Original article

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CANNABIS USE AMONG PHARMACY STUDENTS IN SOUTHEASTERN SERBIA: PREVALENCE AND PREDICTORS OF USE

Maja Vujović[1,2], Aleksandar Jovanović[1], Emilija Kostić[1]

[1]University of Niš, Faculty of Medicine, Department of Pharmacy, Niš, Serbia

[2]Institute of Forensic Medicine, Toxicological Department, Niš, Serbia

Contact: Emilija Kostić

81 Dr Zorana Djindjića Blvd, 18000 Niš, Serbia

E-mail: emilija.kostic@medfak.ni.ac.rs

Cannabis remains the most commonly used illicit substance worldwide, particularly among adolescents and young adults. Data regarding cannabis use among pharmacy students in Serbia remain limited. This study aimed to assess the prevalence and patterns of cannabis use among pharmacy students and to identify factors associated with its use. A cross-sectional study was conducted among 226 pharmacy students enrolled at the Faculty of Medicine, University of Niš, Serbia. Data were collected using an anonymous online questionnaire addressing sociodemographic characteristics, lifestyle habits, cannabis use, and social environment factors. Associations between cannabis use and potential explanatory variables were assessed using univariate and multivariate logistic regression analyses. Lifetime cannabis use was reported by 12.8% of students. Most users reported only a single lifetime experience with cannabis, while regular use was uncommon. In univariate analysis, employment status, year of study, academic year repetition, smoking, acute alcohol intoxication, mental health therapy and acquaintance with cannabis users were associated with cannabis use. In the multivariate logistic regression model,

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only employment status (OR = 3.89; 95% CI: 1.036–14.609; p = 0.044) and knowing someone who uses cannabis (OR = 21.58; 95% CI: 2.794–166.635; p = 0.003) remained independently associated with cannabis use. Cannabis use was reported by a minority of pharmacy students and was predominantly experimental. Social exposure, reflected by acquaintance with cannabis users, represented the strongest factor associated with cannabis use. These findings highlight the importance of social and environmental influences in shaping cannabis use behaviors among future healthcare professionals and may support the development of targeted preventive and educational interventions.

Keywords: Cannabis; marijuana; pharmacy students; substance use; prevalence; risk factors; Serbia

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Upotreba kanabisa među studentima farmacije u jugoistočnoj Srbiji: prevalencija i prediktori upotrebe

Maja Vujovic[1,2], Aleksandar Jovanovic[1], Emilija Kostic[1]

[1]Univerzitet u Nišu, Medicinski fakultet, Katedra Farmacija, Niš, Srbija

[2]Institut za sudsku medicinu Niš, Odsek za toksikologiju, Niš, Srbija

Kontakt: Emilija Kostić

Bulevar dr Zorana Đinđića 81, 18000 Niš, Srbija

E-mail : emilija.kostic@medfak.ni.ac.rs

Kanabis predstavlja najčešće korišćenu ilegalnu psihoaktivnu supstancu u svetu, naročito među adolescentima i mladim odraslim osobama. Podaci o upotrebi kanabisa među studentima farmacije u Srbiji su ograničeni. Cilj ovog istraživanja bio je da se ispita prevalencija i obrazac upotrebe kanabisa među studentima farmacije, kao i faktori povezani sa njenom upotrebom. Sprovedena je studija preseka među 226 studenata integrisanih akademskih studija farmacije na Medicinskom fakultetu Univerziteta u Nišu. Podaci su prikupljeni anonimnim onlajn upitnikom koji je obuhvatio sociodemografske karakteristike, životne navike, upotrebu kanabisa i karakteristike socijalnog okruženja. Povezanost potencijalnih faktora sa upotrebom kanabisa analizirana je primenom univarijantne i multivarijantne logističke regresije. Upotrebu kanabisa tokom života prijavilo je 12,8% ispitanika. Većina korisnika navela je jednokratnu upotrebu, dok je redovna upotreba bila retka. U univarijantnoj analizi sa upotrebom kanabisa bili su povezani zaposlenost, godina studija, obnavljanje godine, pušenje, akutna

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alkoholisanost, terapija zbog mentalnih poremećaja i poznavanje osobe koja koristi kanabis. U multivarijantnom modelu nezavisni prediktori upotrebe kanabisa bili su zaposlenost (OR = 3,89; 95% CI: 1,036–14,609; p = 0,044) i poznavanje osobe koja koristi kanabis (OR = 21,58; 95% CI: 2,794–166,635; p = 0,003). Upotreba kanabisa zabeležena je kod manjeg broja studenata farmacije i uglavnom je imala eksperimentalni karakter. Najznačajniji faktor povezan sa upotrebom kanabisa bilo je poznavanje osobe koja koristi kanabis, što ukazuje na značaj socijalnog okruženja u oblikovanju ponašanja povezanih sa upotrebom psihoaktivnih supstanci. Dobijeni rezultati mogu doprineti planiranju ciljanih preventivnih i edukativnih aktivnosti među budućim zdravstvenim radnicima.

Ključne reči: kanabis; marihuana; studenti farmacije; upotreba psihoaktivnih supstanci; prevalencija; faktori rizika; Srbija.

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Introduction

Cannabis remains the most widely used illicit drug worldwide and is particularly prevalent among adolescents and young adults (1), (2). Despite increasing public acceptance and ongoing changes in cannabis-related legislation in several countries, concerns regarding its potential adverse effects on physical health, mental health, cognitive functioning, and academic performance remain significant (3), (4), (5). Regular cannabis use has been associated with impaired attention, memory deficits, reduced educational achievement, increased risk of psychiatric disorders, and the development of cannabis use disorder (6), (7).

Within Europe, countries in Southeastern Europe (the Balkans) have historically reported lower rates of adolescent drug use compared to the broader European average. However, recent data indicate an upward trend (3).

University students represent a population of particular interest in substance use research due to their increased exposure to social, academic, and environmental factors that may facilitate experimentation with psychoactive substances (8). Previous studies have identified a range of factors associated with cannabis use among young adults, including male sex, alcohol consumption, tobacco smoking, peer influence, mental health problems, and social acceptance of substance use (9), (10), (11). Among these factors, social exposure and peer networks have consistently been recognized as some of the strongest predictors of cannabis initiation and continued use (12).

The investigation of cannabis use among healthcare students is of particular importance. As future healthcare professionals, pharmacy students are expected to provide evidence-based information regarding psychoactive substances, participate in public health promotion activities, and contribute to the prevention of substance misuse. Their own attitudes, experiences, and knowledge regarding cannabis may influence future professional practice and communication with patients (13), (14), (15).

Although several studies have examined substance use among university students, data regarding cannabis use among pharmacy students in southeast Serbia remain limited. Furthermore, little is known about the factors associated with cannabis use in this population. Therefore, the aim of this study was

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to assess the prevalence and patterns of cannabis use among pharmacy students and to identify sociodemographic, lifestyle-related, and social factors associated with its use.

Materials and methods

A cross-sectional study was carried out among pharmacy students enrolled at the Faculty of Medicine, University of Niš, Serbia, during the winter semester of the 2023/2024 academic year. Data were collected using a structured questionnaire developed specifically for this study following a review of the relevant literature. The questionnaire underwent content validation and pilot testing prior to its use in the main survey. Data obtained during the pilot phase were not included in the final analysis. The final version of the questionnaire was administered electronically.

The study included students from all years of study who agreed to participate and completed the questionnaire. A total of 226 students completed the questionnaire and were included in the final analysis, representing 60.9% of the total enrolled student population.

Instrument

Data were collected using a structured questionnaire developed specifically for the purposes of this study based on a review of previously published studies investigating substance use among university students. Prior to the main survey, the questionnaire underwent content validation by specialists in toxicology and social pharmacy, who assessed the relevance and appropriateness of the items in relation to the study objectives. Subsequently, a pilot study was conducted among 10 pharmacy students to evaluate the clarity and comprehensibility of the questions, as well as the overall suitability of the questionnaire. Based on the feedback obtained, minor modifications were introduced to improve the wording and structure of selected items. Data collected during the pilot study were not included in the final analysis.

A literature search was conducted in PubMed, Google Scholar, and Scopus databases using combinations of the following keywords: cannabis use, marijuana use, psychoactive substance use, questionnaire, cross-sectional study. An initial pool of items was generated from the identified literature, after which duplicate and overlapping questions were removed and several items were rephrased to improve clarity,

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relevance, and comprehensibility. The preliminary version of the questionnaire was subsequently reviewed and refined prior to administration.

The final questionnaire consisted of four sections. The first section collected information on respondents' sociodemographic characteristics, including age, sex, employment status, living arrangement, place of residence, and type of secondary school completed. The second section assessed lifestyle-related characteristics, including smoking status, alcohol consumption, episodes of acute alcohol intoxication, energy drink consumption, and the use of mental health therapy. The third section focused on cannabis use and patterns of use, while the fourth section explored characteristics of the social environment, including acquaintance with individuals who use cannabis.

Outcome variable

The primary outcome variable was self-reported lifetime cannabis use. Participants were classified as cannabis users if they reported having used cannabis at least once. Frequency of use was further assessed using predefined response categories, including single experimentation, occasional use, and more frequent use.

Statistical analysis

Statistical analysis was performed using IBM SPSS Statistics version 20.0. Descriptive analyses were performed for all variables. Results for categorical variables were expressed as frequencies and proportions, while continuous variables were presented as means and standard deviations or medians and interquartile ranges, according to their distributional characteristics.

Associations between cannabis use and potential explanatory variables were initially assessed using univariate analyses. Variables showing significant associations in univariate analysis were subsequently included in a multivariate binary logistic regression model to identify factors independently associated with cannabis use. Results were expressed as odds ratios (ORs) with corresponding 95% confidence intervals (95% CIs). A p-value < 0.05 was considered statistically significant.

Ethical statement

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The study was approved by the Ethics Committee of the Faculty of Medicine, University of Niš (approval number: 12-11272/2-5). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Results

Sociodemographic Characteristics and Lifestyle Habits

A total of 226 pharmacy students participated in the study. The mean age of the respondents was 20.88 ± 1.96 years. Most participants were female (83.2%), unemployed (90.7%), and living with their parents (63.7%). More than half of the students had previously completed medical secondary school (65.9%). Students from all years of study were represented, with first-year students constituting the largest proportion of the sample (28.8%). The majority of respondents had not repeated an academic year (77.9%).

Regarding lifestyle habits, 31.9% of students reported smoking, while alcohol consumption was reported by 89.8% of respondents. A history of acute alcohol intoxication was reported by 38.9% of students, and 38.1% reported consuming energy drinks. Mental health therapy was reported by 6.6% of respondents. More than half of the students (52.2%) reported knowing at least one person who uses cannabis. The sociodemographic characteristics and lifestyle habits of the study participants are presented in Table 1.

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Table 1. Sociodemographic characteristics and lifestyle habits of the study participants

Variable	Number (percentage)
Age (years), mean (SD)	20.88 (1.96)
Sex, n (%)	
Male	38 (16.8)
Female	188 (83.2)
Place of residence, n (%)	
Up to 5000 inhabitants	19 (8.4)
Up to 50000 inhabitants	39 (17.3)
Up to 500000 inhabitants	160 (70.8)
More than 500000 inhabitants	8 (3.5)
Living arrangement, n (%)	
Alone	48 (21.2)
Parents	144 (63.7)
Friend/Partner	34 (15.1)
Employment status, n (%)	
Unemployed	205 (90.7)
Employed	21 (9.3)
Previously completed secondary education, n (%)	
Medical	149 (65.9)
General	77 (34.1)
Year of study, n (%)	
1st year	65 (28.8)
2nd year	46 (20.4)
3rd year	46 (20.4)
4th year	32 (14.2)

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5th year	37 (16.4)
Repeating a year, n (%)	
No	176 (77.9)
Yes	50 (22.1)
Smoking, n (%)	
No	154 (68.1)
Yes	72 (31.9)
Alcohol consumption, n (%)	
No	23 (10.2)
Yes	203 (89.8)
Acute alcohol intoxication, n (%)	
No	138 (61.1)
Yes	88 (38.9)
Energy drink consumption, n (%)	
No	140 (61.9)
Yes	86 (38.1)
Mental health therapy, n (%)	
No	211 (93.4)
Yes	15 (6.6)

Prevalence and Patterns of Cannabis Use

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The lifetime prevalence of cannabis use among pharmacy students is presented in

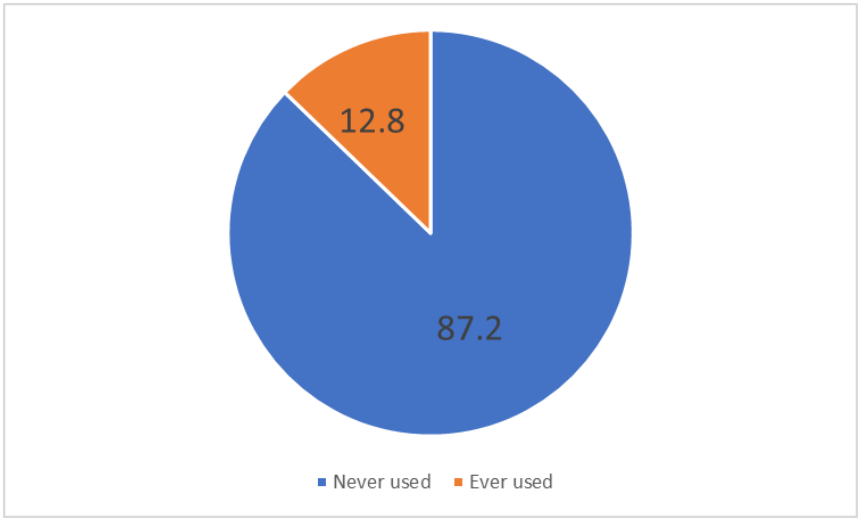


Figure 1. Lifetime prevalence of cannabis use among pharmacy students

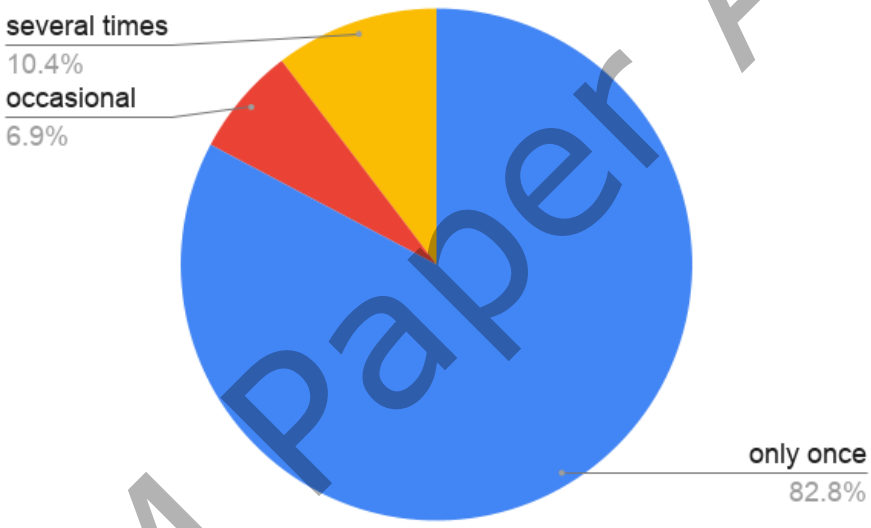


Figure 2. Frequency patterns of cannabis use among cannabis users

1. Figure 2 presents the frequency patterns of cannabis use among students who reported lifetime cannabis use. Among cannabis users, the majority reported having used cannabis only once (10.6% of the total sample), whereas occasional use was reported by a small proportion of respondents, including use once every few months (0.9%) and several times per month (1.3%). These findings indicate that

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cannabis experimentation was present among pharmacy students, whereas regular use was relatively uncommon.

Factors Associated with Cannabis Use

Several variables were significantly associated with cannabis use in the univariate logistic regression analysis, presented in Table 2. Higher odds of cannabis use were observed among employed students (OR = 5.39, 95% CI: 2.00–14.51, p = 0.001), students in the third and fifth years of study (OR = 3.71, 95% CI: 1.07–12.90, p = 0.039 and OR = 5.65, 95% CI: 1.63–19.61, p = 0.006, respectively), students who had repeated an academic year (OR = 4.17, 95% CI: 1.85–9.41, p = 0.001), smokers (OR = 2.63, 95% CI: 1.19–5.80, p = 0.016), students reporting acute alcohol intoxication (OR = 4.22, 95% CI: 1.82–9.76, p = 0.001), and those receiving mental health therapy (OR = 3.90, 95% CI: 1.23–12.36, p = 0.021). In addition, students who reported knowing someone who uses cannabis had substantially higher odds of cannabis use (OR = 33.98, 95% CI: 4.53–254.68, p = 0.001).

Table 2. Predictors of Cannabis Use Among Students

Variable	Cannabis, n (%)	χ^2 / P	Univariate OR (95% CI)	P	Multivariate OR (95% CI)	P
Sex						
Male	5 (13.2)	0.947	Referent	0.947		
Female	24 (12.8)		0.97 (0.344-2.715)			
Place of residence						
Up to 5000 inhabitants	1 (5.3)	0.778	Referent			
Up to 50000 inhabitants	5 (12.8)		2.65 (0.287-24.415)	0.390		
Up to 500000 inhabitants	22 (13.8)		2.87 (0.365-22.5909	0.317		
More than 500000 inhabitants	1 (12.5)		2.571 (0.141-47.017)	0.524		
Living arrangement						
Alone	6 (12.5)	0.939	Referent			
Parents	18		1.00	1.000		

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	(12.5)		(0.372-2.685)			
Friend/Partner	5 (14.7)		1.21 (0.336-4.331)	0.773		
Employment status						
Unemployed	21 (10.2)	**<0.001**	Referent		Referent	
Employed	8 (38.1)		5.39 (2.004-14.506)	0.001	3.89 (1.036-14.609)	0.044
Previously completed secondary education						
Medical	17 (11.4)	0.374	Referent			
General	12 (15.6)		1.43 (0.646-3.179)	0.376		
Year of study						
1st year	4 (6.2)	**0.011**	Referent		Referent	
2nd year	4 (8.7)		1.45 (0.344-6.133)	0.612	0.65 (0.280-8.360)	0.623
3rd year	9 (19.6)		3.71 (1.066-12.903)	0.039	1.218 (0.166-3.966)	0.797
4th year	2 (6.2)		1.017 (0.176-5.867)	0.985	0.50 (0.392-1.472)	0.308
5th year	10 (27.0)		5.648 (1.627-19.614)	0.006	1.60 (0.133-2.919)	0.549
Repeating a year						
No	15 (8.5)	<0.001	Referent		Referent	
Yes	14 (28.0)		4.17 (1.851-9.412)	0.001	2.406 (0.793-7.301)	0.121
Smoking						
No	14 (9.1%)	0.014	Referent		Referent	
Yes	15 (20.8)		2.63 (1.193-5.803)	0.016	1.77 (0.673-4.663)	0.247
Alcohol consumption						
No	1 (4.3)	0.199	Referent			
Yes	28 (13.8)		3.52 (0.456-27.161)	0.227		
Acute alcohol intoxication						
No	9 (6.5)	<0.001	Referent		Referent	
Yes	20 (22.7)		4.22 (1.820-9.763)	0.001	2.21 (0.827-5.887)	0.114

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Energy drink consumption						
No	17 (12.1)	0.693	Referent			
Yes	12 (14.0)		1.17 (0.531-2.594)	0.693		
Mental health therapy						
No	24 (11.4)	0.014	Referent		Referent	
Yes	5 (33.3)		3.896 (1.228-12.360)	0.021	1.17 (0.246-5.484)	0.841
Knowing someone who uses Cannabis						
No	1 (0.9)	<0.001	Referent		Referent	
Yes	28 (23.9)		33.978 (4.533-254.677)	0.001	21.58 (2.794-166.635)	0.003

Independent Predictors of Cannabis Use

Variables that were statistically significant in the univariate analysis were subsequently included in a multivariate logistic regression model. After adjustment for potential confounding factors, only employment status and knowing someone who uses cannabis remained independently associated with cannabis use.

Employed students had more than fourfold higher odds of reporting cannabis use compared with unemployed students (OR = 3.89; 95% CI: 1.036–14.609; p = 0.044). The strongest independent predictor was knowing someone who uses cannabis, which was associated with approximately eighteenfold higher odds of cannabis use (OR = 21.58; 95% CI: 2.794–166.635; p = 0.003).

In contrast, year of study, academic year repetition, smoking status, acute alcohol intoxication and mental health therapy were no longer significantly associated with cannabis use after adjustment for confounding variables.

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Although these factors did not remain statistically significant in the multivariate model, descriptive analyses revealed notable differences in cannabis use across student subgroups. Cannabis use was more frequently reported among fifth-year students (27.0%) compared with first-year students (6.2%), among students who had repeated an academic year (28.0% vs. 8.5%), among smokers (20.8% vs. 9.1%), and among students reporting a history of acute alcohol intoxication (22.7% vs. 6.5%). The highest prevalence was observed among students who reported knowing someone who uses cannabis (23.9% vs. 0.9%).

Discussion

Cannabis use was reported by 12.8% of pharmacy students included in the present study. The relatively low prevalence observed in the present study may reflect cultural and social factors, as well as the illegal status of cannabis in Serbia, which may limit both availability and willingness to report use.

The observed prevalence was lower than that reported in a systematic review and meta-analysis by Papazisis et al., which found a pooled lifetime cannabis use prevalence of 31.4% among medical students worldwide, with 8.8% claiming current use (16). Similarly, Hasan et al. reported that 23% of pharmacy students had used cannabis at least once in their lifetime (17). On the contrary, a study conducted by Prowse et al. in 2025, revealed that 52.4% of respondents used cannabis in the last month (18). Differences in prevalence rates may reflect variations in cultural attitudes toward cannabis, legal regulations, availability of illicit substances, and social norms across different countries and regions.

Among students who reported cannabis use, the majority indicated having used cannabis only once, whereas regular or more frequent use was uncommon. This finding suggests that experimentation rather than habitual use predominated in the studied population. Similar observations have been reported among university students, where cannabis use was often associated with curiosity, social situations, and occasional experimentation rather than established substance use behavior. Although the overall prevalence of cannabis use was relatively low, even experimental exposure remains important from a public health perspective because early contact with psychoactive substances may increase the likelihood of future substance use and facilitate entry into substance-using social environments.

The strongest predictor of cannabis use identified in the present study was knowing someone who uses cannabis. Students who reported knowing a cannabis user had approximately eighteenfold higher odds

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of reporting cannabis use themselves. This finding highlights the important role of social exposure and peer influence in substance use behaviors among young adults. Similar observations have been reported in previous studies. In a systematic review of longitudinal studies, Torrejón-Guirado et al. concluded that friends' cannabis use was the factor most consistently associated with cannabis use among adolescents and young adults (19). Likewise, Barnett et al. demonstrated that university students were more likely to form friendships with peers who exhibited similar cannabis use behaviors, while their own cannabis use also became more similar to that of their peers over time (8). Tucker et al. further reported that cannabis use was associated with the characteristics and behaviors of close friends, emphasizing the importance of peer relationships in shaping substance use behaviors among young adults (20). These findings suggest that both social selection and social influence may contribute to cannabis use among university students. Individuals may actively seek friendships with peers who share similar substance use behaviors, while simultaneously adopting behaviors observed within their social networks. Furthermore, exposure to cannabis-related content on social media may increase the perceived social acceptability of cannabis use among young people (21). Together, these findings indicate that social environments play a central role in shaping attitudes and behaviors related to cannabis use.

Employment status also emerged as an independent predictor of cannabis use. Employed students demonstrated more than fourfold higher odds of reporting cannabis use compared with unemployed students. Although the mechanism underlying this association cannot be established due to the cross-sectional design of the study, employment may be associated with greater financial independence, broader social interactions, and increased exposure to environments where cannabis use is more common. However, this finding should be interpreted cautiously and warrants further investigation in larger studies. To the best of our knowledge, employment status has rarely been investigated as an independent predictor of cannabis use among pharmacy students, making direct comparison with previous studies difficult.

Beyond the independent predictors identified in the multivariable model, several student characteristics were associated with higher prevalence of cannabis use. Cannabis use was more frequently reported among fifth-year students, students who had repeated an academic year, smokers, and those with a history of acute alcohol intoxication. These findings are in line with previous studies indicating that

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cannabis use often coexists with other health-risk behaviors and may reflect broader social and lifestyle patterns among university students.

The findings of the present study have important implications for pharmacy education. Although the prevalence of cannabis use was relatively low, cannabis remains the most commonly reported illicit substance among students. Previous studies have demonstrated that pharmacy students frequently report gaps in knowledge regarding cannabis and often feel insufficiently prepared to counsel patients about cannabis use and cannabis use disorder. Hasan et al. reported discrepancies in pharmacy students' knowledge and attitudes regarding cannabis, while Moeller et al. demonstrated limited knowledge regarding medical cannabis among pharmacy students nationwide (17). In study conducted by Moeller et al, lack of knowledge was observed (22). Similarly, Caligiuri et al, Ganna et al. and Jacobs et al. emphasized the need for greater curricular coverage of cannabis-related topics and improved preparation of future pharmacists for patient counseling (23), (24), (25), (26), (27), (28). Together, these findings support the inclusion of evidence-based education regarding cannabis use, risks, and substance use disorders within pharmacy curricula.

The findings of the present study have important public health implications. Pharmacy students represent future healthcare professionals who may play a role in patient counseling, substance use prevention, and public health education. Understanding factors associated with cannabis use in this population may contribute to the development of targeted educational and preventive strategies aimed at reducing substance-related harms and promoting informed decision-making regarding psychoactive substances.

Study limitations

Several limitations should be acknowledged. The study was conducted at a single faculty and relied on self-reported data, which may be affected by recall and reporting bias. Due to the cross-sectional design, causal relationships cannot be established. Furthermore, the relatively small number of participants reporting lifetime cannabis use (n = 29), together with the limited number of observations in certain predictor categories, may have affected the statistical power and stability of the multivariable logistic regression model. This is reflected in the wide confidence intervals observed for some odds ratios,

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indicating considerable uncertainty regarding the magnitude of the estimated associations. Therefore, although certain associations reached statistical significance, the findings should be interpreted cautiously. Further studies involving larger and more diverse student populations are needed to obtain more precise and robust estimates.

Conclusion

Cannabis use was reported by a minority of pharmacy students, with most users indicating experimental rather than regular use. The strongest factor associated with cannabis use was knowing someone who uses cannabis, highlighting the important role of social exposure and peer-related influences in shaping substance use behaviors among young adults. Although several academic and lifestyle factors were associated with cannabis use in univariate analyses, only employment status and knowing a cannabis user remained independent predictors after adjustment for potential confounding factors. These findings suggest that social and environmental influences may play a more important role than individual demographic characteristics in cannabis use among pharmacy students. Further multicenter studies involving larger student populations are warranted to better understand factors associated with cannabis use and to support the development of targeted prevention strategies in university settings.

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