequences (13). University students are usually stressful from academic performance, leaving high school and home, constructing new social relationships, financial issues, post-graduation working plans, difficult internet use, sleep problems, diet systems, and exercise schedules. These stressors and their effects resemble to a great extent the experiences shared by various life stages of worldwide population (14).

Worldwide, depression and anxiety as mental diseases are the most common causes of disease burden in the general population. Depression is characterized by overwhelming feelings of sadness, hopelessness, and a lack of interest, pleasure, and/or motivation (15). Moreover, patients may experience physical symptoms, such as insomnia, appetite loss, and concentration problems. In any case, university students are more likely to have depression than the general population, as indicated by a prevalence rate of this condition ranging from 10% to 85% among students. This could be related to students' imbalanced lifestyle, which are marked by a lack of sleep, poor nutrition, and time spent with family (16). Beiter et al. (17) reported that the academic performance, pressure to succeed, and post-graduation plans are among the most severe concerns of students with depression. As a result, students, particularly female students, are the most vulnerable population in terms of depressive disorders, with a higher rate of depression than their male counterparts.

To the best of our knowledge, no large-scale Egyptian study discussed mental health of university students; hence, the present study aimed to assess the stress and depression level and mental health status of Egyptian university students during the COVID-19 pandemic.

## Methods

### Study design, settings, and participants

The cross-sectional online survey was conducted from June 1 to December 30, 2021. Medical and non-medical Egyptian students participated in the study. Some of them are members of the Egyptian Novice Nursing and Students Scientific Associations covering 25 governmental and private universities throughout Egypt.

Non-probability sampling method was used in participant recruitment. A total of 1470 participants completed the electronic anonymous online survey of Patient Health Questionnaire (PHQ)-9 and Perceived Stress Scale (PSS).

### Data collection

A secured and password-protected platform were used to electronically design self-administered anonymous data collection form in Arabic language. Before wider dissemination of survey, the data collection form was piloted on a subsample of students. All participants were asked to give informed consents at the outset of the survey. Collected data was saved to a secured research drive available only to the research team and also data was password-protected. In addition to the sociodemographic characteristics (sex, age, residence, university, and affiliation), data collection included the following tools:

**a. PHQ-9:** PHQ-9 is an easy-to-use patient questionnaire is a self-administered version of the PRIME-MD diagnostic instrument for common mental disorders (18). The questionnaire is used to test mental health, particularly depression associated with COVID-19 lockdown. The PHQ-9 is the depression module, which scores each of the nine DSM-IV criteria as "0" (not at all) to "3" (nearly every day). The depression severity

was rated as follows: 0–4, none; 5–9, mild; 10–14, moderate; 15–19, moderately severe; and 20–27, severe. PHQ-9 has 61% sensitivity and 94% specificity in depression screening for adults (19). The Arabic version had been validated and has acceptable psychometric properties (20).

**b. PSS:** The PSS is the most widely used psychological instrument for measuring stress perception. It measures the degree to which situations in one's life are appraised as stressful. Items were designed to determine how unpredictable, uncontrollable, and overloaded respondents find their lives. The scale also includes a number of direct queries about current levels of experienced stress. The questions in the PSS ask about feelings and thoughts during the last month. In each case, respondents are asked how often they felt in a certain way. PSS scores are determined by reversing responses (e.g., 0 = 4, 1 = 3, 2 = 2, 3 = 1, and 4 = 0) to the four positively stated items (items 4, 5, 7, and 8) and then totaling across all scale items. Because assessed stress levels should be affected by daily hassles, major events, and changes in coping resources, the predictive validity of the PSS is expected to decrease off quickly after 4–8 weeks.

Individual scores on the PSS can range from 0 to 40, with higher scores indicating higher perceived stress. ► Scores ranging from 0 to 13 are considered low stress. ► Scores ranging from 14 to 26 are considered moderate stress. ► Scores ranging from 27 to 40 are considered high perceived stress (21). The Arabic version had been validated and has acceptable psychometric properties (22).

## **Data management and statistical analysis**

### ***Statistical analysis and data interpretation***

Data were fed to the computer and analyzed using IBM SPSS (2013) (IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp). Qualitative data were described using number and percentage. Quantitative data were described using median (minimum and maximum) and mean and standard deviation for parametric data after testing normality using Kolmogorov-Smirnov test. Significance of the obtained results was judged at the 0.05 level. The Spearman's rank-order correlation was used to determine the strength and direction of a linear relationship between PSC and PHQ scores. Chi-square test was used for comparison of two or more groups of categorical variables. Prediction of independent variables of binary outcome was performed by binary stepwise logistic regression analysis. Significant predictors in the univariate analysis were entered into the regression model using forward Wald method. Adjusted odds ratios and their 95% confidence interval were calculated.

## **Results**

Students from 25 universities received the surveys, and 1470 participants completed the survey.

Table 1 shows the characteristics of the cohort. Of the 1470 students, 1180 (80.3%) were female, and 789 (53.7%) were from urban areas. Most participants (991 [67.4%]) were aged between 18 and 20 years. Moreover, 1406 (95.6%) participants were from medical faculties. The majority of participants did

not have chronic diseases (1354 [92.11%]) and have friends or relative diagnosed with COVID-19 (1429 [97.2%]).

The majority of participants (75%) reported symptoms of depression: 551 (37.5%) had mild depression, 302 (20.5%) had moderate depression, 160 (10.9%) had moderately severe depression, and 89 (6.1%) had severe depression. The mean of the total depression score was  $8.78 \pm 5.74$  (Table 2).

The majority of participants (1140 [77.6%]) reported moderate stress, 239 (16.3%) reported low stress, and 91 (6.2%) reported high stress. The mean of the total stress score was  $18.76 \pm 5.43$  (Table 2).

Figure 1 shows a strong positive correlation between depression and stress among participants ( $r = 0.815$ ) ( $p < 0.001$ ).

There was no significant relationship between depression and residence. A significantly increased prevalence of depression with the lowest age was detected. The prevalence of depression increased from 50.3% in participants aged 21–24 years to 86.9% in those aged 18–20 years. A significant relationship of depression and sex (increased in women), presence of chronic diseases, and presence of friends or relatives diagnosed with COVID-19 was reported ( $p = 0.013$ ,  $p = 0.014$  and  $p < 0.001$ , respectively) (Table 3).

There was no significant association between stress and residence or presence of chronic diseases. A significantly increased prevalence of stress in participants with the lowest age (18–20 years) was reported ( $p < 0.001$ ). There was a significant association between moderate to high stress and sex (increased in women) and presence of friends or relatives diagnosed with COVID-19 ( $p = 0.02$  and  $p < 0.001$ , respectively). Participants from medical faculties showed higher proportion of moderate to high stress compared to those from non-medical faculties ( $p = 0.02$ ) (Table 3).

The significant predictors for depression were age between 18 and 20 years, female sex, presence of chronic diseases, and presence of friends or relatives diagnosed with COVID-19 (adjusted odds ratio [AOR], 6.19 [4.77–8.03], 1.42 [1.04–1.93], 4.26 [2.43–7.48], and 2.45 [1.23–4.89], respectively) (Table 4).

The significant predictors for stress were age between 18 and 20 years, female sex, presence of friends or relatives diagnosed with COVID-19, and medical faculties (AOR, 10.84 [7.67–15.32], 1.47 [1.01–2.16], 13.48 [5.62–32.36], and 3.01 [1.53–5.9], respectively) (Table 5).

## Discussion

High rates of transmission and mortality of COVID-19 have negatively affected the mental health of many individuals. University students are at high risk of various mental problems, such as anxiety, depression, and substance use, when facing stressful situation or crisis (23, 24). In the current study, the majority of participants had moderate stress, with a mean PSS score of 18.76. In a similar finding reported by **Son et al. (2020)**, the mean PSS score for 195 university students was 18.8 during the COVID-19 pandemic in the USA (25). Most participants were medical students (95.6%), who showed elevated

level of stress. **O'Byrne et al. (2021)** reported that a majority of the medical students reported stress levels ranging from moderate to extreme (26). In the present study, women accounted for more than three-quarter of the participants, which may explain the high percentage of stress among the participants. This explanation is supported by **Graves et al. (2021)**, who concluded that, by using the PSS score, female college students reported higher level of moderate stress compared to male college students in the USA (27). The PHQ-9 scoring system for depression demonstrated that more than one-third of the participants had mild depression, while about one-fifth had moderate depression. Alarming, 17% of the participants had moderately severe to severe depression. Matched with the current study results, Wang et al. (2020) used the PHQ-9 scoring system to measure depression among 2031 college students in the USA and found that 48% of them showed moderate to severe depression (28). In the comparison to the pre-COVID-19 era, Choi et al. (2020) analyzed the collected data for more than 25000 college students in the USA from 2013 to 2017 and found that only 6.2% of students had moderate to severe depression (29). Findings of the present study showed a significant association between age and depression and stress levels. The young age group (18–20 years) exhibited a higher percentage of depression and moderate to severe stress than the older age group (21–24 years). These findings comply with Gasteiger et al. (2020), who reported that the younger age group of the community cohort in New Zealand had greater level of anxiety, stress, and depression (30). Moreover, Halperin et al. (2021) revealed that preclinical students (younger age group) in medical schools in the USA had higher prevalence of generalized anxiety disorder (GAD) and depression (31). Sex-related differences of university students in terms of stress and depression have been confirmed in many studies (31–33), which is in line with our results, revealing that female university students have higher levels of stress and depression than male university students. The presence of chronic disease in university students who participated in the current study was a risk factor for depression. This finding is compatible with the results of Wang et al. (2020), who concluded that the presence of chronic disease is associated with an increase in Impact of Event Scale – revised (IES-R), depression, and anxiety scores (34). Additionally, there was a significant elevation in stress and depression scores among participants in the current study who have friends or relatives diagnosed with COVID-19, which matched with the results of Halperin et al. (2021) (31), who revealed significant elevated GAD-7 scores in case of having a COVID-19 diagnosed friend or relative. Similarly, Torun et al. (2020) stated that a significant increase in IES-R scores is associated with having friends or relatives diagnosed with COVID-19 (32). Focusing on predictors of high stress level among university students in the present study during the COVID-19 pandemic, the obtained results showed that age, sex, presence of friends or relatives diagnosed with COVID-19, and faculty type are significant predictors of high stress level, indicating that university students who were younger, female, and medical students and had friends or relatives diagnosed with COVID-19 had high stress level. Consistent with these findings, many studies reported the association between high level of stress and younger age, female sex, medical school, and presence of friends or relatives diagnosed with COVID-19 (26, 27, 30–32). Conversely, younger age, female sex, presence of chronic disease, and presence of friends or relatives diagnosed with COVID-19 were predictors for moderate to severe depression, which was confirmed by the results of several previously mentioned studies (27, 30, 31, 34).

# Limitations Of The Study

As participation in the current study is voluntary, most participants were medical students (95.6%). For this reason, the study does not represent all university students.

## Conclusions

During the COVID-19 pandemic, a majority of university students in Egypt showed moderate to high level of stress, and about one-third of them had moderate to severe depression. Younger age, female sex, and confirmed diagnosis of a relative or friend with COVID-19 were significant predictors for high stress level and depression in university students.

## Abbreviations

Patient Health Questionnaire-9 (PHQ-9)

Perceived Stress Scale (PSS).

The coronavirus disease (COVID-19)

generalized anxiety disorder (GAD)

Event Scale – revised (IES-R)

## Declarations

Authors' contributions: Asmaa soliman revise the manuscript for adding an modification sharing in writing the manuscript ,Shimaa Elsayed wrote comments on tables ,Radwa Samir Hagag wrote references ,Ahmed A Ghandour Hanem Awad wrote the disscussion and Enas Elsayed Elsherbeny wrote methods and tables and analysis of data .All authors reviewed the manuscript.

Competing interests: I confirm that all authors of the manuscript have no conflict of interests to declare, the manuscript is the authors' original work and the manuscript has not received prior publication and is not under consideration for publication elsewhere.

Ethical considerations: Research ethical approval from the Faculty of Pharmacy Research Ethical Committee (REC) (ECH-023) was obtained. The confidentiality of data was maintained in accordance with the revised Declaration of Helsinki of biomedical ethics.

Consent to participate: Study participants were informed about the purpose of the study and then asked to provide written informed consent electronically before data collection. Participants approved the participation in the study completed the submission process.

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## Tables

Table (1) Demographic information of the respondents (n=1470)

Characteristics	Category	n=1470	%
Age (years)	18-20	991	67.4
	21-24	479	32.6
Sex	Male	290	19.7
	Female	1180	80.3
Residence	Rural	681	46.3
	Urban	789	53.7
Chronic disease	absent	1354	92.11
	present	116	7.89
Friend or relative diagnosis with COVID	No	41	2.8
	Yes	1429	97.2
Faculty type	Medical	1406	95.6
	Non-medical	64	4.4

N, number

Table (2) Categorization of the participants according to prevalence of depression and stress

Variable	Category	n= 1470	%
Depression <sup>a</sup>	None	368	25.0
	Mild	551	37.5
	Moderate	302	20.5
	Moderately severe	160	10.9
	Severe	89	6.1
Total depression score	Mean±SD	8.78 ± 5.74	
Stress scale <sup>b</sup>	Low	239	16.3
	Moderate	1140	77.6
	High	91	6.2
Total stress score	Mean±SD	18.76 ± 5.43	

<sup>a</sup>, depression frequency according to PHQ-9; <sup>b</sup> stress level according to PSS;

*n, number*

Table (3) Association between demographic variables and depression and stress

Variable	category	Total n=1470	No Depression	Depression	Test of significance
<b>Age (years)</b>	18-20	991	130(13.1)	861(86.9)	$\chi^2=230.1$
	21-24	479	238(49.7)	241(50.3)	P<0.001*
<b>Sex</b>	Male	290	89(30.7)	201(69.3)	$\chi^2=6.16$
	Female	1180	279(23.6)	901(76.4)	P=0.013*
<b>Residence</b>	Rural	681	176(25.8)	505(74.2)	$\chi^2=0.444$
	Urban	789	192(24.3)	597(75.7)	P=0.505
<b>Chronic disease</b>	Absent	1354	350(25.8)	1004(74.2)	$\chi^2=6.08$
	present	116	18(15.5)	98(84.5)	P=0.014*
<b>Friend or relative diagnosis with COVID</b>	No	41	26(63.4)	15(36.6)	$\chi^2=33.11$
	Yes	1429	342(23.9)	1087(76.1)	P<0.001*
<b>Faculty type</b>	Medical	1406	352(25)	1054(75)	$\chi^2=0.0$
	Non- medical	64	16(25)	48(75)	P=0.995
Variable	category	Total Number=1470	Low stress	Moderate to high stress	Test of significance
<b>Age /years</b>	18-20	991	51(5.1)	940(94.9)	$\chi^2=275.83$
	21-24	479	188(39.2)	291(60.8)	P<0.001*
<b>Sex</b>	Male	290	60(20.7)	230(79.3)	$\chi^2=5.21$
	Female	1180	179(15.2)	1001(84.8)	P=0.02*
<b>Residence</b>	Rural	681	123(18.1)	558(81.9)	$\chi^2=3.03$
	Urban	789	116(14.7)	673(85.3)	P=0.082
<b>Chronic disease</b>	Absent	1354	223(16.5)	1131(83.5)	$\chi^2=0.562$
	present	116	16(13.8)	100(86.2)	P=0.453
<b>Friend or relative diagnosis with COVID</b>	No	41	33(80.5)	8(19.5)	$\chi^2=127.79$
	Yes	1429	206(14.4)	1223(85.6)	P<0.001*
<b>Faculty type</b>	Medical	1406	222(15.8)	1184(84.2)	$\chi^2=5.22$
		64	17(26.6)	47(73.4)	

Non-  
medical

P=0.02\*

<sup>a</sup>, *depression frequency according to PHQ-9;* <sup>b</sup> *stress level according to PSS;*

*n, number; significant if  $p \leq 0.05$*

Table (4) Univariate and multivariate analysis of predictors of depression <sup>a</sup> among participants (n=1470)

Risk factor	Univariate analysis		Multi variate analysis		
	P	COR (95% CI)	$\beta$	P	AOR (95% CI)
<b>Age /years</b>					
18-20	<0.001*	6.54(5.06-8.45)	1.82	<0.001*	6.19(4.77-8.03)
21-24 (R )					
<b>Sex</b>			0.348	0.029*	1.42(1.04-1.93)
Male (R)	0.013*	1.43(1.08-1.89)			
Female					
<b>Residence</b>					
Rural (R )	0.505	1.084(0.856-1.37)			
Urban					
<b>Chronic disease</b>					
Absent (R )	0.015*	1.89(1.13-3.18)	1.45	0.001*	4.26(2.43-7.48)
present					
<b>Friend or relative diagnosis with COVID</b>					
No ( R)					
Yes	<0.001*	5.51(2.88-10.52)	0.898	0.01*	2.45(1.23-4.89)
<b>Faculty type</b> Medical		1.002			
Non-medical (R)	0.992	(0.562-1.79)			
<b>Overall % predicted =78.6%</b>					
<b>Constant =1.66</b>					
<b>Model <math>\chi^2=262.99</math> , P&lt;0.001*</b>					

<sup>a</sup>, depression diagnosed by PHQ-9; COR, crude odds ratio; AOR, Adjusted odds ratio; R, reference

Table (5) Univariate and multivariate analysis of predictors of high stress level <sup>a</sup> among participants (n=1470)

Risk factor	Univariate analysis		Multi variate analysis		
	P	COR (95% CI)	$\beta$	P	AOR (95% CI)
<b>Age /years</b>					
18-20	<0.001*	11.91(8.51-16.67)	2.38	<0.001*	10.84(7.67-15.32)
21-24 (R )					
<b>Sex</b>					
Male (R)	0.023*	1.459(1.053-2.02)	0.388	0.046*	1.47(1.01-2.16)
Female					
<b>Residence</b>					
Rural (R )					
Urban	0.082	1.27(0.969-1.69)			
<b>Chronic disease</b>					
Absent (R )					
present	0.454	1.23(0.713-2.13)			
<b>Friend or relative diagnosis with COVID</b>					
No ( R)			2.60	<0.001*	13.48(5.62-32.36)
Yes	<0.001*	24.49(11.16-53.77)			
<b>Faculty type</b>					
Medical			1.10	0.001*	3.01(1.53-5.9)
Non-medical (R)	0.025*	1.93(1.09-3.42)			
<b>Overall % predicted =86.2%</b>					
<b>Constant =3.36</b>					
<b>Model <math>\chi^2=318.96</math>, P&lt;0.001*</b>					

<sup>a</sup> stress level according to PSS; COR, crude odds ratio; AOR, Adjusted odds ratio; R, reference

# Figures

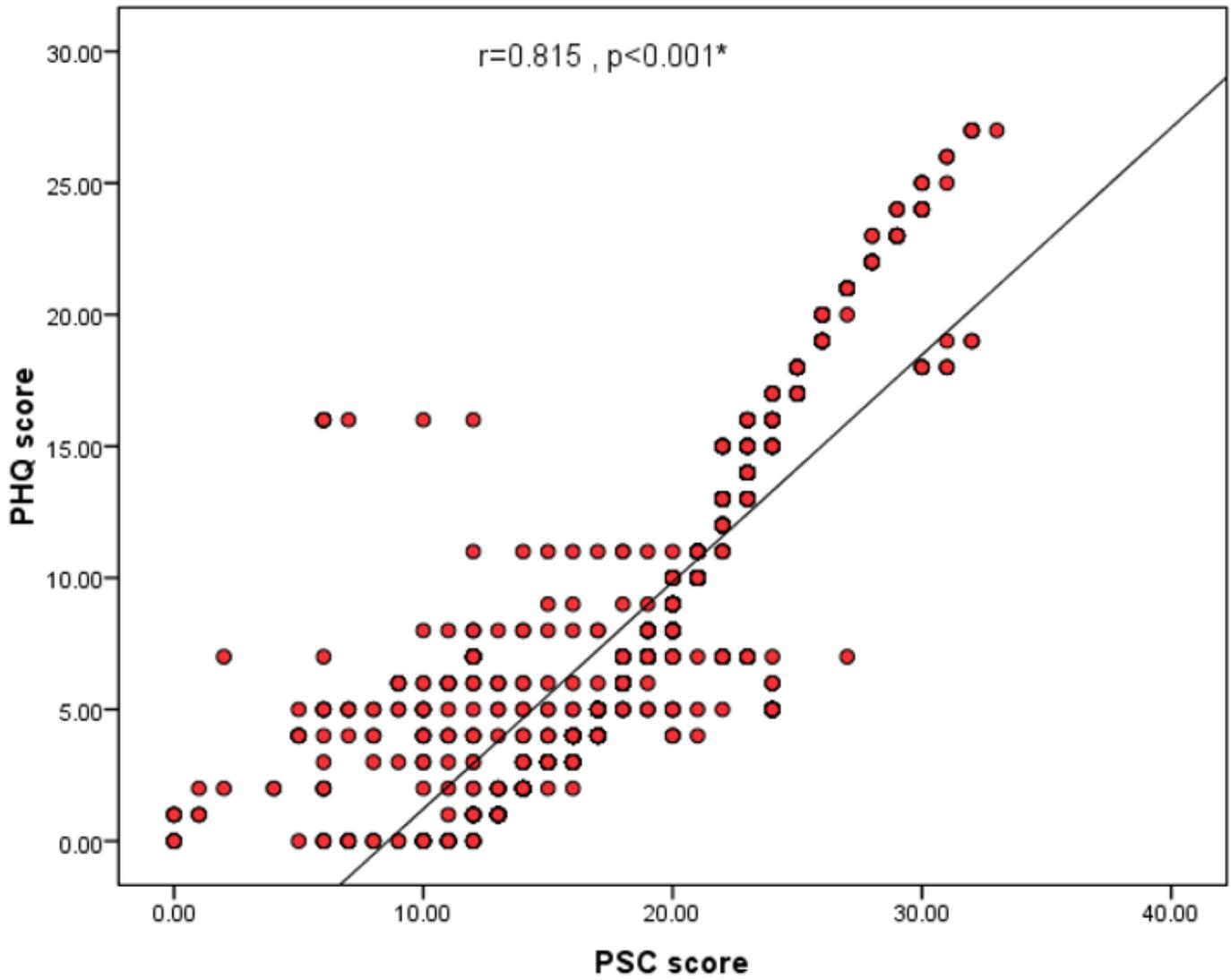


Figure 1

correlation between depression and stress among participants (n=1470).