Depression among Saudi international university students and its associated risk factors

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Abstract

Introduction Depression disorders are one of the most widespread mental disorders among college students. In university students, depression has been associated with lower academic performance, worse work performance, and increased dropout risk. his study aims to assess the prevalence of depression and highlight risk factors among Saudi international university students (IUS) in the United States (US), the United Kingdom (UK), and Australia.

Subject and methods This cross-sectional study was conducted among Saudi students who chose to study abroad. A self-administered online questionnaire was sent to the students using an online survey. The questionnaire includes socio-demographic data (e.g., age, gender, specialty, etc.), medical characteristics, social status, and the Patient Health Questionnaire (PHQ-8) to assess the student's depression.

Results Of the 401 students, 52.4% were younger (age 18 – 25 years), and more than half were males (53.9%). Most of the participants were studying in the US (46.6%), followed by the UK (40.6%) and Australia (12.7%). The rate of major depression among Saudi students studying abroad was 40.4%. In univariate analysis, major depression was influenced by age, marital status, specialty, personal and family history of mental illness, contact with family and friends, and feeling like a stranger. However, after conducting multivariate regression analysis, previous diagnoses of mental illness and feeling a stranger were identified as the significant independent risk factors for major depression.

Conclusion This study provides insights into the prevalence and risk factors associated with depression among Saudi IUS. The prevalence of major depression among Saudi IUS was 40.4%. Previous history of mental illness and feeling like strangers were identified as the most prominent risk factors in this study. Identifying the prevalence and contributing factors of depression can guide academic institutions and governments in the development of effective interventions and support for IUS's mental well-being. Future research could diversify the sample and employ longitudinal designs.

Keywords International university students, Depression, Saudi Arabia, Prevalence, Risk, Factor, PHQ-8

Introduction

Depression is a mood disorder that causes a continual feeling of sorrow and loss of interest. It is commonly characterized by sadness, emptiness, irritable mood, and cognitive and somatic alterations that impact the individual's capacity for everyday performance [1]. Moreover, depression is a multi-faceted disorder that

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impairs interpersonal, social, and occupational functioning. A lack of self-care, anxiety, poor attention, sleep disturbances, and a loss of interest in everyday experiences are some of the symptoms of depression [2]. Depression has a multifactorial etiology, with genetic and environmental factors contributing. For example, people with first-degree relatives with depression are three times more likely to develop depression than the general population.

Several factors have been linked with depression. Having a depressed parent, particularly a depressed mother, is a strong risk factor for depression. A stable relation across countries is that women, beginning from adolescence, have a 2:1 greater probability of getting major depressive disorder than men. Moreover, for men, childhood sexual abuse, conduct disorders, substance misuse, and stressful experiences with financial, professional, or legal significance were all strong predictors of depression. However, in women, divorce, low parental warmth, low marital satisfaction, and low social support were all found to be stronger predictors of depression [3].

In a cross-national analysis based on surveys of 156,331 respondents from 29 countries, the lifetime prevalence of any mood disorder was found to be 9.5% for males and 15.4% for females. Notably, major depressive disorder typically has its first onset during childhood through early adulthood [4]. Depression and other mental disorders are linked to significantly diminished life opportunities, affecting both physical health and success [5]. The Saudi National Mental Health Survey, a face-to-face epidemiological survey conducted in a nationally representative sample of 4,004, revealed a 9.3% prevalence of mood disorders, with 6% attributed to major depressive disorder and 3.3% to bipolar disorder. Lifetime mental disorders in Saudi Arabia are highly prevalent and typically have early ages of onset [6]. Additionally, a national screening conducted via phone interviews with 6,015 participants found that 12.7% of respondents were at risk of major depressive disorder [7].

Depression is a widespread mental disorder among college students [2, 8, 9]. A systematic review involving twenty-four studies reporting on the depression prevalence rate among university students has found that the average depression prevalence is 30.6%. This is a greater rate than the 9% observed in the United States's (US) population rates [2]. At a Saudi university, it was found that 24% of undergraduate students have a mood disorder [10]. International university students (IUS) have also been the focus of previous investigations. For instance, a study conducted in Japan found that the prevalence of depression was higher among international students compared to domestic students (37.81% vs. 29.85%) [11]. Similarly, another study in Malaysia reported that the overall prevalence of depression among international students was 58.9% [12].

Many predisposing factors have been linked with university students' depression. These factors include being a first-year student, living alone, being single rather than married, and having a low or high grade point average (GPA) [13]. Additionally, sleep and eating disturbances, family relationship alterations, financial stressors, and academic worries are all factors that might increase students' vulnerability to depression [2].

In university students, depression has been associated with lower academic performance [14], worse work performance [2], and increased dropout risk [15]. Furthermore, depression can result in a buildup of harmful consequences through adulthood because of its effect on social relationships and career prospects [2].

Our study investigated the prevalence and potential predictors of depression among Saudi students studying internationally, which to our knowledge has not been discussed in previous literature. There were limited studies in Saudi Arabia that provided evidence about the issue of mental health among this group of population. Hence, the outcome of this study could be an important contribution to the literature, given the high prevalence of depression among university students in Saudi Arabia and the wide range of illnesses brought by depression if left untreated [2, 13]. We aim to highlight these factors and assess the prevalence of depression among Saudi IUS in the US, United Kingdom(UK), and Australia. Hopefully, this research will draw attention to international students' mental health and help acknowledge the factors associated with it.

Methodology
Design and participants
A cross-sectional, questionnaire-based design was adopted in this study, which was conducted in February 2023. All Saudi students studying at a university or a college in the US, UK, or Australia for a bachelor's, master's, or doctorate degree were eligible to participate in the study. The three countries included in the study were chosen because they were Saudi students' most prevalent scholarship destinations. Participants who were non-Saudi, not studying in the US, UK, or Australia, studying for a fellowship or a diploma, in their first year of college, or had not properly completed the form were excluded. First year students were excluded for two reasons. First, as they have not study abroad for a lengthy amount of time, the researchers preferred excluding them to reduce biases. Second, they would not be able to fill out items of the questionnaire like the GPA and yearly visits to Saudi Arabia. Participation was voluntary, and informed consent was obtained online before the survey.

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Additionally, confidentiality was assured, questionnaires were submitted anonymously, and all participants could withdraw from completing the survey at any time. This study was approved by the Deanship of Scientific Research at King Faisal University on February 1, 2023 (KFU-REC-2023-FEB-ETHICS525).

Sample size calculation

Four hundred and one participants were included in this study using convenient sampling technique. The sample size needed for the study was calculated to be 324 participants. Taking a 5% margin of error, a 95% confidence interval, a 30.6% expected population proportion, and a population size of 35,840 international Saudi students. The formula used is:

$$n = N^*X/(X + N - 1),$$

where,

$$X = Z_{\alpha/2^2} * p * (1 - p)/MOE^2,$$

The population size number was obtained in January 2023 from a governmental platform used by all Saudi IUS called "SAFEER2." Which includes the number of all Saudi IUS in all countries. The expected population proportion was assumed according to a systematic review of depression prevalence among university students, which found that the average depression prevalence is 30.6% [2].

Data collection

Data was collected through an online Google Forms survey from February 2023 to April 2023. Then, the survey was distributed on social media platforms and Saudi IUS WhatsApp groups. The data of all subjects were subsequently stored in a secured Microsoft Excel spreadsheet file on Google Drive.

Study variables and instruments

The survey consisted of three sections administered in English. The first is for informed consent. The second section is the demographic data and risk factors section. The demographic part was designed to collect the general characteristics of Saudi IUS. Including sex, age, country of study, marital status, housing, academic discipline, sought academic degree, and number of years studying abroad. The risk factors' part consists of the last GPA, personal and family history of mental illness, frequency of family contact, frequency of going out with friends, the yearly average number of visits to Saudi Arabia, having a financial aid program and feeling like a stranger. All GPAs are converted to a 5-point system and then grouped into five hierarchical categories. *The researchers have selected these risk factors after reviewing the literature and then consulted a psychiatrist to review them.* Only those who are getting their bachelor's degree were asked about their GPAs. The last section is for depression screening. There are many screening tools developed from the patient health questionnaire (PHQ). The items in the PHQ-9 consist of the nine criteria for depression from the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM-IV). However, we preferred using PHQ-8 rather than PHQ-9 for two reasons. First, the ninth item in the PHQ-9 is "Thoughts that you would be better off dead or of hurting yourself in some way." The authors of PHQ-9 (and PHQ-8) believe that excluding this item is appropriate if it will be self-administered which, in our study, it was. Second, The PHQ-8 and PHQ-9 were both validated previously, have similar sensitivity, specificity, and positive predictive value and have a similar likelihood of predicting any depressive disorder. Thus, to screen for depression, we used the eight-item version of the Patient Health Questionnaire (PHQ-8) [16–18]. We used a PHQ-8 score of ≥ 10 as a cut-off point for defining clinically significant depression as it was suggested by the authors [18].

Statistical analysis

The data were analyzed using the software program Statistical Packages for Software Sciences (SPSS) version 26 (Armonk, New York, IBM Corporation, USA). The numbers and percentages (%) were given for categorical variables. Univariate analysis was performed to identify the factors that influence major depression. Significant results were then placed in a multivariate regression model to determine the significant independent risk factors for major depression. Values were considered significant with a p-value of less than 0.05.

Results

This study enrolled four hundred and one Saudi university students studying abroad. As described in Table 1, 52.4% were between 18 and 25 years of age. Male students constitute 53.9%, and 46.6% are currently enrolled in the USA. Most students were single (67.8%) and lived alone (30.7%). Engineering and technology disciplines were the most common specialties (48.4%). Over half (54.9%) were bachelor's degree holders. Approximately 20% had 1 year of studying abroad. In addition, 62.3% had excellent GPAs (between 4.5 and 5 out of 5).

Regarding the medical history of the students, 23.2% had a previous diagnosis of mental illness. Of them, only 10.8% received medical treatment. Family history of mental illness constitutes 17.5%. Regarding social status, approximately 37.9% of the students contacted their families almost every day. 39.2% indicated going with friends

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Table 1 Socio-demographic characteristics of Saudi International University Students [(n=401)]

Study variables	N (%)
Age group	
• 18 – 25 years	210 (52.4%)
• > 25 years	191 (47.6%)
Gender	
• Male	216 (53.9%)
• Female	185 (46.1%)
Country of study	
• United States of America	187 (46.6%)
• United Kingdom	163 (40.6%)
• Australia	51 (12.7%)
Marital status	
• Single	272 (67.8%)
• Married	120 (29.9%)
• Divorced	07 (01.7%)
• Widowed	02 (0.50%)
Living status	
• Alone	123 (30.7%)
• With parents	18 (04.5%)
• With friend(s)/roommate(s)	122 (30.4%)
• With Spouse	15 (03.7%)
• With spouse and children	76 (19.0%)
• With children without a spouse	18 (04.5%)
• With other family members	29 (07.2%)
Specialty	
• Medical disciplines	50 (12.5%)
• Engineering and technology disciplines	194 (48.4%)
• Arts and Humanities	61 (15.2%)
• Business and finance disciplines	56 (14.0%)
• Natural science	14 (03.5%)
• Architecture and design disciplines	05 (01.2%)
• Other	21 (05.2%)
Academic degree	
• Bachelor's degree	220 (54.9%)
• Master's degree	86 (21.4%)
• Doctorate degree	95 (23.7%)
Years studying abroad	
• 1 year	80 (20.0%)
• 2 years	57 (14.2%)
• 3 years	53 (13.2%)
• 4 years	126 (31.4%)
• 5 years	33 (08.2%)
• 6 years or more	52 (13.0%)
GPA [(n=220)]	
• 4.5 to 5 out of 5	137 (62.3%)
• 4.0 to 4.5 out of 5	54 (24.5%)
• 3.5 to 4.0 out of 5	16 (07.3%)
• 3.0 to 3.5 out of 5	12 (05.5%)
• Less than 3.0 out of 5	01 (0.50%)

Table 2 University students' medical history and social status [(n=401)]

Medical history	N (%)
Diagnosed with any mental illness	
• No	308 (76.8%)
• Yes	93 (23.2%)
Received treatment for mental illness [(n=93)]	
• No	83 (89.2%)
• Yes	10 (10.8%)
Family history of mental illness	
• No	209 (52.1%)
• Yes	70 (17.5%)
• I don't know	122 (30.4%)
Social status	
How often do you contact your family?	
• Every day	70 (17.5%)
• Nearly every day	152 (37.9%)
• Once weekly	128 (31.9%)
• Once every two weeks to once a month	36 (09.0%)
• Less than once a month	13 (03.2%)
• I don't have a family in Saudi Arabia	02 (0.50%)
How often do you go out with friends?	
• Every day	16 (04.0%)
• Nearly every day	93 (23.2%)
• Once weekly	153 (38.2%)
• Once every two weeks to once a month	67 (16.7%)
• Less than once a month	33 (08.2%)
• I don't go out with friends	39 (09.7%)
How often did you visit Saudi Arabia? (Yearly average)	
• Less than once a year	58 (14.5%)
• Once a year	198 (49.4%)
• Twice a year	90 (22.4%)
• Three times a year	31 (07.7%)
• More than three times a year	24 (06.0%)
Do you feel like a stranger?	
• Never	34 (08.5%)
• Rarely	78 (19.5%)
• Sometimes	178 (44.4%)
• Most of the time	69 (17.2%)
• All the time	42 (10.5%)
Do you have a financial aid program?	
• No	29 (07.2%)
• Yes	372 (92.8%)

once a week. Nearly half (49.4%) were visiting Saudi Arabia once a year. Students who felt like being a stranger all the time constitute 10.5%. Additionally, 92.8% received financial aid programs (Table 2).

In Fig. 1, among those who were previously diagnosed with mental illness (N=93), the most common of them
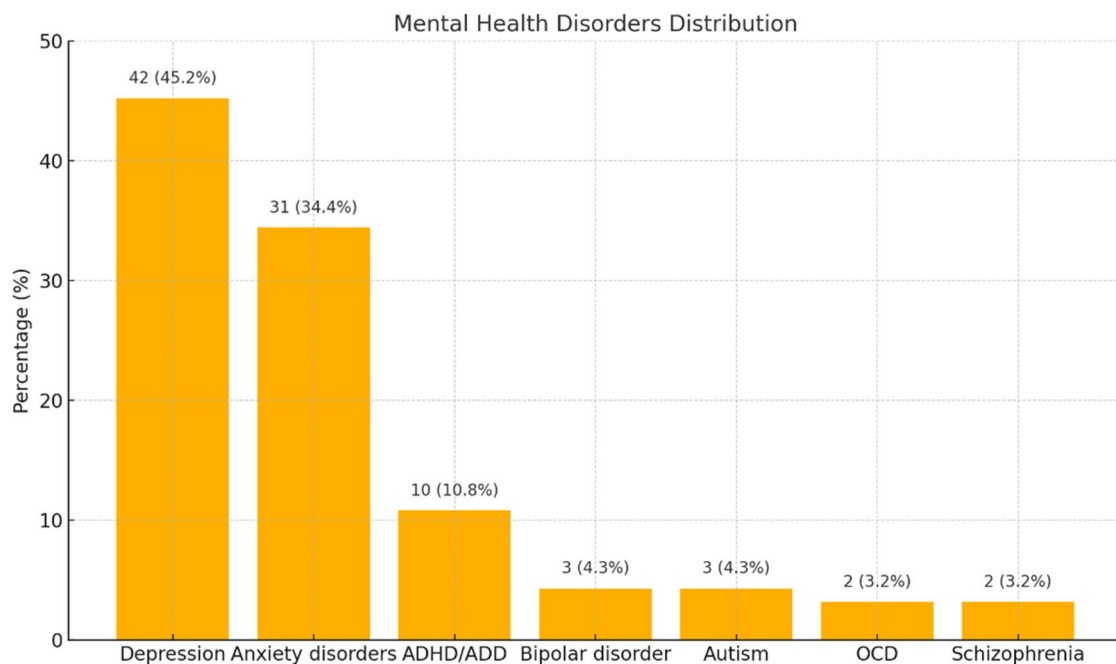
Fig. 1 Specific type of mental illness

was depression (45.2%), followed by anxiety disorders (34.4%) and ADHD/ADD (10.8%).

Figure 2 shows that 40.4% were deemed to have a major depression, and the rest were normal (59.6%).

When exploring the relationship between major depression according to the socio-demographic and medical characteristics along with social status (Table 3), it was observed that students with major depression were more likely to be younger students ($p = 0.038$), in engineering and technology disciplines ($p = 0.030$), never been married ($p = 0.047$), with previous diagnosis of a mental disorder ($p < 0.001$), with family history of mental illness ($p < 0.001$), having infrequent contact with family ($p = 0.047$), having infrequent going out with friends ($p = 0.022$) and feeling like a stranger most or all the time ($p < 0.001$).

When conducting a multivariate regression analysis (Table 4), it was found that students who had previous diagnoses of mental illness were 2.89 times more likely to have major depression compared to students who did not have it (AOR = 2.890; 95% CI = 1.440 − 5.800; $p = 0.003$). Also, compared to students who never or rarely feel like strangers, students sometimes felt like strangers were at increased risk of having major depression by at least 7.06 times higher (AOR = 7.058; 95% CI = 3.219 − 15.476; $p < 0.001$) and increased by 5.07 times higher among those who felt like strangers most or all the time (AOR = 5.069; 95% CI = 2.558 − 10.044; $p < 0.001$). No significant effects were observed between major depression in terms of age,

marital status, family history of mental illness, frequent contact with family, and going with friends after adjustment to a Multivariate regression model ($p > 0.05$).

Discussion

Depression among university students has negative effects on their academic careers, including poorer academic results, reduced productivity at work, and higher dropout rates. Moreover, depression's impact extends into adulthood, impeding social interactions and professional opportunities, and establishing a detrimental cycle of adverse outcomes [2, 14, 15]. Many papers have assessed the prevalence of depression among university students, especially among medical students [2, 8, 9, 13]. However, to our knowledge, none have measured it among Saudi IUS. Furthermore, none has taken into consideration the factors associated with depression among the said population.

The results of this study revealed that out of 401 Saudi IUS, 162 (40.4%) were detected to have major depression (PHQ-8 score > 10). This is almost consistent with the study done in Bangladesh, with a prevalence of depressive symptoms in international students at 47.7% [19]. Consistent with these reports, in the UK [20], the rate of depression among international postgraduate students was 34.6%. In contrast, American international students recorded the lowest depression rate, as only 4.5% were positive for depression [21].

Prevalence of Major Depression According to PHQ-8 Among International University Students
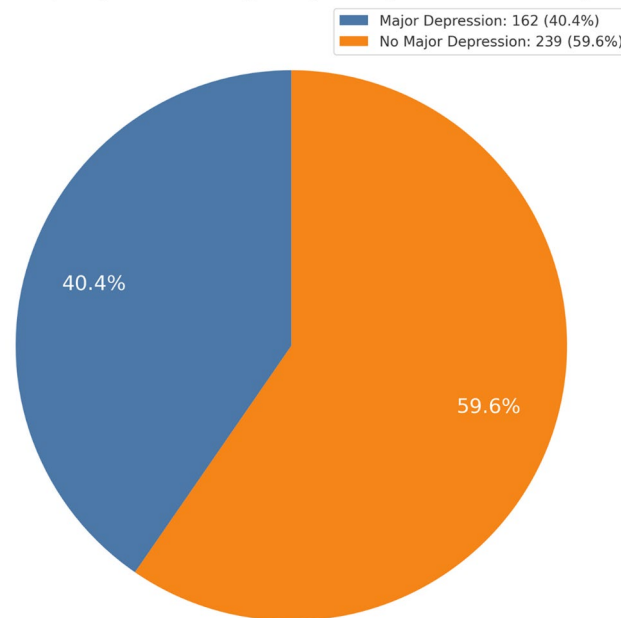
Fig. 2 Prevalence of major depression according to PHQ-8 (PHQ-8 score > 10) among international university students

The results of our study offer insight into the higher rate of depression while studying abroad by considering the following contributing factors. Previous history of mental illness increased the likelihood of major depression by at least 2.89-fold higher. This finding is in accordance with a report documented by Amanvermez et al. (2023) [22]. They found that after adjustment for confounders such as socio-demographic data, depressive and anxiety symptoms, and other sources of stress, international student status was positively associated with higher perceived stress, particularly in the dimensions of financial situation and health of loved ones. However, in a paper published by Jamilah et al. (2020) [19], socio-demographic characteristics such as age and marital status, as well as living condition satisfaction, problems with studies, food, homesickness, accommodation, and health were all predicted to increase the risk of developing depression. In our study, major depression did not vary significantly by gender, country of study, living status, specialty, and academic degree (p > 0.05), which did not coincide with previous reports.

Feeling like a stranger increased the likelihood of developing depression in both "sometimes" (AOR: 7.058) and "most or all time" (AOR: 5.069). Not opposing this result, several studies documented that language barriers increase the likelihood of depression among international students [22–25]. Language barriers have always been an issue among foreigners, particularly among first timers abroad who are used to

speaking the native language. This contributed to the development of depression. Hence, linguistic proficiency is an important contributor to coping strategies against depression [26].

Kabir et al. (2023) reported that international students who were suffering from financial constraints had a two-fold higher risk of suffering from depression. Other contributing factors were living alone and living with others [27]. This corroborates the findings of Jamilah et al. [19], with approximately one-third of cases complaining of financial difficulties and health problems. Hunley (2010) also observed that having a lower level of functioning was concomitant to an increase in psychological distress and loneliness [28]. In our study, living status and years studying abroad were not seen to influence the development of depression (p > 0.05). the financial difficulties may have been mitigated for our study group by easier access to financial aid programs from the Saudi government and companies as 92.8% had financial aid programs.

Motivating factors are indispensable to coping with mental issues abroad. Supporting this view, Hu et al. (2022) asserted that effective coping strategies could link to better interaction with other cultures [26]. Supporting these reports, Zhao et al. (2021) noted that taking preventive measures more seriously could reduce the depression rate of the students. Measures such as counseling and education programs are vital to support and enhance the mental health status of students living abroad [29]. In our study, communication with family

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Table 3 Univariate analysis for the predictors of major depression [(n=401)]

Factor	Major depression		*P*-value [§]
	Yes **N (%)** **(*n*=162)**	**No** **N (%)** **(*n*=239)**	
Age group			
• 18 – 25 years	95 (58.6%)	115 (48.1%)	**0.038 **
• > 25 years	67 (41.4%)	124 (51.9%)	
Gender			
• Male	78 (48.1%)	138 (57.7%)	0.059
• Female	84 (51.9%)	101 (42.3%)	
Country of study			
• United States of America	78 (48.1%)	109 (45.6%)	0.835
• United Kingdom	65 (40.1%)	98 (41.0%)	
• Australia	19 (11.7%)	32 (13.4%)	
Marital status			
• Never been married	119 (73.5%)	153 (64.0%)	**0.047 **
• Been married	43 (26.5%)	86 (36.0%)	
Living status			
• Living Alone	57 (35.2%)	66 (27.6%)	0.272
• Living with family	59 (36.4%)	97 (40.6%)	
• Living with friend(s)/roommate(s)	46 (28.4%)	76 (31.8%)	
Specialty			
• Engineering and technology disciplines	89 (54.9%)	105 (43.9%)	**0.030 **
• Non-engineering and technology disciplines	73 (45.1%)	134 (56.1%)	
Academic degree			
• Bachelor's degree	98 (60.5%)	122 (51.0%)	0.062
• Master's or Doctorate degree	64 (39.5%)	117 (49.0%)	
Years studying abroad			
• ≤ 3 years	78 (48.1%)	112 (46.9%)	0.800
• > 3 years	84 (51.9%)	127 (53.1%)	
Diagnosed with any mental illness			
• No	104 (64.2%)	204 (85.4%)	**<0.001 **
• Yes	58 (35.8%)	35 (14.6%)	
Family history of mental illness			
• No	56 (60.2%)	153 (82.3%)	**<0.001 **
• Yes	37 (39.8%)	33 (17.7%)	
How often do you contact your family?			
• Nearly every day to every day	80 (49.4%)	142 (59.4%)	**0.047 **
• Every two weeks or more	82 (50.6%)	97 (40.6%)	
How often do you go out with friends?			
• Nearly every day to every day	34 (21.0%)	75 (31.4%)	**0.022 **
• Every two weeks or more	128 (79.0%)	164 (68.6%)	
How often did you visit Saudi Arabia?			
• Once a year or less	101 (62.3%)	155 (64.9%)	0.608
• Two years or more	61 (37.7%)	84 (35.1%)	
Do you feel like a stranger?			
• Never or rarely	21 (13.0%)	91 (8.1%)	**<0.001 **
• Sometimes	62 (38.3%)	116 (48.5%)	
• Most or All the time	79 (48.8%)	32 (13.4%)	

[§] *P*-value has been calculated using Chi-square test

** Significant at *p* < 0.05 level

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Table 4 Multivariate regression analysis to determine significant independent risk factors of major depression [(n=401)]

Factor	AOR	95% CI	*P*-value
Age group			
• 18 – 25 years	Ref		
• > 25 years	0.671	0.290 – 1.553	0.351
Marital status			
• Never been married	Ref		
• Been married	0.787	0.350 – 1.771	0.562
Specialty			
• Engineering and technology disciplines	Ref		
• Non-engineering and technology disciplines	0.773	0.409 – 1.461	0.428
Diagnosed with any mental illness			
• No	Ref		
• Yes	2.890	1.440 – 5.800	**0.003 ** **
Family history of mental illness			
• No	Ref		
• Yes	1.879	0.973 – 3.631	0.060
How often do you contact your family?			
• Nearly every day to every day	Ref		
• Every two weeks or more	1.385	0.775 – 2.475	0.272
How often do you go out with friends?			
• Nearly every day to every day	Ref		
• Every two weeks or more	1.361	0.665 – 2.784	0.399
Do you feel like a stranger?			
• Never or rarely	Ref		
• Sometimes	7.058	3.219 – 15.476	**< 0.001 ** **
• Most or all the time	5.069	2.558 – 10.044	**< 0.001 ** **

AOR – Adjusted Odds Ratio; CI – Confidence Interval

** Significant at $p < 0.05$ level

and going out with friends more frequently were factors most associated with less depression occurrence. These findings underscore the importance of social support networks in mitigating the impact of stressors and promoting mental well-being. The influence of these factors implies that institutions should emphasize creating supportive environments that encourage meaningful relationships and opportunities for social engagement among international students.

Regarding the treatment of depression, medication or brief psychotherapy alone can relieve depressive symptoms. Nevertheless, combination therapy has been linked with markedly higher rates of depressive symptom relief, better treatment adherence, and improved quality of life [1]. It was found that while psychotherapy tends to increase frontal activity, pharmacotherapy reduces limbic structures' overactivity [30]. Furthermore, the inclusion of circadian rhythms normalization as a part of treatment for depression has been proposed [31, 32]. It was found that dysregulation of the circadian system increases susceptibility to depression [31].

Around 60% of depressed people do not seek medical help [1]. Many factors may hinder help-seeking. One is the stigma toward mental disorders and people who have them [1, 13]. Another factor is the lack of mental health literacy among the general public [13]. Exploring these strategies, along with those highlighted in this study, can provide valuable guidance for policymakers in identifying the most effective approaches to addressing this issue.

While the study contributes valuable insights into depression among Saudi students studying internationally, it is not without limitations. It suffers from sampling bias, focusing only on Saudi IUS in specific countries and thus limiting generalizability. Relying on voluntary self-reported data and exclusion criteria might lead to selection bias. The cross-sectional design makes it difficult to draw causal conclusions and comprehend how depression levels change over time. The study's focus on specific risk factors might overlook other vital elements like social support and cultural adjustment. The study only screened for depression without investigating the

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variation in severity between students. Finally, the study's temporal limitations might have missed seasonal fluctuations or long-term trends in the mental health of students studying abroad. For comprehensive and complex insights into depression among Saudi IUS, these constraints must be addressed.

The study's findings carry significant implications for academic institutions, mental health professionals, and policymakers. Understanding the prevalence and determinants of depression among Saudi IUS can guide the development of targeted interventions to enhance their mental well-being. Culturally Sensitive mental health resources, awareness campaigns, and peer support programs can address the unique challenges faced by these students.

Conclusion and recommendations

There was a high prevalence of major depression among Saudi university students studying abroad. Students who felt like strangers and had a previous diagnosis of mental disorder were more likely to develop major depression than any other university students. However, those with more frequent communication with families and friends were less likely to have depression. The study emphasizes the need for tailored mental health support for Saudi students abroad, focusing on social connections and accessible mental health services. Diplomatic headquarters abroad should take necessary actions to help their citizens who are experiencing mental breakdown. To further enhance our understanding and develop comprehensive intervention strategies, it is important to diversify participant samples, employ mixed methods, conduct longitudinal studies, include clinical assessments for accurate diagnoses, broaden the focus to encompass social and cultural factors, analyze data over different timeframes, promote international collaborations, advocate for supportive policies within institutions, and expand the research focus to include depression among Saudi IUS. Implementing these measures will deepen research insights and guide the development of culturally sensitive support systems.

Abbreviations
IUS   International university students
US   United States
UK   United Kingdom
PHQ   Patient health questionnaire
GPA   Grade point average
AOR   Adjusted odds ratios

Authors' contributions
All authors participated in the preparation of the manuscript and approved the final version submitted. Mohammed A. Alnaim, Abdullah M. Al-Omair, Abdullah H. Alghamdi, Mohammed R. Aljuwair, and Faisal A. Alhadi contributed to the original draft's Conceptualization, Methodology, and writing. Ali J. Alsaad reviewed and edited the manuscript and contributed to the supervision and project administration.

Data availability
The corresponding author can be contacted to obtain the study's data with reasonable request. The raw survey responses and particular data regarding respondents will not be made accessible to the public due to the sensitive nature of the collected information and the potential for participant identification.

Declarations

Ethics approval and consent to participate
Ethical approval was obtained from the Research Ethics Committee at King Faisal University in Al-Ahsa, Saudi Arabia (KFU-REC-2023-FEB-ETHICS525). All methods were carried out under relevant guidelines and regulations. There was no experimentation on humans, human tissue, or other species. Participants responded anonymously to the online survey, which began with an informed consent form in the first section. In this consent form, participants were informed about the confidentiality of the information. They were provided with information concerning the research purpose and that they had the right to revoke their participation without prior justification.

Consent for publication
Not Applicable.

Competing interests
The authors declare no competing interests.

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