

## Prevalence of illicit drug use among medical students in Northern Greece and association with smoking and alcohol use

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### Abstract:

**Aim:** The aim of this study was to estimate the prevalence of illicit drug use among medical students in Northern Greece, to identify the motivations for cannabis use and also to investigate the possible associations with smoking and alcohol misuse.

**Methods:** A sample of undergraduate students completed an anonymous, self-administered, web-based survey assessing lifetime and past-year illicit substance use. To further evaluate the motivation to use, the responders were classified into three subtypes (self-medication, recreational, and mixed). The CAGE questionnaire and a question assessing binge drinking were also used. Illicit substance use was correlated with age, gender, study year, CAGE and binge drinking.

**Results:** Five hundred and ninety-one undergraduate medical students completed the survey. The lifetime prevalence of illicit drug use was 24.7 %, while the most used drug was cannabis (22.2 %). The past-month prevalence of cannabis use was 8.1 %. Experimentation was the predominant reported motivation for its use, and the recreational subtype was the most prevalent. Binge drinking behavior was reported by 22.7 % of the sample, and the CAGE screening test was positive for 6.4 % of the students. Most students (80.4 %) characterized themselves as non-smokers. In the multivariate analysis, lifetime use of illicit drugs was significantly correlated with smoking and binge drinking. No associations were found with gender, age, study year or CAGE.

**Conclusion:** Smoking and binge drinking were found to be risk factors for illicit drug use, whereas no association was found with gender, age, study year and CAGE. HIPPOKRATIA 2017, 21(1): 13-18.

**Keywords:** Illicit drugs, cannabis, smoking, alcohol, prevalence, medical students

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### Introduction

Illicit substance use among medical students is a phenomenon that has been widely studied, but it remains of interest due to its' high prevalence and the potential consequences. The most common illicit substance used by medical students is cannabis. According to recently published data, 11.84 % of medical students reported recent (within the preceding month) cannabis use<sup>1</sup>. Alcohol misuse among medical students is also remarkable, and it is evident that studying medicine or working as a physician does not in itself, prevent harmful alcohol use, while alcohol use during studies predicts hazardous drinking after leaving medical school<sup>1-3</sup>. It is unquestionable that the misuse of substances such as cannabis and alcohol potentially influence the affected physicians and their ability to treat patients properly. Alcohol abuse by doctors has been associated with increased risk of medical errors, while doctors' attitudes towards health and drinking behaviors may influence their preventive counseling practices<sup>4</sup>. Also, the perception and detection of patients with substance abuse problems may be influenced by

physicians' personal experience with substance abuse<sup>5</sup>.

The aim of our study was to estimate the prevalence of illicit drug use among medical students in Northern Greece, to identify the motivations for cannabis use and also to investigate the possible associations with smoking and alcohol misuse. It is the first study among Greek medical students assessing both lifetime and past-year use of a wide range of illicit drugs, alcohol, and tobacco.

### Methods

#### Study Design

This cross-sectional study was conducted from January to March 2015 at the School of Medicine of the Aristotle University of Thessaloniki, which is the second largest Medical School in Greece. A simple random sample of 700 students was drawn from the total undergraduate student population (over 3,500 students). The sample size was calculated with the following method: based on the recently published data<sup>1</sup>, we supposed that the prevalence of illicit drugs' use among medical students was 12 %, for a margin of error 3 % and confidence

level 95 %, so we used precision approach. The sample size was then calculated by the type:  $n > 1.962p(1-p)/\delta^2 = 1.962 \times 0.12 \times 0.088 / 0.032 = 451$  (1.96 is the 5 % sign of the normal distribution). We added more than 45 % in this sample because some students would never answer the questionnaire, so the final sample we used was 700 students. All the registered medical students were appropriate to participate in the study. Then a simple method of random allocation was used, where a table of random numbers was used. In this table each number corresponds to a medical student, every number occurs equally, and the ordering of numbers is random and thus, unpredictable. The entire sample was emailed a pre-notification e-mail describing the study and inviting students to complete a web-survey. The final response rate was 84.4 % ( $n = 591$ ), and the completion rate was 100 % (participants were required to answer all questions in the survey for it to be submitted). No incentives were provided to the students for completing the survey.

#### *Compliance with Ethical Standards*

The study was approved by the Ethical Committee of the School of Medicine of the Aristotle University of Thessaloniki (No: 110, date: 28/12/2014). All the participants were informed regarding the aim and objectives of the study. A comprehensive information leaflet was also uploaded to the webpage for the participants.

#### *Measurements*

The data were collected using an anonymous, self-administered, web-based survey with the objective of gathering information about the use of illicit substances. To assess lifetime and past-year use, the questions used were based on similar questionnaires reported previously<sup>6</sup>. The lifetime prevalence was assessed with the following question: 'Have you ever used any of the following illicit drugs?' The past-year prevalence was assessed with the question: 'In the past 12 months have you used any of the following drugs?' There were separate questions for each of the following illicit drugs: 1) Cannabis, 2) LSD, 3) Heroin, 4) Ecstasy, 5) Cocaine, 6) Shisha, 7) Crack, 8) Ketamine, 9) Amphetamine, 10) Methadone, 11) Fentanyl, 12) Mephedrone, 13)  $\gamma$ -Butyrolactone (GBL), 14) Mushrooms, 15) Buprenorphine or 16) Inhalants (solvents, aerosols, gases, and nitrites).

For regular cannabis users (use several times per month), past-month use was further assessed with the question: 'What is the frequency of cannabis use?' The response scale for this question was (1) no use, (2) 1-2 times per month, (3) 1-2 times per week, (4) 3-4 times per week, (5) every day. Furthermore, to evaluate attitudes about cannabis use, the students were asked: 'Do you think that cannabis is dangerous for your health?'

To further assess their motivations to use cannabis, respondents were asked to disclose the reasons for its use. No questionnaires are validated for this purpose; there are only some studies evaluating the motives for non-medical use of prescription medications<sup>6</sup>. However,

concerning cannabis use among medical students, studies assessing the motivations for its use are sparse<sup>7</sup>.

Eight motivations were included: 'to relieve pain', 'because it helps decrease anxiety', 'because it helps me sleep', 'to relieve depression', 'because it counteracts the effects of other drugs', 'because it gives me a high', 'because of experimentation', and 'because I'm addicted'. The first five replies were considered as self-medication attempts while the last three were characterized as recreational motivations. Finally, if respondents endorsed combinations of self-treatment and recreational motives they were considered as having mixed motivations<sup>6</sup>.

To assess smoking the following question was asked: 'Do you smoke? If yes, how many cigarettes per day?' The response scale for this question was (1) no smoking, (2) 0-10, (3) 10-20, (4) 20-40, (5) >40 cigarettes per day.

The National Institute on Alcohol Abuse and Alcoholism defines binge drinking as 'a pattern of drinking that brings blood alcohol concentration levels to 0.08 g/dl'. This typically occurs after four drinks for women and five drinks for men within around two hours<sup>8</sup>. Based on this definition, as used in different studies<sup>3,9</sup>, binge drinking was measured using the following single item question: 'Over the past two weeks, how many occasions have you had five or more drinks in a row (four or more for women)?' The response scale ranged from (1) none to (6) ten or more occasions.

The CAGE is a standard four-item brief screening instrument used to identify potential alcohol abuse and dependence<sup>10</sup>. Respondents who consumed alcohol were asked to recall how many times in the preceding year they had experienced the following: a) felt that they should cut down their drinking, b) were annoyed when people criticized their drinking, c) felt remorse or guilt after drinking, and d) had first thing in the morning a drink as an 'eye-opener'. If a respondent reported having experienced two or more of these events, this was considered (been consistent with previous college-based research) a 'positive' screening test result, denoting potential alcohol abuse<sup>11</sup>.

#### *Statistical Analyses*

Prevalence of illicit drugs was calculated by dividing the number of respondents reporting at least one drug use by the total number of respondents. Descriptive statistics are displayed as mean  $\pm$  standard deviation (SD) for continuous variables and percentage for categorical variables. The primary outcome variable of interest was the lifetime illicit drug use. Lifetime use was managed as a categorical variable, and univariate analyses (binary logistic regression) were carried out between categorical dependent (lifetime use of illicit drugs) and independent variables. Using significant variables ( $p < 0.05$ ) from the univariate analysis, a multivariate logistic regression analysis was used to identify factors independently associated with lifetime use of illicit drugs. Estimated associations are described in terms of odds ratios (OR) with 95% confidence intervals (CIs). The level of statistical

significance was set at 0.05. All statistical analyses were performed using the IBM SPSS Statistics for Windows software (IBM SPSS, IBM Corp., Armonk, NY, USA), version 22.0.

## Results

The final sample of the study consisted of 591 undergraduate medical students. Their mean age was 21.7 (SD: 1.8, range: 18-28) years. Of the sample population, 56.3 % was female and 43.7 % male. No gender differences were observed in the prevalence of use of any illicit substance, alcohol or tobacco (Table 1). The majority of the respondents (62.8 %) were clinical level students, while 37.2 % were preclinical level students. In Greece, clinical level commences on the fourth year of Medical studies. The demographic characteristics of the sample closely resembled the overall student population of the Medical School.

The lifetime prevalence of illicit drug use was reported at 24.7 % while the majority of the users reported cannabis use (n =131, 22.2 %). Also, 2.2 % reported lifetime use of LSD, 0.2 % heroin, 2.4 % ecstasy, 2.4 % cocaine, 1.4 % shisha, 0.2 % crack, 2 % ketamine, 1.9 % amphetamine, 0.2 % methadone, 1.9 % mephedrone, 0.2 % GBL, 1.9 % mushrooms, and 3.1 % reported use of inhalants (Table 1). Regarding the prevalence of past-year drug use, cannabis was also the most frequently used drug, reported by 17.8 % (Table 2). Furthermore, 8.1 % (n =48) of the respondents reported themselves as regular users of cannabis (monthly use), specifically, 4.4 % (n =26) reported use 1-2 times/month, 1.4 % (n =8) 1-2 times/week, 0.8 % (n =5) 3-4 times/week, and 1.5 % (n =9) every day. The majority of the students (65.7 %) considered cannabis use to be dangerous for health. The per-

**Table 1:** Gender differences among any illicit substance, alcohol or tobacco use in this cross-sectional, web-based survey assessing lifetime and past-year illicit substance use among 591 undergraduate medical students in Northern Greece.

	Male		Female	
	(n)	(%)	(n)	(%)
Cannabis	65	11	66	11.2
LSD	10	1.7	3	0.5
Heroin	1	0.2	0	0
Ecstasy	8	1.4	6	1
Cocaine	8	1.4	6	1
Shisha	2	0.4	6	1
Crack	1	0.2	0	0
Ketamine	5	0.8	7	1.2
Amphetamine	6	1	5	0.9
Methadone	1	0.2	0	0
Fentanyl	0	0	0	0
Mephedrone	4	0.7	7	1.2
GBL	1	0.2	0	0
Mushrooms	10	1.7	1	0.2
Buprenorphine	0	0	0	0
Inhalants	8	1.4	10	1.7
Smoking	54	9.2	62	10.5
Binge drinking	65	11	69	11.7
CAGE	20	3.4	18	3

n: number of answers, %: percentage of each answer, LSD: lysergic acid diethylamide, GBL: gamma-Butyrolactone.

centages of use for the other illicit substances (cocaine, LSD, ecstasy, etc.) was low. Thus, they are not further analyzed in our results.

Regarding the motivations for drug use, the recreational subtype was the most prevalent subtype for the lifetime use of cannabis (19.3 % recreational, 2.5 % mixed, 0.3 % self-medication) and experimentation was the predominant motivation (16.4 %, n =97). Only a small number of students reported use for self-medication or mixed purposes (Table 3).

Most students (80.4 %) characterized themselves as non-smokers at the time of the study, while the majority of the smokers (11.5 %) reported consuming 0-10 cigarettes per day. Regarding binge drinking, approximately one-fifth of the students (22.7 %) scored positive, while the CAGE screening test was positive for 6.4 % of the respondents (Table 4).

**Table 2:** Prevalence of lifetime and past-year use of illicit drugs among the 591 undergraduate medical students who participated in this cross-sectional, web-based survey.

Drugs	Lifetime (n)	Lifetime (%)	Past year (n)	Past year %
Cannabis	131	22.2	105	17.8
LSD	13	2.2	11	1.9
Heroin	1	0.2	1	0.2
Ecstasy	14	2.4	13	2.2
Cocaine	14	2.4	11	1.9
Shisha	8	1.4	7	1.2
Crack	1	0.2	1	0.2
Ketamine	12	2	0	0
Amphetamine	11	1.9	9	1.5
Methadone	1	0.2	1	0.2
Fentanyl	0	0	0	0
Mephedrone	11	1.9	10	1.7
GBL	1	0.2	1	0.2
Mushrooms	11	1.9	3	0.5
Buprenorphine	0	0	0	0
Inhalants	18	3.1	4	0.7

n: number of answers, %: percentage of each answer, LSD: lysergic acid diethylamide, GBL: gamma-Butyrolactone.

**Table 3:** Motivation for lifetime use of cannabis among the 591 undergraduate medical students who participated in this cross-sectional, web-based survey.

Motives	Frequency (n)	Percentage (%)
To relieve pain	2	0.3
To decrease anxiety	14	2.4
It helps me sleep	12	2
To relieve depression	2	0.3
It counteracts the effects of other drugs	1	0.2
It gives me a high	53	9.0
Experimentation	97	16.4
Motivation	Frequency (n)	Percentage (%)
No use	460	77.9
Self-treatment	2	0.3
Recreational	114	19.3
Mixed	15	2.5

n: number of answers, %: percentage of each answer.

**Table 4:** Smoking and alcohol use (Binge drinking and CAGE) among the 591 undergraduate medical students who participated in this cross-sectional, web-based survey.

Characteristics	Frequency (n)	Percentage (%)
No smoking	475	80.4
0-10 / day	68	11.5
10-20 / day	43	7.3
20-40 / day	4	0.7
>40 / day	1	0.2
Binge drinking	134	22.7
CAGE	38	6.4

n: number of answers, %: percentage of each answer.

**Table 5:** Factors associated with illicit drugs' use among the 591 undergraduate students (univariate analysis and multivariate logistic regression).

Explanatory variables (univariate analysis)	p value	OR	95% CI
Sex	0.113	0.738	0.507-1.074
Age	0.468	1.038	0.938-1.150
Clinical level	0.898	0.975	0.663-1.434
Smoking	<0.001*	5.899*	3.812-9.127*
Binge drinking	<0.001*	3.498*	2.313-5.289*
CAGE	0.012*	2.366*	1.207-4.640*
Explanatory variables (multivariate analysis)	p value	OR	95% CI
Sex	-	-	-
Age	-	-	-
Clinical level	-	-	-
Smoking	<0.001*	4.871*	3.101-7.652*
Binge drinking	<0.001*	2.620*	1.679-4.089*
CAGE	0.102	1.869	0.883-3.956

OR: odds ratios, 95% CI: 95% confidence intervals, \*: parameters indicating statistical significance.

In the univariate analysis, the following characteristics were not significantly associated with lifetime use: sex, age, and clinical level. On the contrary, smoking habit, binge drinking, and CAGE screening test were significantly associated with illicit drug use (Table 5). In the multivariate analysis, smoking and binge drinking were independently associated with illicit drug use. Lifetime use of illicit drugs was significantly higher among smokers than non-smokers (OR: 4.871, 95% CI: 3.101-7.652); binge drinking was also associated with higher risk of illicit drug use (OR: 2.620, 95% CI: 1.679-4.089) (Table 5).

## Discussion

This is the first study among Greek medical students assessing both lifetime and current use of a wide range of illicit drugs and their association with alcohol misuse and smoking. The prevalence of use of certain illicit substances was previously assessed in a smaller study conducted at the same medical school, which found lifetime marijuana use of 19.5 %, cocaine 2.7 %, and heroin 0.7 %<sup>12</sup>. Interestingly, we found similar rates (22.2 %, 2.4 %, and 0.2 %, respectively) for these substances, but significantly lower rates for LSD (2.2 % vs 9.75 %) and amphetamines (1.9 % vs 9.54 %). We further found a past-year prevalence of cannabis use of 17.8 % and a past-month prevalence of 8.1 %; the past-month use is an indicator of current substance use. A recently published review summarized the evidence on the epidemiology of il-

legal drug use among medical students worldwide. According to these results (which should be interpreted with caution due to the heterogeneity of the studies included), among 17,887 medical students, cannabis was used by 1-6 % on a weekly/daily basis and by 11.8 % during the preceding month. Analysis by geographical area, revealed past-month cannabis use been 20 % in Europe, 16.5 % in North America and 10 % in Latin America. The male to female usage ratio was 2:1. Further international studies assessing lifetime and recent use of illicit substances reported various percentages ranging from 4-5 %<sup>13,14</sup> to 25 %<sup>2</sup> for past-month cannabis use. The majority of these studies noticed that male students tend to consume cannabis more frequently than female students. Gender differences were also noticed in international studies concerning alcohol and tobacco use, where male students, usually during the senior academic years, presented more frequent misuse of these substances<sup>2,15,16</sup>. However, this was not confirmed in the current study where no gender differences were observed in the prevalence of illicit drug use.

In our sample, 80.4 % of the students characterized themselves as non-smokers at the time of the survey, while the majority of the smokers (11.5 %) reported smoking 0-10 cigarettes per day. Previous studies in Greece reported a higher percentage of smoking among medical students, ranging from 29 % to 41 %<sup>17-19</sup>. The smaller percentage of regular smokers recorded in our sample is consistent with the recently published data concerning the general population in Greece, which show a descending trend of current cigarette smoking among young Greek students, adolescents<sup>20</sup>, and adults<sup>21</sup>. Consistently and as highlighted in an international review of tobacco smoking among medical students, most studies reporting low rates of smoking among medical students, concurrently reported low rates of tobacco usage in the general population. Among medical students, the prevalence of smoking varies widely between students of different countries and also between the students' genders within the same countries<sup>22</sup>.

Based on the CAGE scale, 6.4 % of the sample screened positive for alcohol abuse. Furthermore, 22.7 % presented binge drinking behavior. There are no published Greek studies using these scales among medical students. A small study consisting of 54 medical students revealed that 35 % had more than two incidents of alcohol intoxication during the preceding month<sup>19</sup>, whereas another survey reported a mean amount of alcohol consumption of 2.22 units/week<sup>23</sup>. A nationwide, long-term, prospective study in Norway demonstrated that the use of alcohol for coping with stress predicts hazardous drinking after leaving medical school<sup>3</sup>. Thus, it is important to study this risky behavior among medical students globally.

A significant correlation found in our study was that lifetime use of illicit drugs is higher among students who were smokers. These students are almost five times more likely to use illicit drugs than those who reported no smoking at all. Furthermore, binge drinking was significantly associated with an over threefold increase in

the lifetime use of illicit drugs. These findings are consistent with recent findings among French and US medical students, reporting that binge drinkers were more likely to consume tobacco or illegal substances<sup>24,25</sup>. In another French study, high-risk alcohol consumption was significantly correlated with high-risk cannabis use<sup>26</sup>.

Finally, there are few studies assessing the motivation for cannabis use or the student's perception of its' health risks. In our sample, recreational was the most prevalent subtype for cannabis use and experimentation was the predominant motivation, while the majority of the students considered cannabis use to be dangerous for health. It seems that despite their knowledge on the effects and the possible consequences of using cannabis, recreation and curiosity are sufficient reasons for its use. This is consistent with previous studies among young adults reporting the most common reasons to be enjoyment/fun, conformity, experimentation, social enhancement, boredom, and relaxation<sup>27</sup>. In contrast, a recent study from Pakistan reported that the main reasons for students to use cannabis were addiction, depression, and stress, but not recreation and curiosity<sup>7</sup>. Peer pressure, curiosity, academic stress, family conflicts, living in hostels and male gender have also been observed as factors leading to cannabis use in other studies among medical students<sup>28</sup>.

The reasons leading medical students and young physicians to alcohol consumption seem to be clearly related to working conditions. Doctors consume alcohol to cope with tension and heightened stress experienced during their training due to clinical inexperience, long working hours, workload, and time pressure<sup>29</sup>. Binge drinking in medical school was found to be an important predictor for later binge drinking<sup>3</sup> and over time to increase the risk of alcohol dependence<sup>30</sup>. Thus, our finding that 22 % of the students reported binge drinking behavior raises concerns about their future drinking behavior.

There are some limitations of the present study, which need to be considered. First, its' design was cross-sectional, so we could not investigate a cause and effect relationship. Second, the study was questionnaire-based, thus some information bias may have occurred. Finally, the study population was limited to students from a single Medical School of a University of Northern Greece; consequently, our results cannot be generalized to all Greek students in health professions.

## Conclusion

According to reported results, smoking and binge drinking were found to be risk factors for illicit drug use, whereas no association was found with gender, age, study year, and CAGE. Further international studies among medical students are needed to strengthen the research on the epidemiology of illicit drug use and to extensively study students' motivations and attitudes towards this risky behavior.

## Conflict of interested

None declared by authors.

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In the electronic version of the paper two appendices are included, Appendix I: the Greek questionnaire used in this study, which can also be found in the link: <http://evaluation.med.auth.gr/evaluation/index.php?sid=11218&lang=el> and Appendix II: the English version of the questionnaire used in this study.

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