



Key modifiable risk factors for self-medication among university students: An observational study

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ABSTRACT

Background: Self-medication among university students is becoming a health concern, especially during examinations and stress. This pattern of medication use among students could lead to adverse health consequences if it is not addressed and tackled. Thus, this study investigated the most associated factors with this practice among students.

Methods: An observational cross-sectional study was conducted among university students in Northern Borders Province, Saudi Arabia. A total of 220 students were selected and took part in the survey. Data was collected through a self-administered questionnaire. The survey was distributed among participants to answer five sections: demographic and socioeconomic characteristics, health status problems, satisfaction with academic performance, and self-medication questions. The content validity was tested using a pilot sample of 30 students. The descriptive, univariate, and multivariate analyses were conducted using the Statistical Package for Social Science program.

Results: In the present sample of university students, the response rate was 100%. Approximately one-third reported using medications without prescriptions, and 83% of them have used medications three times at most during the past 12 months. Headache was the most common reason for use (59%), followed by fever (20%). Adjusted multivariate analysis showed that students who were 21–24 years of age (OR = 3.79, 95% CI = 1.21–11.82), female (OR = 2.43, 95% CI = 1.03–5.72), and living alone in private housing (OR = 3.62, 95% CI = 1.32–9.90) were at high risk of self-medication as compared to their counterparts. However, students in the last years of college (fourth (OR = 0.14, 95% CI = 0.03–0.62), fifth (OR = 0.21, 95% CI = 0.05–0.95), sixth (OR = 0.05, 95% CI = 0.01–0.35)) were at lower risk as compared to their counterparts.

Conclusion: The study found that self-medication was common among university students, with higher rates among those who were 21–24 years old, female, and living alone in private housing, but lower rates among students in the later years of college. Educational programs and awareness campaigns should target students who are at higher risk of practicing self-medication to avoid misuse of over-the-counter medications.

1. Introduction

Self-medication, defined as using medications to manage illnesses or symptoms without a medical prescription, is a common practice among university students worldwide.^{1,2} Global studies have shown that

improper use of medications and lack of awareness regarding self-medication can lead to adverse health outcomes for students.^{3–5} Studies from countries such as the United States,⁶ the United Kingdom,⁷ India,⁸ Ethiopia,^{9–11} Uganda,¹² and others¹³ have also explored the prevalence and factors associated with self-medication among

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Table 1
Characteristics of the study population.

Variables	N (%)
Age (years)	
18–21	85 (38.6)
>21–24	114 (51.8)
>24	21 (9.50)
Sex	
Male	109 (49.5)
Female	111 (50.5)
Marital status	
Single	199 (90.5)
Married	21 (9.50)
College	
Medical colleges	163 (74.1)
Non-medical colleges	57 (25.9)
Academic year	
1st Year	40 (18.2)
2nd year	18 (8.2)
3rd year	47 (21.4)
4th year	40 (18.2)
5th year	33 (15.0)
6th year	17 (7.7)
Internship year	25 (11.4)
Mother education	
Illiterate	24 (10.9)
Primary	13 (5.9)
Elementary	23 (10.9)
High school	38 (17.3)
University	122 (55.5)
Father education	
Illiterate	13 (5.9)
Primary	17 (7.7)
Elementary	19 (8.9)
High school	54 (24.9)
University	117 (53.2)
Housing status	
With family	185 (84.1)
University Housing	6 (2.7)
Private housing	29 (13.2)
Smoking status	
Current smoker	32 (14.5)
Past smoker	12 (2.2)
Non-smoker	176 (80.0)
Presence of physical problems that limit daily activity	
No	203 (92.3)
Yes	17 (7.7)
Presence of mental problems that limit daily activity	
No	193 (87.7)
Yes	27 (12.3)
Academic satisfaction	
Very dissatisfied	11 (5.0)
Dissatisfied	25 (11.4)
Neither satisfied nor dissatisfied	60 (27.3)
Satisfied	85 (38.6)
Very satisfied	39 (17.7)
Self-medication	
No	146 (66.4)

(continued on next page)

Table 1 (continued)

Variables	N (%)
Yes	74 (33.6)
Analgesic use	
No	168 (76.8)
Yes	51 (23.2)

Data are presented as numbers (N) and percentages (%).

university students. While there have been several studies conducted in various cities in Saudi Arabia, such as Abha, Riyadh, Jazan, Buraidah, Taif, and Al-Khobar, on self-medication and the use of over-the-counter (OTC) medications among students,^{14–18} it is essential also to consider research findings from other cities and geographical entities, including the authors region to gain a broader perspective on this issue.

OTC medications can be purchased without a prescription from pharmacies to treat conditions that do not require immediate medical intervention or supervision from health practitioners.¹⁹ These medications may include analgesics (like paracetamol), antacids, or some topical creams for minor conditions.²⁰ However, numerous regulations ensure the safe and effective use of OTC medications in Saudi Arabia.²¹

Notably, there was no consistency in the prevalence of self-medication since it ranged from 29% to 98.7%,^{18,22–25} while the proportion of using medication with a prescription was only 11.5% among students.¹⁸ Also, antibiotics and tramadol were frequently misused as a prescription medication, often acquired from family members or friends.^{18,22–26} The most commonly used medications were paracetamol,^{14,15,17,18,27} non-steroidal anti-inflammatory drugs (e.g., Ibuprofen),^{17,26} Sedatives,¹⁶ and vitamins.²³

The commonly reported reasons for OTC medication usage include headache,^{15,17,27,28} pain,^{18,28} fever,^{17,28} cough,^{15,17,28} toothache,²⁷ fatigue,²⁷ and back pain.²⁷

Factors that were suggested by previous studies to be associated with self-medication use consisted of gender,²⁸ major,²⁶ age,^{18,28} level of education,²⁸ medications' price,²⁸ knowledge about OTC,^{18,27} and previous experience with OTC medications use.¹⁶ Although male students had lower awareness and knowledge about the safety of OTC drug use as compared to female students,²⁸ females were more likely to use OTC medication, especially analgesics, as compared to males.^{16,24} Another study conducted among female students of King Saud University (KSU) in Riyadh City found that students in health colleges were less likely to misuse OTC drugs as compared to students in other colleges.²⁵ Also, among medical students, females were more likely to use analgesics as compared to males.²⁹ Sources of information for OTC medication usage were family members,^{16,25} colleagues,¹⁶ and television.¹⁸ However, none of these studies have examined the association of OTC medication use with other factors, such as students' housing status, academic year, health status, health behaviors, and parents' education. Thus, this study aimed to identify more associated risk factors with self-medication and OTC medication usage among university students in our region.

2. Material and methods

2.1. Study design and population

The study was a descriptive cross-sectional study with a convenient sampling of university students aged 18 years and older who lived in the Northern Borders region of Saudi Arabia. All participants were asked to consent to the study before starting the survey. The responses were anonymous. The researchers used convenience sampling techniques, including on-site recruitment, online enrollment, referrals, and volunteer sampling, to efficiently gather the 220 university student participants from the local institute. Two members of the research team revised

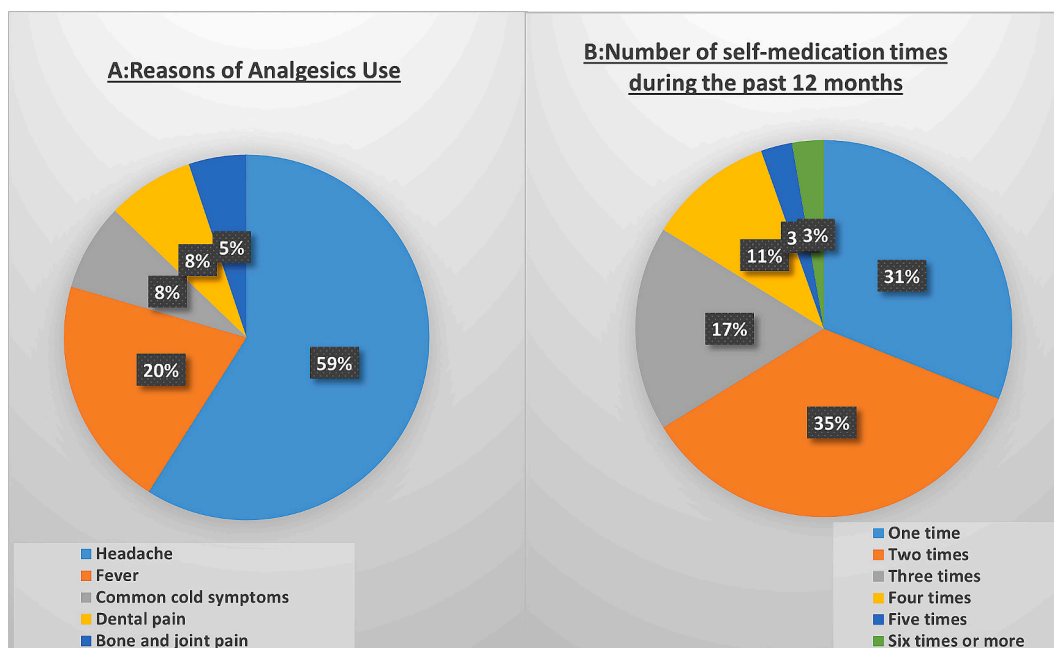


Fig. 1. Reasons for analgesic use and self-medication frequency during the last 12 months.

the survey for validation of the contents by a pilot sample of 30 students. The validated questionnaire was translated into Arabic and then into English by a language expert to guarantee uniformity and establish face validity. Any raised difficulty in understanding the meaning of the questions was addressed accordingly.

2.2. Data collection

Data collection was done electronically for three months via a web-based questionnaire. The researchers share the links with all students in the related Whats app groups after explaining and clarifying the aim of the study and writing the consent for participation in the Google survey. The data were collected from September through November 2022.

2.3. Measures

The self-designed collecting tool included five sections: demographic characteristics, socioeconomic characteristics, health status, satisfaction with academic performance, and self-medication items. Demographic characteristics included age, gender, and city of permanent residence. Socioeconomic factors encompassed marital status, participant's education, parents' education, housing status, and family monthly income. To assess health status, participants were asked whether they had experienced any physical or psychological problems that limited their daily activities within the past 12 months. Additionally, participants were queried about their smoking status, classifying them as current smokers, past smokers, or non-smokers.

Regarding satisfaction with academic performance, students were asked, "Overall, how satisfied are you with your academic performance?" Responses were recorded on a 5-point Likert scale ranging from 1 ("very dissatisfied") to 5 ("very satisfied"). Concerning self-medication practices, students were asked, "Have you used any medication without a prescription during the last 12 months?" If the response was affirmative, students were required to list the names of the medications used and rate the frequency of their use.

2.4. Study sample calculation and power analysis

Using the Raosoft sample size calculator (http://www.raosoft.com/sample_size.html, Raosoft, Inc., Seattle, WA) and setting parameters at a 95% confidence level, a 6.56% margin of error, and a University student population size of 16,415 based on the recent university statistics, with an anticipated response distribution of 50%, the minimum required sample size was determined to be 220 students. Levine and Ensom's posthoc power analysis equation was applied to estimate the study power of the current sample.³⁰ The applied study parameters were as follows: incidence in group 1 = 33.6%, incidence in group 2 = 66.4%, sample size for group 1 = 74, sample size for group 2 = 146, and alpha = 0.05. The resulting power for the specified input data was nearly 99%.

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2.5. Statistical analysis

The descriptive statistics were reported as frequency with percentages (%). The statistical analyses considered a margin of error of 5% and a confidence level of 95%. Univariate analysis of the associations between self-medication and the sample's characteristics were examined in chi-square tests. The adjusted associations of self-medication with the sample's characteristics were examined in multivariate binary logistic regression analysis. The outputs were presented as odds ratios (ORs) with 95% confidence intervals (95% CI) for the most straightforward interpretation. The data was analyzed using the Statistical Package for Social Sciences (SPSS) program version 24.0 (IBM SPSS Statistics, Armonk, NY, USA).

2.6. Ethical consideration

Ethical approval for this investigation was secured from the Local Bioethics Committee at the current University with reference number (5/44/H). Given that this research was observational, the risk to participants was minimal. Moreover, all participant data were de-identified to maintain privacy, ensuring that personal identifiers were not gathered. To preserve data confidentiality, only the research team members had access to the collected information.

Table 2
Univariate associations of self-medication with participant's characteristics.

Variables	Self-medication during the last 12 months		P-value
	No N (%)	Yes N (%)	
Age (years)			0.626
18–21	58 (68.2)	27 (31.8)	
>21–24	76 (66.7)	38 (33.3)	
>24	12 (57.1)	9 (42.9)	
Sex			0.850
Male	73 (67.0)	36 (33.0)	
Female	73 (65.8)	38 (34.2)	
Marital status			0.154
Single	135 (67.8)	64 (32.2)	
Married	11 (52.4)	10 (47.6)	
College			0.301
Medical colleges	105 (64.4)	58 (35.6)	
Non-medical colleges	41 (71.9)	16 (28.1)	
Academic year			0.035
1st Year	25 (62.5)	15 (37.5)	
2nd year	7 (38.9)	11 (61.1)	
3rd year	31 (66.0)	16 (34.0)	
4th year	31 (77.5)	9 (22.5)	
5th year	23 (69.7)	10 (30.3)	
6th year	15 (88.2)	2 (11.8)	
Internship year	14 (56.0)	11 (44.0)	
Mother education			0.785
Illiterate	15 (62.5)	9 (37.5)	
Primary	7 (53.8)	6 (46.2)	
Elementary	17 (73.9)	6 (26.1)	
High school	26 (68.4)	12 (31.6)	
University	81 (66.4)	41 (33.6)	
Father education			0.382
Illiterate	9 (69.2)	4 (30.8)	
Primary	9 (52.9)	8 (47.1)	
Elementary	12 (63.2)	7 (36.8)	
High school	41 (75.9)	13 (24.1)	
University	75 (64.1)	42 (35.9)	
Housing status			<0.001
With family	131 (79.8)	54 (29.2)	
University Housing	5 (83.3)	1 (16.7)	
Private housing	10 (34.5)	19 (65.5)	
Permanent residence			0.330
Inside Arar city	124 (67.8)	59 (32.2)	
Outside Arar city	22 (59.5)	15 (40.5)	
Smoking status			0.923
Current smoker	20 (62.5)	12 (37.5)	
Past smoker	8 (66.7)	4 (33.3)	
Non-smoker	118 (67.0)	58 (33.0)	
Presence of physical problems that limit daily activity			0.079
No	138 (68.0)	65 (32.0)	
Yes	8 (47.1)	9 (52.9)	
Presence of mental problems that limit daily activity			0.204
No	131 (67.9)	62 (32.1)	
Yes	15 (55.6)	12 (44.4)	
Academic satisfaction			0.129
Very dissatisfied	6 (54.5)	5 (45.4)	
Dissatisfied	16 (64.0)	9 (36.0)	

Table 2 (continued)

Variables	Self-medication during the last 12 months		
	No N (%)	Yes N (%)	P-value
Neither satisfied nor dissatisfied	33 (55.0)	27 (45.0)	
Satisfied	63 (74.8)	22 (25.9)	
Very satisfied	28 (71.8)	11 (28.2)	

Data are presented as numbers (N) and percentages (%). The Chi-square or Fisher exact tests were applied when appropriate. Bold values indicate significance at p -values <0.05.

3. Results

3.1. Sample characteristics

Two hundred twenty students were selected and took part in the survey. In the present sample of university students, the response rate was 100%. The sample's characteristics are presented in [Table 1](#). The majority of the students (90.4%), aged from 18 to 24 years old, were single (90.5%), non-smokers (80%), without physical problems (92.3%) or mental problems (87.7%) that could limit their daily activities. Most of them studied in medical colleges (74.1%) and lived with their families (84.1%) in the local region.

About one-third (33.6%) of the sample have reported using medications without prescriptions, and 23.2% have used analgesics without prescription during the past 12 months. The most common reasons for analgesic use were headache (59%), fever (20%), and common cold symptoms or dental pain (8% for each) ([Fig. 1A](#)). Among students who reported self-medication, 31% of them reported having only one medication, and 35% reported having two medications during the last 12 months ([Fig. 1B](#)).

Although 23.2% of participants reported using analgesics, some students reported using more than one analgesic medication, accounting for 34% of the total medications used. Other commonly reported medications included supplements (8%), antidepressants (8%), decongestants (7%), antihistamines (5%), antacids (5%), antibiotics (5%), anti-inflammatory drugs (4%), antispasmodics (4%), activated charcoal (3%), insomnia treatments (2%), antiemetics (2%), and acne treatments (2%).

3.2. Unadjusted analyses

The findings from testing the univariate associations of self-medication with the sample's characteristics were demonstrated in [Table 2](#). There were significant associates of self-medications with academic year and housing status. Other sample's characteristics were not significantly associated with self-medication among university students. Unlike other academic years, a higher percentage (61%) of students in the second year reported having medication without a prescription compared to those who did not (p -value 0.035). In contrast to other housing statuses, a high percentage of students (65.5%) (p -value <0.001) who lived alone in private housing reported having medications without a prescription compared to those who did not.

The results of univariate associations of analgesic use with the sample's characteristics were demonstrated in [Table 3](#). There were significant associations of analgesic use with academic year, housing status, and the presence of physical problems that limit daily activity.

The highest analgesic usage was found in 2nd-year students (61.1%) (p -value 0.004), less usage was found among those living with family (79.5%), while in terms of private housing, 44.8% of the respondents indulged in the usage of analgesics (p -value 0.010). Participants with physical problems limiting daily activity have higher rates of analgesic use (47.1%) compared to those without such problems (21.2%) (p -value 0.021). Similar rates of analgesic use are observed among those with (22.2%) and without (23.3%) mental problems, but the association here

Table 3
Univariate associations of analgesics use with participant's characteristics.

Variables	Analgesics use during the last 12 months		P-value
	No N (%)	Yes N (%)	
Age (years)			0.321
18–21	69 (81.2)	16 (18.8)	
>21–24	86 (75.4)	28 (24.6)	
>24	14 (66.7)	7 (33.3)	
Sex			0.815
Male	83 (76.1)	26 (23.9)	
Female	86 (77.5)	25 (22.5)	
Marital status			0.081
Single	156 (78.4)	43 (21.6)	
Married	13 (61.9)	8 (38.1)	
College			0.938
Medical colleges	125 (76.7)	38 (23.3)	
Non-medical colleges	44 (77.2)	13 (22.8)	
Academic year			0.004
1st Year	31 (77.5)	9 (22.5)	
2nd year	7 (38.9)	11 (61.1)	
3rd year	38 (80.9)	9 (19.1)	
4th year	35 (87.5)	5 (12.5)	
5th year	24 (72.2)	9 (27.3)	
6th year	16 (94.1)	2 (5.9)	
Internship year	18 (72.0)	7 (28.0)	
Mother education			0.496
Illiterate	18 (75.0)	6 (25.0)	
Primary	10 (76.9)	3 (23.1)	
Elementary	20 (87.0)	3 (13.0)	
High school	32 (84.2)	6 (15.8)	
University	89 (73.0)	33 (27.0)	
Father education			0.402
Illiterate	9 (69.2)	4 (30.8)	
Primary	15 (88.2)	2 (11.8)	
Elementary	15 (78.9)	4 (21.1)	
High school	45 (83.3)	9 (16.7)	
University	85 (72.6)	32 (27.4)	
Housing status			0.010
With family	147 (79.5)	38 (20.5)	
University Housing	6 (100.0)	0 (0.0)	
Private housing	16 (55.2)	13 (44.8)	
Permanent residence			0.059
Inside Arar city	145 (79.2)	38 (20.8)	
Outside Arar city	24 (64.9)	13 (35.1)	
Smoking status			1.000
Current smoker	25 (78.1)	7 (21.9)	
Past smoker	9 (75.0)	3 (25.0)	
Non-smoker	135 (76.7)	41 (23.3)	
Presence of physical problems that limit daily activity			0.021
No	160 (78.8)	43 (21.2)	
Yes	9 (52.9)	8 (47.1)	
Presence of mental problems that limit daily activity			0.900
No	148 (76.7)	45 (23.3)	
Yes	21 (77.8)	6 (22.2)	
Academic satisfaction			0.114
Very dissatisfied	9 (81.8)	2 (18.2)	
Dissatisfied	17 (68.0)	8 (32.0)	

Table 3 (continued)

Variables	Analgesics use during the last 12 months		P-value
	No N (%)	Yes N (%)	
Neither satisfied nor dissatisfied	40 (66.7)	20 (33.3)	
Satisfied	70 (82.4)	15 (17.6)	
Very satisfied	33 (84.6)	6 (15.4)	

Data are presented as numbers (N) and percentages (%). The Chi-square or Fisher exact tests were applied when appropriate. Bold values indicate significance at p -values <0.05.

is not statistically significant (p -value = 0.90).

3.3. Adjusted analyses

The adjusted associations of self-medication with the sample's related factors were demonstrated in [Table 4](#). The results remained significant for the academic year and housing status. Also, age and gender emerged as factors that are significantly associated with self-medication practice after adjusting for all other factors. Students whose ages were >21 and less than or equal to 24 years old were about four times more likely to use medication without a prescription as compared to those who were younger than 21 years old (OR = 3.79, p -value = 0.02). Females were 2.43 more likely to have medications without prescription than males (p -value = 0.042). Students in the 4th year (OR = 0.14, p -value = 0.010), 5th year (OR = 0.21, p -value = 0.042), and 6th year (OR = 0.05, p -value = 0.003) were less likely to report having medications without prescription as compared to students in the first year. Students who lived alone in private housing were more likely to have medications without prescription than those who lived with their families (OR = 3.62, p -value = 0.012).

4. Discussion

Currently, the increasing trend of self-medication on a global scale presents a significant challenge in society, healthcare, and economics for many nations, including Saudi Arabia.³¹ College students often face specific health risks, such as stress, poor nutrition, lack of sleep, substance abuse, and mental health issues.³² Understanding their behavior and beliefs enables institutions to address potential risks and provide resources to reduce them proactively.³³

The current study examined self-medication among university students in the local region. The findings showed that more than a quarter of students had used medications without a prescription during the last 12 months. However, a majority (four-fifths) denied usage of analgesic medications during the past 12 months ([Table 1](#)). The prescriptions are mandatory for analgesics to avert the negative impacts of this medication.³⁴ This indicated that there could be a higher risk of misuse or overuse of OTC medications among university students in this region. A summary of studies on self-medication within this country, including the characteristics and outcomes similar to those observed in our study, is presented in [Table 5](#).^{14–18,22–25,27,29,34,35}

Consistent with previous studies, headaches emerged as a common reason for self-medication, and analgesics were commonly used by students in other studies as well.^{15,27,28}

One of the primary aims of our study was to explore the possible risk factors associated with self-medication among university students. The adjusted results indicated that students aged between 21 and 24, female students, and those living alone in private housing were at a higher risk of self-medication compared to their counterparts. Several possible reasons may explain this trend. Firstly, individuals in the 21–24 age group are often transitioning from adolescence to adulthood and may lack the skills to navigate the healthcare system effectively,³⁶ leading to a reliance on self-medication as a quick and convenient solution to health issues. Furthermore, increased independence and autonomy,

Table 4
Adjusted associations of self-medication with participant's characteristics.

Variables	Self-medication during the last 12 months		
	OR (95% CI)	SE	P-value
Age (years)			
18–21	Reference		
>21–24	3.79 (1.21–11.82)	0.58	0.022
>24	3.45 (0.55–21.74)	0.94	0.188
Sex			
Male	Reference		
Female	2.43 (1.03–5.72)	0.44	0.042
Marital status			
Single	Reference		
Married	1.65 (0.52–5.20)	0.59	0.393
College			
Medical colleges	Reference		
Non-medical colleges	0.60 (0.22–1.61)	0.51	0.305
Academic year			
1st Year	Reference		
2nd year	1.97 (0.48–7.95)	0.71	0.344
3rd year	0.40 (0.13–1.25)	0.59	0.113
4th year	0.14 (0.03–0.62)	0.78	0.010
5th year	0.21 (0.05–0.95)	0.76	0.042
6th year	0.05 (0.01–0.35)	1.03	0.003
Internship year	0.33 (0.05–1.99)	0.91	0.226
Mother education			
Illiterate	Reference		
Primary	0.88 (0.15–5.02)	0.89	0.889
Elementary	0.30 (0.05–1.82)	0.92	0.189
High school	0.33 (0.07–1.48)	0.77	0.147
University	0.24 (0.07–1.24)	0.75	0.094
Father education			
Illiterate	Reference		
Primary	2.80 (0.37–20.87)	1.02	0.318
Elementary	1.44 (0.24–8.49)	0.91	0.688
High school	1.18 (0.21–6.72)	0.89	0.855
University	2.55 (0.44–14.80)	0.90	0.297
Housing status			
With family	Reference		
University Housing	0.29 (0.18–4.74)	1.44	0.388
Private housing	3.62 (1.32–9.90)	0.51	0.012
Permanent residence			
Inside Arar city	0.83 (0.29–2.36)	0.54	0.723
Outside Arar city	Reference		
Smoking status			0.923
Current smoker	Reference		
Past smoker	0.54 (0.09–3.09)	0.89	0.486
Non-smoker	0.55 (0.19–1.58)	0.54	0.266
Presence of physical problems that limit daily activity			
No	Reference		
Yes	2.01 (0.55–7.37)	0.66	0.292
Presence of mental problems that limit daily activity			
No	Reference		
Yes	1.17 (0.42–3.31)	0.53	0.763
Academic satisfaction			
Very dissatisfied	Reference		
Dissatisfied	1.19 (0.20–6.70)	0.90	0.846
Neither satisfied nor dissatisfied	1.58 (0.31–8.05)	0.83	0.579

Table 4 (continued)

Variables	Self-medication during the last 12 months		
	OR (95% CI)	SE	P-value
Satisfied	0.74 (0.15–3.76)	0.83	0.716
Very satisfied	1.05 (0.19–5.79)	0.87	0.957

OR: Odds ratios estimate from the binary regression model, CI: Confidence interval, SE: standard error. Bold values indicate significance at p -values <0.05 .

coping with academic and personal challenges, and a lack of awareness or understanding of risks could be other contributing factors.^{37,38} Secondly, females may be more likely to self-medicate due to societal norms and expectations that place a greater emphasis on self-care and taking responsibility for one's health. Mohamed Elkalmi et al.³⁹ demonstrated in their research that 77.2% of female students have a tendency towards self-medication as opposed to prescribed medication, citing a reluctance to seek medical care outside their homes.⁴⁰ Also, females may face unique health challenges, including those experiencing menstrual problems that make them more likely to turn to self-medication for relief.^{41,42} Lastly, individuals living alone in private housing may not have easy access to healthcare services or may feel isolated and lack social support, which might change their attitude, leading them to self-medicate as a way to manage their health issues.^{13,43,44} Further research is needed to understand the underlying reasons for this trend and develop targeted interventions to address it.

Students whose ages were >21 years old and less than or equal to 24 years old were about four times more likely to use medications without a prescription than younger ages. This finding is consistent with a previous study conducted among Swedish adults, which found that adults ages 18 to 25 years old were more likely to use paracetamol without a prescription since they have a less perceived risk of using OTC medications as compared to their counterparts.⁴⁵

Concerning sex, female students were about 2.5 more likely to practice self-medications during the last 12 months as compared to males. As consistent with other studies conducted in Italy and Brazil, being a male student could be a protective factor against practicing self-medication.^{26,46} Additionally, Behzadifar et al. meta-analysis for 89 studies, including 60,938 students, supported that female students self-medicated 1.5 more often than male students.¹³ However, females could be more aware and knowledgeable about the safety issues of self-medication.^{14,22}

Certain contextual factors, such as academic year and housing status, also emerged as possible risk factors for practicing self-medication. Students in the 4th year, 5th year, and 6th year were 86%, 75%, and 95%, respectively, less likely to practice self-medication than students in the first year (foundation year). Consistent with others, our study showed that studying in medical-related majors could not protect from self-medication practice; however, being at a higher academic level could decrease the likelihood of using medications without prescription.^{33,47} Al-Hussaini and colleagues found that self-medication among undergraduate medical students in Kuwait declines with age, possibly due to an improved understanding of drug use and side effects as individuals mature.⁴⁷

Further, students who lived alone in private houses were 3.6 times more likely to use medications without a prescription than those who lived with their families. Although James et al. reported that "family attitudes play a role in medication use prevalence and these are in many ways determined with societal norms and values",⁴⁸ further large-scale and follow-up studies will be required to validate this finding.

Raising awareness and providing educational campaigns directed to groups of students who are at high risk is needed to promote responsible usage of medication by highlighting the significance of utilizing healthcare services that are provided on campus free for students and consulting healthcare professionals.

Our findings should be interpreted considering some limitations. First, the study was conducted exclusively among university students

Table 5
 Characteristics of similar studies in the author's country of origin concerning self-medication.

*Author (Year) [Ref.]	Sample	City	Design	Main findings
Orayj et al., 2021 ¹⁴	463 undergraduate students	Abha	A cross-sectional study from May –July 2020 using a pre-validated tool	During exams, students mainly used OTC drugs for headaches, followed by pain, fever, and coughs. A significant gender gap existed in OTC medication safety knowledge, with male students less aware than females and less likely to read usage instructions. Age, academic year, and drug-related household income were crucial factors affecting OTC drug use.
Khalifa et al., 2021 ¹⁵	421 medical and non-medical students	Riyadh	A cross-sectional study using A pre-coded, pre-tested online questionnaire	The study found no notable correlation between students' majors or genders and their OTC drug utilization. Panadol emerged as the OTC medication most frequently taken for relief, predominantly for treating headaches.
Albasheer et al., 2016 ¹⁶	300 medical students at Jazan University	Jazan	Cross-sectional study, using a self-administered questionnaire e-based	Self-medication was widespread among medical students, occurring in 87% of those surveyed. Female students engaged in self-medication at a higher rate compared to their male peers. Sedatives emerged as the predominant choice, with 58% of students utilizing these for self-treatment. The primary motivations for self-medication included confidence in their knowledge about medications, past personal experiences, and the influence of family and peers. Notwithstanding the high rate of self-medication, a substantial majority (84.5%) of participants acknowledged the potential risks and adverse effects associated with the practice.
Saeed et al., 2014 ¹⁷	354 first-six-year male students from Qassim University	Buraidah city	Cross-sectional survey, using a self-administered pre-validated questionnaire.	The incidence of self-medication in male students stood at 86.6%, which is elevated compared to figures from similar research in the region. The most frequently self-treated symptoms included headaches, coughs/colds, and fevers. In line with these ailments, the medications most commonly taken without prescriptions were paracetamol, with antibiotics (31.4%) and non-steroidal anti-inflammatory drugs also widely used.
Abahussain et al., 2007 ¹⁸	1331 third-grade intermediate and all three grades of secondary school female students	Al-Khobar	A multistage stratified sampling design was adopted at the end of 2001.	The research indicates a considerable occurrence of self-medication among female students. Thirty-eight percent reported utilizing over-the-counter (OTC) drugs. Notably, 43.3% of the participants took paracetamol for menstrual discomfort, and 43.5% had consumed antibiotics in the past year. Television emerged as the primary channel through which students obtained information about medications and health-related topics. Additionally, age alongside awareness of potential medication adverse effects were identified as significant factors influencing the consumption of antibiotics and OTC drugs.
Almalak et al., 2014 ²²	1596 students from King Saud University and a high school	Riyadh	A cross-sectional study from May to December 2011, using a newly created validated survey.	Among those surveyed, 80.0% reported utilizing over-the-counter non-steroidal anti-inflammatory drugs to alleviate headaches and pain. Other medications used included flu treatments, vitamins, and antibiotics, each by 5.0% of respondents. It was observed that female students had a greater awareness of the safety considerations related to the use of OTC medications in comparison to male students.
Alshahrani et al., 2019 ²³	King Khalid University student, Abha	Abha	A cross-sectional study using a self-administered questionnaire.	In the study, 98.7% of participants engaged in self-medication, mainly for headaches (75.9%) and respiratory symptoms (52.5%). Pain relievers were preferred by 91.6% of medical students, while 35.4% of non-medical students chose antibiotics. The top reasons for self-medication were efficiency (64.2%), mild symptom management (51.7%), and quick relief (36.9%).
Alshehri et al., 2017 ²⁴	420 University students	Saudi Arabia	A cross-sectional study using a validated questionnaire	Over half of the study participants (52.4%) reported using over-the-counter (OTC) medications on at least one occasion. In contrast, 25.7% of individuals opted for prescription drugs, while 21.9% utilized both types. Cleansers constituted the majority of OTC medication usage, with a prevalence of 41.9%. Among those who chose prescription medications, the usage of topical and oral antibiotics was the most frequent at 11.4%. The study also found that female participants were more inclined to use OTC medications than their male counterparts.
Dabbagh et al., 2020 ²⁵	Students from the King Saud University and a high school in central Riyadh	Riyadh	cross-sectional study in 2019	Lifetime misuse of OTC medications among the participants was 29.09%, with lower rates recently at 22.35% (past year) and 11.95% (past month). Prescription drug misuse was higher at 62.24% lifetime, decreasing to 52.60% and 34.68% over the past year and month, respectively. Tramadol was the most misused prescription drug, often obtained from family. Health program students were less likely to misuse drugs – by 13% for OTC and 21% for prescriptions – compared to students from other disciplines.

(continued on next page)

Table 5 (continued)

*Author (Year) [Ref.]	Sample	City	Design	Main findings
Alshahrani et al., 2020 ²⁷	468 general population	Aseer region	A cross-sectional study between June and October 2017, using a previously validated survey tested by a pilot study.	In this study, 53.5% of participants reported engaging in self-medication using over-the-counter pain relievers. Among these, paracetamol was the analgesic most frequently selected, with ibuprofen being the second choice. Headaches were the leading complaint leading to self-medication, succeeded by toothaches, fatigue, and back pain being the symptom least reported. Additionally, the majority of individuals displayed limited knowledge concerning the proper use of OTC analgesics.
Alharthi et al., 2019 ²⁹	205 medical students at Taif University	Taif	A cross-sectional, qualitative study using an online self-developed questionnaire	Analgesic consumption is prevalent among medical students, with a high incidence rate of 92.7%. Despite this, 50.7% of respondents reported infrequent usage. Female students tend to use painkillers more regularly than their male counterparts and also experience side effects more often. Abdominal discomfort was identified as the most frequent adverse effect, present in 2.5% of cases, whereas the predominant rationale for taking analgesics was to alleviate headaches, accounting for 63.7% of usage.
Al-Qahtani et al. 2022 ³⁴	205 undergraduate medical students	Najran	A descriptive, cross-sectional study using a self-administered questionnaire	Generally, the attitude towards self-medication was deemed satisfactory. Sixty percent of students reported engaging in self-medication in the previous six months, with 25% explicitly using antibiotics. A notable negative relationship was observed between attitudes towards self-medication and its actual practice.
Loni et al., 2023 ³⁵	214 female students from the Health Science Colleges in Majmaah University	Majmaah	A descriptive, cross-sectional study using a self-administered questionnaire	Most students self-medicated for fast relief (77.5%), convenience (76.3%), and minor ailments (71.1%), especially for menstrual pain (82.7%) and headaches (79.8%). Antipyretics and analgesics (84.4%) topped medication use, with fewer antidepressants and sedatives (3.5–7.5%). Family (67.1%) and self-acquired knowledge (64.7%) were the primary information sources. For adverse reactions, the majority sought medical (85%) or pharmaceutical advice (56.7%).

*First author surname/year of publication. OTC: Over-the-counter.

residing in the Northern Borders region of Saudi Arabia, potentially constraining the generalizability of the findings to other populations or geographical areas. Since the data was gathered from a self-administered questionnaire, the responses may be prone to recall bias (underreport or over-report their self-medication behaviors). Although there could be some suggested associations in this study, no causal relationship can be claimed in cross-sectional design.

5. Conclusion

In conclusion, this survey aimed to determine the risk factors associated with self-medication among university students. Being a traditional university student, female, and living alone in private housing (not campus housing) could be considered risk factors, while being at a higher academic level could be a protective factor for self-medication practice. Further studies with a representative large sample of university students are needed. Also, conducting a study with explorative qualitative data is essential to explore the underlying motivations, beliefs, and attitudes related to self-medication among university students. Incorporating qualitative research methods could provide deeper insights into the subject matter.

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CRediT authorship contribution statement

Ebtihag O. Alenzi: Writing – original draft, Supervision, Software, Resources, Project administration, Formal analysis, Data curation, Conceptualization. **Shahad Khalid A. Bedaiwi:** Writing – original draft,

Investigation, Data curation, Conceptualization. **Rahma Hamayun:** Writing – original draft, Validation, Resources, Data curation. **Abdulaziz Salamah T. Alanazi:** Writing – original draft, Validation, Resources, Data curation. **Manal S. Fawzy:** Writing – review & editing, Validation, Resources.

Declaration of competing interest

“The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.”

Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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