

Research Article



Investigation of the Prevalence of Stress, Anxiety, and Depression and Their Association with Self-Reported Tobacco Use among Students

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ABSTRACT

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Introduction: Tobacco use and psychological disorders remain major public-health challenges worldwide, particularly among young adults. University students may be uniquely vulnerable due to academic pressures and social transitions.

Objectives: This study assessed the prevalence of stress, anxiety, and depression among university students in Qaen, Iran, and examined their associations with self-reported tobacco use.

Methods: A cross-sectional study was conducted among 226 students enrolled at five universities in Qaen County, South Khorasan Province, Iran, in 2023. Participants were selected using multistage random sampling proportional to university enrollment. Psychological symptoms were assessed using the Depression, Anxiety, and Stress Scale, and demographic, academic, health-related, and tobacco-use information was collected using a structured questionnaire. Factors associated with self-reported tobacco use were examined using multivariable logistic regression.

Results: Of the 226 participants, 57.1% were male, and the mean age was 22.41 ± 4.39 years. The prevalence of any level of depression, anxiety, and stress symptoms was 61.5%, 83.6%, and 34.1%, respectively. Self-reported tobacco use was reported by 23.0% of students, with hookah being the most commonly reported form. In the multivariable logistic regression analysis, male sex (adjusted odds ratios [AOR] = 3.29, 95% confidence interval [CI]: 1.06–10.14), older age (AOR = 1.14, 95% CI: 1.02–1.29), history of physical or mental illness (AOR = 5.77, 95% CI: 1.56–21.28), and moderate (AOR = 10.75, 95% CI: 1.15–100.03) and severe anxiety symptoms (AOR = 24.76, 95% CI: 2.32–264.44) were significantly associated with self-reported tobacco use.

Conclusions: Psychological distress, particularly anxiety, was significantly associated with self-reported tobacco use among university students. These findings suggest that students reporting higher levels of psychological distress may be considered a priority group for mental health support and tobacco-use prevention programs. However, the cross-sectional nature of this study does not allow causal inferences.

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1. Introduction

Tobacco use among university students is a major health-risk behavior associated with several adverse physical and psychological outcomes (1). Recent evidence indicates that cigarette, electronic cigarette, and other nicotine-containing product use is associated with a greater likelihood of depression, anxiety, and psychological distress, particularly among daily users and individuals who use multiple tobacco products (2 - 4).

The World Health Organization (WHO) reports that 19.2% of adults globally are projected to use tobacco in 2025, highlighting the ongoing global public health challenge posed by tobacco use. Tobacco use is estimated to account for more than 8 million deaths each year, including more than 7 million deaths among tobacco users and approximately 1.2 million deaths attributable to secondhand smoke exposure (1). Beyond its well-documented effects on cardiovascular and respiratory health, tobacco exposure has also been associated with adverse psychological and behavioral outcomes in adolescents and young adults (5, 6). Among Iranian medical students, cigarette smoking was associated with mental health indicators; smokers had higher depression scores than non-smokers, and anxiety was also associated with a greater likelihood of cigarette smoking (7).

University years are a key period for establishing and reinforcing health-related behaviors. University entry often brings new academic, social, and personal demands. During the early years of university, students may need to adapt to living away from family, unfamiliar social settings, changing peer relationships, and greater academic responsibilities. Such transitions may be accompanied by loneliness, homesickness, anxiety, or depressive symptoms and may influence the ways students cope with psychological stress, including through health-risk behaviors (8, 9). Previous studies have also identified social contexts as an important setting for tobacco use, particularly hookah use, among university students (10, 11).

Tobacco-use prevalence varies across university populations and sociocultural settings. Current tobacco use has been reported among 24.1% of university students in Morocco, 10.0% in Bangladesh, and 34.1% of students in Bosnia and Herzegovina based on past-30-day cigarette use (12-14). In Iran, a 2025 systematic review and meta-analysis of 43 studies estimated a pooled cigarette-smoking prevalence of 16%, with higher rates among males (26%) than females (7%) (15). Similarly, 9.4% of students at Kashan University of Medical Sciences reported tobacco use (16). Hookah use is also common, with lifetime and point prevalences of 32.3% and 21.5%, respectively, among Iranian

university students (11). Student tobacco use has been associated with peer smoking, psychological stress, living arrangements, recreational motives, sex, alcohol use, and academic performance (3, 16, 17).

Mental health disorders are major contributors to disability and reduced quality of life worldwide. Persistent psychological conditions, including depression, anxiety, and stress, can adversely affect emotional well-being, academic functioning, and social relationships (18-20). University students are particularly vulnerable to these conditions because they are exposed to multiple academic, social, and developmental challenges during a critical stage of life (18, 20). In Iran, depressive symptoms are also common and have been associated with stress and anxiety (21). Psychological distress may also be associated with tobacco and other substance use (22).

Depression is among the most prevalent mental health conditions worldwide. The WHO estimates that about 332 million people around the world are affected by depression, underscoring its considerable impact on public health (19, 23). Recent evidence from China indicates that depression is also common in university students, with a 2025 systematic review and meta-analysis estimating a pooled prevalence of 34.7% (24). These findings underscore the considerable burden of depression among young adults and the importance of identifying factors associated with mental health and health-risk behaviors in university settings.

Tobacco use in university students continues to be a public health concern, particularly because the university years represent a period during which smoking and other tobacco-related behaviors may become established. Recent Iranian evidence indicates that smoking remains prevalent among university students, while studies among Iranian medical students have also documented associations between tobacco or substance use and mental health indicators (15). However, much of the available Iranian literature has focused either on the prevalence of tobacco use or on specific mental health outcomes, and evidence simultaneously examining stress, anxiety, and depression in relation to self-reported tobacco use remains limited in smaller and culturally distinct university settings. Given the social, cultural, and educational context of eastern Iran, examining these relationships among students in Qaen, Iran, may provide context-specific evidence to inform targeted prevention strategies and university health policies.

2. Objectives

This study aimed to determine the prevalence of stress, anxiety, and depression and examine their association with self-reported tobacco use among students of universities in this city in 2023.

3. Methods

3.1 Study Design

This descriptive–analytical cross-sectional study was conducted among university students in Qaen County, South Khorasan Province, Iran, in 2023. The study population included students from five universities in Qaen, Iran: The Faculty of Medical Sciences, Islamic Azad University of Qaen, Iran; Payame Noor University of Qaen, Iran; Bozorgmehr University of Technology; and Farhangian University.

3.2 Participants

Participants were selected using a multistage random sampling method proportional to the number of enrolled students in each university. Each university was considered a sampling stratum, and the number of participants selected from each university was determined according to that university's proportion of the total student population in Qaen, Iran.

The required sample size was calculated using the formula for estimating sample size in analytical cross-sectional studies, using a previous similar study as the reference (25). Considering $\alpha = 0.05$, $\beta = 0.20$, $d = 0.6$, and $2\sigma = 92$, the estimated minimum sample size was 220 participants. To account for incomplete questionnaires and improve sample representativeness across universities, 226 students were included in the final analysis.

$$N = \frac{(z_{1-\frac{\alpha}{2}} + z_{1-\beta})^2}{d^2} \times \sigma^2$$

The inclusion criteria were enrollment at a university in Qaen County, providing written informed consent, ability to complete the study questionnaire, and the absence of any severe physical or mental condition that could interfere with participation in the study. Students were excluded if they withdrew from the study or submitted an incomplete questionnaire. A self-reported history of physical or mental illness was assessed separately as a demographic and health-related variable and included in the statistical analyses; therefore, a history of illness was not an exclusion criterion unless it affected the participant's ability to participate in the study.

3.3 Scales

Data were collected using a structured questionnaire consisting of two sections. The first section included demographic, academic, and health-related characteristics, including age, gender, religion, marital status, residence status, university affiliation, academic level, field of study, academic term, grade point average (GPA), physical activity, parental educational level,

family economic status, social media use duration, time spent with friends, satisfaction with field of study, history of physical or mental illness, tobacco use status, and type of tobacco product used. The second section consisted of the Depression, Anxiety, and Stress Scale (DASS-21), which was used to assess psychological symptoms. The DASS-21 includes three subscales measuring depression, anxiety, and stress, with seven items allocated to each domain. Participants rated each item based on their experiences during the previous week using a four-point Likert scale ranging from 0 ("did not apply to me at all") to 3 ("applied to me very much or most of the time"). The scores for each subscale were summed and multiplied by two to obtain the final scores, with higher scores indicating greater psychological symptom severity. The Persian version of the DASS-21 has demonstrated acceptable validity and reliability in Iranian populations (26). In the present study, Cronbach's alpha coefficients for depression, anxiety, and stress subscales were 0.70, 0.85, and 0.87, respectively.

3.4 Data Collection

After obtaining informed consent, questionnaires were distributed to eligible participants and completed in person. To protect participants' privacy and reduce concerns about disclosing sensitive behaviors, all questionnaires were completed anonymously. No identifying information, including names, student identification numbers, telephone numbers, or other personal identifiers, was collected. Participants were informed that participation was voluntary and that refusal to participate or withdrawal from the study would have no academic, administrative, or disciplinary consequences. In addition, faculty members and university administrators were not present during questionnaire completion and had no access to individual responses. All collected information was analyzed and reported only in an aggregated form for research.

3.5 Data Analysis

Data were analyzed using SPSS software (version 26). Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to summarize participant characteristics. Associations between categorical variables and self-reported tobacco use were initially assessed using the Chi-square test or Fisher's exact test, as appropriate. Variables with a p value < 0.20 in the univariate analyses were considered for inclusion in the multivariable logistic regression model. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were calculated to identify factors associated with self-reported tobacco use. A p value < 0.05 was considered statistically significant.

3.6 Ethical Considerations

The Ethics Committee of Birjand University of Medical Sciences, Birjand, Iran approved the study (Ethics code: IR.BUMS.REC.1402.151). The study followed ethical principles for research involving human participants.

4. Results

A total of 226 students participated: 57.1% male and 42.9% female. A total of 80.1% were single, and 19.9% were married. The mean age was 22.41 ± 4.39 years. By university, the largest subgroup of participants was at Bozorgmehr University (68 students, 30.1%) and the smallest was at Farhangian University (17 students, 7.5%). Most students (57.1%) lived in dormitories. A total of 42 students (23.0%) reported having used tobacco, with hookah being the most common (48 of 52 cases). Based on the DASS-21 questionnaire, the mean ($\pm$ SD) depression subscale score was 11.90 ± 4.39 , and 38.5% of students fell in the normal range for depression. The mean stress score was 12.93 ± 4.35 (65.9% normal), and the mean anxiety score was 10.99 ± 3.62 , with most students (40.7%) in the moderate anxiety range. Table 1 presents these descriptive data.

Univariate logistic regression analyses identified several factors significantly associated with self-reported tobacco use (Table 2). For example, male students had higher odds of self-reported tobacco use than females (OR = 3.72; 95% CI: 1.92–7.17; $p < 0.001$), and students living in dormitories were more likely to use tobacco than those living at home (OR = 1.96; 95% CI: 1.01–3.79; $p = 0.046$). Students whose mothers had a high school diploma (versus less education) had increased odds of self-reported tobacco use (OR = 2.14; 95% CI: 1.03–4.41; $p = 0.039$). Studying at Farhangian (OR = 3.75; 95% CI: 1.13–12.43; $p = 0.030$) or Medical Sciences University (OR = 3.55; 95% CI: 1.32–9.52; $p = 0.012$) was associated with higher self-reported tobacco use than Islamic Azad University. Students reporting a history of specific physical or mental illness had much higher odds of self-reported tobacco use (OR = 6.64; 95% CI: 2.76–15.96; $p < 0.001$). Regarding psychological factors, students with mild stress had higher odds of self-reported tobacco use than those with normal stress (OR = 4.10; 95% CI: 2.00–8.43; $p < 0.001$), and moderate and severe anxiety were also associated with increased self-reported tobacco use (OR = 6.89; 95% CI: 1.54–30.75; $p = 0.011$ and OR = 10.50; 95% CI: 2.20–50.07; $p = 0.003$, respectively). Higher levels of depression (mild, moderate, or severe vs. normal) were similarly associated with higher smoking odds (all OR > 3, all $p < 0.05$).

After multivariate adjustment (controlling for other factors), the final predictors of self-reported tobacco use among students were male gender, older age, university of study, lower GPA, history of physical/mental illness, and higher anxiety level. In the adjusted model, male students had about 3.3 times the odds of self-reported tobacco use compared to females (adjusted OR = 3.29; 95% CI: 1.06–10.14; $p = 0.038$). Each additional year of age increased the odds by about 14% (OR = 1.14 per year; 95% CI: 1.02–1.29; $p = 0.019$). Compared to Azad University students, those at Payame Noor University had significantly lower odds of self-reported tobacco use (adjusted OR = 0.10; 95% CI: 0.01–0.80; $p = 0.030$), whereas those at Farhangian and Medical Sciences Universities did not differ significantly after adjustment. A higher GPA was protective: each one-point increase in GPA reduced self-reported tobacco use odds by about 37% (adjusted OR = 0.63; 95% CI: 0.43–0.92; $p = 0.018$). Students with a history of specific illness had 5.77 times greater odds of self-reported tobacco use than others (adjusted OR = 5.77; 95% CI: 1.56–21.28; $p = 0.008$). Finally, compared to those with normal anxiety, students with moderate or severe anxiety had greatly increased odds of self-reported tobacco use (adjusted OR = 10.75; 95% CI: 1.15–100.03; $p = 0.037$ for moderate; OR = 24.76; 95% CI: 2.32–264.44; $p = 0.008$ for severe). Table 2 presents all univariate and multivariate logistic regression results.

To evaluate whether including students from Farhangian University influenced the findings, a sensitivity analysis was performed by excluding these participants and refitting the multivariable logistic regression model. The results were consistent with those of the primary analysis. After exclusion of Farhangian University students, male sex, older age, lower GPA, and a history of physical or mental illness remained significantly associated with self-reported tobacco use. Although the overall association between anxiety and self-reported tobacco use was not statistically significant, students with severe anxiety had significantly higher odds of self-reported tobacco use than those with normal anxiety levels (OR = 20.76, 95% CI: 1.77–243.50, $p = 0.016$). Table 3 presents the detailed findings of the sensitivity analysis.

5. Discussion

One of the main findings of this study was the relatively high prevalence of self-reported tobacco use among university students in Qaen County. In total, 23% of students reported tobacco use, a proportion higher than the pooled prevalence of cigarette smoking reported among Iranian university students (15). However, this comparison should be interpreted

cautiously because the definition of tobacco uses and study populations differed across studies. Our study found a higher prevalence than that reported among university students in the United Arab Emirates

(15.1%) and Portugal (21.1%) (27, 28), suggesting that tobacco use may vary across student populations and sociocultural settings.

Table 1: Frequency Distribution of Demographic and DASS-21 Variables by Self-reported Tobacco Use Status

Variable	Category	Self-reported Tobacco Use (Yes), No. (%)	Self-reported Tobacco Use (No), No. (%)	Total, No. (%)	p value
Gender	Male	35 (36.1)	62 (63.9)	97 (42.9)	$p < 0.001$
	Female	17 (13.2)	112 (86.8)	129 (57.1)	
Religion	Shia	44 (21.8)	158 (78.2)	202 (94.8)	$p < 0.001^*$
	Sunni	4 (20.0)	16 (80.0)	20 (8.8)	
	Other	4 (100.0)	0 (0.0)	4 (1.8)	
Marital status	Single	46 (25.4)	135 (74.6)	181 (80.1)	$p = 0.08$
	Married	6 (13.3)	39 (86.7)	45 (19.9)	
University	Azad (Qaen)	9 (19.1)	38 (80.9)	47 (20.8)	$p < 0.001^*$
	Payame Noor (Qaen)	4 (6.8)	55 (93.2)	59 (26.1)	
	Bozorgmehr (Qaen)	15 (22.1)	53 (77.9)	68 (30.1)	
	Farhangian (Qaen)	8 (47.1)	9 (52.9)	17 (7.5)	
	Medical Sciences (Qaen)	16 (47.1)	19 (52.9)	35 (15.5)	
Education level	Associate (2-year)	4 (40.0)	6 (60.0)	10 (4.4)	$p = 0.4^*$
	Bachelor's	46 (22.4)	159 (77.6)	205 (90.7)	
	Master's	2 (18.2)	9 (81.8)	11 (4.9)	
Place of origin	Local (in-city)	13 (13.1)	86 (86.9)	99 (43.8)	$p = 0.02$
	Non-local (out-of-city)	39 (30.7)	88 (69.3)	127 (56.2)	
Current residence	Dormitory	36 (27.9)	93 (72.1)	129 (57.1)	$p = 0.12^*$
	Own home	15 (16.3)	77 (83.7)	92 (40.7)	
	Rented lodging	1 (20.0)	4 (80.0)	5 (2.2)	
Family income	Low income	8 (34.8)	15 (65.2)	23 (10.2)	$p = 0.04$
	Middle income	35 (19.0)	150 (81.0)	185 (81.9)	
	High income	9 (50.0)	9 (50.0)	18 (7.9)	
Physical activity	Moderate (household)	20 (21.1)	75 (78.9)	95 (42.0)	$p = 0.21^*$
	Vigorous (household)	6 (28.6)	15 (71.4)	21 (9.3)	
	Leisure walking	11 (19.3)	46 (80.7)	57 (25.2)	
	Vigorous leisure	13 (36.1)	23 (63.9)	36 (15.9)	
	Moderate leisure	2 (11.8)	15 (88.2)	17 (7.5)	
Internet use/day	< 1 hour	8 (24.2)	25 (75.8)	33 (14.6)	$p = 0.08$
	2 hours	12 (14.8)	69 (85.2)	81 (35.8)	
	4 hours	19 (25.0)	57 (75.0)	76 (33.6)	
	≥ 8 hours	13 (36.1)	23 (63.9)	36 (15.9)	
Time with friends/day	< 1 hour	13 (18.6)	57 (81.4)	70 (30.9)	$p = 0.14$
	2 hours	10 (16.4)	51 (83.6)	61 (26.9)	
	4 hours	12 (31.6)	26 (68.4)	38 (16.8)	
	≥ 8 hours	17 (29.8)	40 (70.2)	57 (25.2)	
Satisfaction with major	Satisfied	41 (21.0)	154 (79.0)	195 (86.3)	$p = 0.07$
	Not satisfied	11 (35.5)	20 (64.5)	31 (13.7)	
Death in past 6 months	Yes	9 (32.1)	19 (67.9)	28 (12.4)	$p = 0.22$
	No	43 (21.7)	155 (78.3)	198 (87.6)	
Physical/mental illness	Yes	15 (60.0)	10 (40.0)	25 (11.1)	$p < 0.001$
	No	37 (18.4)	164 (81.6)	201 (88.9)	
DASS Anxiety level	Normal	2 (8.3)	35 (91.7)	37 (16.4)	$p = 0.002^*$
	Mild	9 (15.8)	48 (84.2)	57 (25.2)	
	Moderate	26 (28.3)	66 (71.7)	92 (40.7)	
	Severe	15 (37.5)	25 (62.5)	40 (17.7)	
DASS Stress level	Normal	23 (15.4)	126 (84.6)	149 (65.9)	$p = 0.004$
	Mild	21 (42.9)	28 (57.1)	49 (21.7)	
	Moderate	8 (28.6)	20 (71.4)	28 (12.4)	
DASS Depression level	Normal	8 (9.2)	79 (90.8)	87 (38.5)	$p < 0.001^*$
	Mild	23 (34.8)	43 (65.2)	66 (29.2)	
	Moderate	17 (27.9)	44 (72.1)	61 (27.0)	
	Severe	4 (33.3)	8 (66.7)	12 (5.3)	

Fisher's exact test used where indicated.

Abbreviations: DASS, depression, anxiety, and stress scale.

Table 2: Univariate and Multivariate Logistic Regression Models for Factors Associated with Self-reported Tobacco Use

Variable	Category	Simple Analysis			Multiple Analysis		
		OR	95% CI	P	OR	95% CI	p
Gender	Female (ref)	1.00					
	Male	3.72	1.92 – 7.17	<0.001	3.29	1.06 – 10.14	0.038
Age (y)		1.02	0.95 – 1.08	0.563	1.14	1.02 – 1.29	0.019
Religion	Shia (ref)	1.00					
	Sunni	1.79	0.72 – 4.47	0.209	–	–	–
Marital status	Single (ref)	1.00					
	Married	0.45	0.18 – 1.13	0.091	–	–	–
Current living	Home (ref)	1.00					
	Dormitory	1.96	1.01 – 3.79	0.046	–	–	–
Father's education	< Diploma (ref)	1.00					
	Diploma	0.91	0.44 – 1.92	0.816	–	–	–
	> Diploma	1.77	0.81 – 3.90	0.152	–	–	–
Mother's education	< Diploma (ref)	1.00					
	Diploma	2.14	1.03 – 4.41	0.039	–	–	–
	> Diploma	1.66	0.70 – 3.91	0.242	–	–	–
University	Azad (ref)	1.00					
	Payame Noor	0.31	0.08 – 1.07	0.064	0.10	0.01 – 0.80	0.030
	Bozorgmehr	1.19	0.47 – 3.01	0.706	1.05	0.18 – 6.12	0.950
	Farhangian	3.75	1.13 – 12.43	0.030	1.18	0.15 – 9.42	0.871
	Medical Sciences	3.55	1.32 – 9.52	0.012	3.78	0.66 – 21.41	0.132
Education level	Associate (ref)	1.00					
	Bachelor's	0.43	0.12 – 1.60	0.211	–	–	–
	Master's	0.33	0.05 – 2.43	0.279	–	–	–
GPA (average)	–	0.87	0.70 – 1.09	0.237	0.63	0.43 – 0.92	0.018
Family income	Low (ref)	1.00					
	Middle	0.44	0.17 – 1.11	0.083	–	–	–
	High	1.87	0.53 – 6.61	0.329	–	–	–
Physical activity	Moderate (home) (ref)	1.00					
	Vigorous (home)	1.50	0.52 – 4.36	0.457	–	–	–
	Leisure walking	0.89	0.39 – 2.04	0.795	–	–	–
	Leisure vigorous	2.12	0.91 – 4.91	0.080	–	–	–
	Leisure moderate	0.50	0.10 – 2.36	0.383	–	–	–
Internet use/day	<1 hr (ref)	1.00					
	2 hr/day	0.54	0.19 – 1.48	0.234	–	–	–
	4 hr/day	1.04	0.40 – 2.69	0.933	–	–	–
	≥8 hr/day	1.76	0.62 – 5.03	0.287	–	–	–
Time with friends/day	<1 hr (ref)	1.00					
	2 hr/day	0.86	0.34 – 2.12	0.744	–	–	–
	4 hr/day	2.02	0.81 – 5.03	0.130	–	–	–
	≥8 hr/day	1.86	0.81 – 4.26	0.140	–	–	–
Satisfaction with major	Yes (ref)	1.00					
	No	2.06	0.91 – 4.65	0.080	–	–	–
Loved one's death (6 mo)	No (ref)	1.00					
	Yes	1.70	0.72 – 4.04	0.224	–	–	–
Self-reported history of physical or mental illness	No (ref)	1.00					
	Yes	6.64	2.76 – 15.96	<0.001	5.77	1.56 – 21.28	0.008
DASS Stress level	Normal (ref)	1.00					
	Mild	4.10	2.00 – 8.43	<0.001	–	–	–
	Moderate	2.19	0.86 – 5.56	0.099	–	–	–
DASS Anxiety level	Normal (ref)	1.00					
	Mild	3.28	0.66 – 16.13	0.144	9.93	0.88 – 11.68	0.063
	Moderate	6.89	1.54 – 30.75	0.011	10.75	1.15 – 100.03	0.037
	Severe	10.50	2.20 – 50.07	0.003	24.76	2.32 – 264.44	0.008
DASS Depression level	Normal (ref)	1.00					
	Mild	5.28	2.17 – 12.81	<0.001	–	–	–
	Moderate	3.81	1.52 – 9.55	0.004	–	–	–
	Severe	4.93	1.21 – 20.08	0.026	–	–	–

"Ref" indicates the reference category; "–" indicates not included in the multivariate model. *p* values are as shown. Abbreviations: OR, odds ratio; CI, confidence interval.

Another important finding was the considerable prevalence of depression, anxiety, and stress among university students. In our study, students reported moderate-to-severe levels of depression, anxiety, and stress, with prevalence rates of 32.3%, 58.4%, and 12.4%, respectively. These findings were generally comparable with those reported in previous studies of university students (18, 29). Recent evidence from Iran has also indicated a substantial burden of depressive symptoms among university students (21). However, some studies reported higher prevalence estimates in some studies (30–33), whereas others observed lower rates (34, 35). Such variation may reflect differences in student populations, assessment instruments, and educational and socio-cultural contexts. Differences in perceived social support, coping strategies, and exposure to academic and other stressors may also contribute to these variations. In the present study, the relatively high levels of anxiety and depression may be related to the academic and social demands of

university life, although these factors were not directly assessed. Limited access to mental health support and the absence of routine screening may further affect the identification and management of psychological distress among students.

An important finding of the regression analysis was that the associations between psychological symptoms and self-reported tobacco use changed after adjustment for potential confounders. In univariate analyses, higher levels of depression, anxiety, and stress were associated with greater odds of self-reported tobacco use, consistent with previous findings (4, 36) and evidence from Iran linking tobacco or substance use with mental health indicators (7, 22). However, after adjustment, only anxiety remained significantly associated with self-reported tobacco use, whereas depression and stress were no longer significant. This pattern is consistent with findings reported in previous studies (33, 34).

Table 3: Sensitivity Analysis of the Multivariable Logistic Regression Model After Excluding Farhangian University Students

Variable	OR	95% CI	p value
Sex (female)	1	–	–
Male	3.15	1.03–9.65	0.044
Age	1.14	1.01–1.29	0.024
Grade point average (GPA)	0.60	0.40–0.90	0.015
Physical or mental illness (No)	1	–	–
Yes	4.72	1.15–19.35	0.031
Anxiety (Normal)	1	–	0.117*
Mild	9.08	0.73–111.73	0.085
Moderate	9.26	0.95–89.53	0.055
Severe	20.76	1.77–243.50	0.016
University (Azad)	1	–	0.003*
Payam Noor	0.09	0.01–0.77	0.028
Bozorgmehr	0.98	0.16–5.76	0.990
Medical Sciences	3.87	0.69–21.75	0.124

* Overall Wald test *p* values are shown for Anxiety and University.

Abbreviations: OR, odds ratio; CI, confidence interval.

The persistent association between anxiety and self-reported tobacco use warrants further attention. This finding is consistent with previous evidence linking anxiety to tobacco use and smoking-related outcomes (37, 38). Some individuals may perceive tobacco use as a way to cope with psychological distress, although the direction of this relationship remains uncertain (3, 38). Given the cross-sectional design, it cannot be determined whether anxiety contributes to tobacco use, tobacco use increases anxiety, or both are influenced by shared factors. Therefore, these findings indicate an association, but they do not demonstrate causality.

Gender was also significantly associated with self-reported tobacco use, with male students showing higher odds of use. This finding is consistent with

studies by Windarwati et al. and Wangdi et al. (33, 39) but differs from Teh et al. (40). These differences may reflect differences in study population characteristics, measurement periods, and sociocultural contexts. In some settings, stronger social norms against tobacco use among women may reduce both actual use and willingness to report it. Greater exposure to peer groups in which tobacco use is more common may also contribute to the higher prevalence observed among male students.

A history of physical or mental illness was also associated with self-reported tobacco use, consistent with previous evidence linking health problems to tobacco use (4). This association may reflect greater vulnerability to tobacco use among students with existing health conditions, although the underlying _

mechanisms remain unclear.

Academic characteristics were also associated with self-reported tobacco use, consistent with findings from Iranian university students and a recent systematic review (16, 17). Several factors may contribute to this relationship, including greater exposure to peers who use tobacco, perceived stress-relieving effects of smoking, prolonged university enrollment, and concerns about future academic or career outcomes.

The association between anxiety and tobacco use has implications for student health promotion. Routine mental health screening within student support services may help identify students at greater risk of tobacco use, while integrating psychological counseling, stress-management programs, and tobacco-prevention activities could strengthen comprehensive prevention efforts. Given the cross-sectional design, these approaches should be viewed as preventive and early-identification strategies rather than interventions based on a causal relationship.

5.1 Limitation

Several limitations should be considered when interpreting these findings. First, because the study used a cross-sectional design, the temporal direction of the relationship between psychological symptoms and tobacco use could not be determined, and causal inferences cannot be made. Therefore, the observed associations should not be interpreted as evidence of causality, and longitudinal studies are needed to clarify their direction. Second, the DASS-21 is a validated screening instrument rather than a diagnostic tool; therefore, the findings represent self-reported psychological symptoms rather than clinically diagnosed disorders. Third, tobacco use was self-reported and may have been affected by social desirability bias despite anonymous data collection, potentially resulting in underreporting. Fourth, some adjusted odds ratios, particularly for anxiety categories, had relatively wide confidence intervals, which may reflect the small number of participants in some subgroups and the limited number of tobacco users. These estimates should therefore be interpreted cautiously and confirmed in larger studies. Finally, the study was conducted among university students in Qaen, Iran, which may make it difficult to apply these findings to other student populations and young adults. Multicenter studies with more diverse samples are warranted to improve external validity.

4.2 Conclusion

This study showed that the self-reported prevalence of self-reported tobacco use among the participating students was considerable and that self-reported

tobacco use was associated with certain individual characteristics and psychological factors, including anxiety. Given the cross-sectional nature of the study, the findings reflect statistical associations and cannot establish temporal or causal relationships. Furthermore, because tobacco use was assessed based on self-reported data, underreporting and social desirability bias cannot be completely ruled out. These results point to the need for greater attention to mental health and tobacco-related behaviors within university-based counseling and prevention programs. However, longitudinal studies and research using more objective methods of assessing tobacco use are recommended to further clarify these associations.

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Statements

AI Use: The authors used AI as a language editing tool to improve grammar, sentence structure, and overall readability of the manuscript. The authors used this tool only for language refinement. The authors performed all scientific content, study design, data collection, statistical analyses, interpretation of results, and final decisions regarding the manuscript, and take full responsibility for the accuracy and integrity of the work.

Authors' Contribution: All authors contributed substantially to the conception and design of the study, data collection, statistical analysis, interpretation of the findings, drafting and critical revision of the manuscript, and approved the final version for publication. All authors agree to be accountable for all aspects of the work.

Conflict of Interests: The authors declared no conflicts of interest.

Data Availability: The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Ethical Approval: The Ethics Committee of Birjand University of Medical Sciences, Birjand, Iran approved the study (Approval No.: IR.BUMS.REC.1402.151), and it was conducted in accordance with the ethical principles of the Declaration of Helsinki.

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Informed Consent: Written informed consent was obtained from all participants prior to enrollment. Participation was voluntary, and participants were informed that they could decline participation or withdraw from the study at any time without any academic, educational, administrative, or disciplinary consequences. All questionnaires were completed anonymously.

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