

# Medical students' knowledge, attitudes and behaviours related to substance use in Lebanon: a cross-sectional survey

Georges Assaf,<sup>1</sup> Samar Nouredine,<sup>2</sup> Silva P. Kouyoumdjian<sup>3</sup> and Jamil El Khoury<sup>4</sup>

معلومات طلاب الكليات الطبية واتجاهاتهم وسلوكياتهم بشأن تعاطي المواد المخدرة في لبنان: مسح مقطعي جورج عساف، سمر نور الدين، سيلفا كويومديان، جميل الخوري

**الخلاصة:** أُبلغ عن تعاطي المواد المخدرة في صفوف طلاب الكليات الطبية في لبنان. وتهدف هذه الدراسة إلى استكشاف معلومات الطلاب اللبنانيين واتجاهاتهم وسلوكياتهم إزاء تعاطي المواد المخدرة وتحديد مستوى انتشارها ومنبئاتها النفسية. وقد أُجري مسح مقطعي لما مجموعه 231 طالباً في الكليات الطبية. وتناول الاستبيان المعلومات والاتجاهات المتعلقة بتعاطي المواد المخدرة والالتزام الديني والاكتئاب والقلق والخصائص السكانية. وتم توزيع العينة بالتساوي حسب نوع الجنس (51.4% من الإناث، و48.6% من الذكور) والتدريب (53.1% طب وقائي؛ و46.9% طب سريري). وبلغت درجة المعرفة 52.65% (انحراف معياري = 14.41)، وانخفضت على نحو كبير في السنة الثانية مقابل السنتين الثالثة والرابعة (48.53% مقابل 57.51% و57.4% و57.4% ( $p < 0.05$ ). وأفاد الطلاب بتلقيهم تدريباً بشأن تعاطي المخدرات أكثر من تعاطي الكحوليات (38.2% مقابل 34.4%). وأفاد ربع أفراد العينة بأنهم يدخنون و57.7% يتعاطى الكحوليات و46.8% يتعاطى المخدرات. وكان من بين المنبئات الكبرى لتعاطي أقل من المخدرات التدخين والاهتمام بالعمل في الميدان. وكشفت النتائج عن نقص المعرفة بالمخدرات وتعاطي المواد المخدرة على نطاق كبير في صفوف طلاب الكليات الطبية اللبنانيين. وعليه، نوصي بتقديم مزيد من التدريب حول تعاطي المواد المخدرة وتوفير المشورة للطلاب.

**ABSTRACT** The study aims were to explore the knowledge, attitudes and behaviours of Lebanese medical students related to substance use and to determine prevalence and psychosocial predictors. A cross-sectional survey of 231 medical students (48.6% male; 53.1% preclinical, 46.9% clinical) was conducted during June 2012–July 2013. The questionnaire addressed knowledge and attitudes about substance use, religiosity, depression, anxiety and demographic characteristics. The knowledge score was 52.7% (standard deviation 14.4%), and was significantly lower in 2nd year students (48.53%) than in 3rd and 4th year students (57.5% and 57.4%) ( $P < 0.05$ ). Students reported more training in drug abuse than alcohol abuse (38.2% vs. 34.4%). One-fourth reported smoking, 57.7% using alcohol and 46.8% using drugs. Significant predictors of lower substance use included intrinsic religiosity and interest in working in the field. The findings reveal inadequate knowledge and considerable substance use in Lebanese medical students. Therefore, training in substance use and counseling of students are necessary.

## Connaissances, attitudes et comportements des étudiants en médecine en matière de consommation de substances psychoactives au Liban : étude transversale

**RÉSUMÉ** La présente étude vise à explorer les connaissances, les attitudes et les comportements des étudiants en médecine libanais en matière de consommation de substances psychoactives, ainsi qu'à déterminer leur prévalence et les prédicteurs psychosociaux. Une étude transversale auprès de 231 étudiants en médecine (48,6 % de sexe masculin ; 53,1 % en études précliniques, 46,9 % en études cliniques) a été conduite de juin 2012 à juillet 2013. Le questionnaire abordait les connaissances et les attitudes en matière de consommation de substances, la religiosité, la dépression, l'anxiété et les caractéristiques démographiques. Le score des connaissances était de 52,7 % (ET = 14,4 %), et était significativement moins élevé en deuxième qu'en troisième et quatrième années (48,53 % contre 57,51 % et 57,4 %,  $p < 0,05$ ). Les étudiants déclaraient être mieux formés dans le domaine de la consommation de drogues que d'alcool (38,2 % contre 34,4 %). Un quart ont rapporté être fumeurs, 57,7% être consommateurs d'alcool et 46,8% de drogues. Les prédicteurs significatifs d'une moins forte consommation de substances incluaient une forte religiosité et un intérêt pour le travail dans ce domaine. Les résultats ont révélé des connaissances insuffisantes et une consommation de substances considérable parmi les étudiants en médecine libanais. Il est donc nécessaire d'organiser une formation dans le domaine de la consommation de substances et de dispenser des conseils aux étudiants.

<sup>1</sup>Department of Family Medicine, Faculty of Medicine, American University of Beirut, Beirut, Lebanon. <sup>2</sup>Hariri School of Nursing, American University of Beirut, Beirut, Lebanon (Correspondence to: Samar Nouredine: sn00@aub.edu.lb). <sup>3</sup>Infectious Disease Epidemiology Group, Weill Cornell Medical College, Qatar. <sup>4</sup>Senior Research Officer, International Rescue Committee, Beirut, Lebanon.

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## Introduction

The abuse of substances, tobacco, alcohol, stimulants and hallucinogenics, has been an ongoing concern for some time. In the Diagnostic and Statistical Manual 4 (DSM-IV), substance abuse and substance dependence were categorized as 2 separate health problems (1). However more recently, the DSM-V merged them into "Substance use disorders" (2). Diagnostic criteria are presented for use disorder, withdrawal and intoxication for: alcohol; caffeine; cannabis; phencyclidine and other hallucinogens; inhalants; opioids; sedatives, hypnotics or anxiolytics; tobacco; stimulants; and other unknown substances. The criteria for use disorders involve problematic patterns of consumption and impaired control over the amount used, craving, giving up social activities in pursuit of the substance, use despite knowledge of recurrent associated physical and psychological problems, tolerance and withdrawal effects (2).

There is empirical evidence of abuse of alcohol, stimulants and narcotics with some regularity during the course of medical education (3). Substance abuse may lead to dependence problems that can jeopardize careers and relationships, and medical errors that compromise patient safety (3,4). Studies from various countries reported the prevalence of excessive drinking among medical students ranging between 7% and 45%, and the prevalence of use of drugs such as cannabis and ecstasy ranging between 4% and 45% (5-9).

Predictors of substance abuse among medical students include sex, age, family history, academic stress and mental disorders (7,9-12). A study of medical students in Lebanon (13) showed high levels of anxiety (69%) and depression (28%), which increase the risk of drug abuse considering the connection between mental health and drug use (2). On the other hand, degree of religiosity was found to be protective against initial alcohol exposure among

university students in Lebanon (14). A more recent study of 118 medical residents in Lebanon (15) documented moderate to severe depressive symptoms in 22%, with depression significantly correlated with drug abuse. The investigators reported an illicit drug abuse rate of 14%, with 12% showing a low level problem and 2.5% a moderate problem. Over half (59%) reported drinking alcohol, with 10% at hazardous levels (15).

Medical education has an impact on how doctors approach substance abuse issues (16). Studies have shown lack of knowledge among medical students and attitudes that could interfere with their care for patients with abuse problems as well as their own wellbeing (16,17). Factors found to contribute to the students' knowledge and attitudes include previous experience with substance use, family history, social and cultural context and exposure to drug education programmes (18). Researchers have highlighted the role of medical education in ensuring that doctors become competent in managing patients with substance abuse. However, some studies have shown that the integration of training in substance abuse management into medical curricula is suboptimal (19,20), leaving physicians unprepared to address these issues in patient care (21). Therefore, measuring students' knowledge and attitudes towards substance use reflects how well medical schools prepare them to address this problem in practice.

In Lebanon, both the French and American systems of medical education are used. The 2nd, 3rd and 4th years of education in the American system are equivalent to the 5th, 6th and 7th years in the French system. Overall, the substance abuse curriculum does not vary between schools of medicine. The preclinical training years include on average 5 hours of lectures on substance abuse, and the clinical training incorporates a 1-month rotation in psychiatry, which may include exposure

to the management of patients with addiction disorders. This indicates the importance of investigating medical students' knowledge and attitude towards substance abuse.

Most of the current research on medical students addresses either substance use with selected predictors or knowledge and attitudes in regard to specific substances. To our knowledge, no published study has comprehensively examined the impact of religiosity, mental health, knowledge and attitudes on the abuse of substances, including alcohol and illicit drugs, among medical students. Thus the aims of this study were to explore the knowledge, attitudes and behaviours of Lebanese medical students related to substance abuse and determine the prevalence and psychosocial predictors of substance abuse in this population.

## Methods

There are 7 medical schools in Lebanon, 6 private and 1 public, all located in Beirut and Mount Lebanon; however, students come from all over the country to these schools. This cross-sectional survey targeted medical students in their last 3 years of study at 1 public and 5 private universities as the 7th university had not graduated its first cohort at the time of the study. Following approval by the institutional review board of the university where the study was conducted (IRB No. NUR.SN.15), we sent letters to the deans of the faculties of medicine of these 6 universities inviting them to participate in the survey. Two universities did not agree to participate, yielding a sample drawn from 1 public and 3 private universities. The survey was conducted between June 2012 and July 2013.

Using Godden's formula (22), at least 274 participants were needed to establish 95% confidence level, considering a finite population and  $\pm 5$  margin of error. Assuming a 50% response rate

(5), we sought to recruit at least 509 participants. At the time of the study there were 690 students in the 4 universities in their last 3 years of medical school (2nd, 3rd and 4th in the American system). The number of students per class ranged between 35 and 85.

All 690 eligible students in the 4 participating universities were sent email announcements about the study from the Dean's office of each medical school. Then a week later questionnaires were sent by regular mail via their university mailboxes, with a covering letter explaining the study and which served as an informed consent document, a return envelope, and instructions to return completed questionnaires to the Dean's office. All the questionnaires were sent in English, as this was the language of instruction in the participating institutions. Reminder emails were sent 1 and 2 weeks later.

The survey included a knowledge and attitudes scale; the Alcohol Use Disorders Identification Test (AUDIT) (23); the Drug Abuse Screening Test (DAST) (24), the Duke Depression and Anxiety scale (DUKE-AD) (25), and the Duke University Religiosity Scale (DUREL) (26). The knowledge and attitude items (17) included 29 multiple choice and true/false knowledge questions and 23 items rated on 3–5 point Likert scales that assessed the attitude regarding substance use. The knowledge items addressed material covered in medical curricula internationally. The attitude items included the participants' perceptions regarding success of treatment, confidence in their ability to treat substance abuse problems, and who can help others with substance use disorders. Substance use was measured using the 10-item AUDIT and the 10-item DAST. A summative score of 8–15 on the AUDIT indicates "hazardous drinking", 16–19 "harmful drinking" and  $\geq 20$  "severe dependence" (23). A DAST score of zero indicates no problem, 1–2 low risk, 3–5 moderate risk, 6–8 substantial risk, and 9–10

severe risk (24). Tobacco smoking was also assessed.

Anxiety and depression were measured using the 7-item DUKE-AD, rated on a 3 point Likert scale (25). A score  $\geq 5$  indicates excessive symptoms of anxiety and/or depression. This brief screening instrument was chosen to reduce the research participants' burden. A diagnostic measure was not used since depression and anxiety were not the main outcomes in this study. The 5-item DUREL scale measures organizational and private religious activity and intrinsic religiosity. The DUREL has been used in many large cross-sectional and longitudinal studies worldwide, and is available in 10 languages, including Arabic (26).

The data were analysed using SPSS, version 20.0. Summative scores were calculated for the knowledge, AUDIT, DAST, DUKE-AD and DUREL scales. A cut-off score of 70% was used to determine whether knowledge was adequate or not (17).

The attitude scale data were analysed per item since they measure different concepts and thus cannot be synthesized into a summative or mean score. Frequencies, percentages, means and standard deviations were used to describe the sample. Sex and class difference for the knowledge, AUDIT and DAST scores as well as the attitude items were analysed using *t*-tests, the non-parametric median test, and analysis of variance (ANOVA) with Bonferroni correction. Since the DAST and AUDIT data were right skewed, Spearman's rho correlation coefficient was calculated between the AUDIT, DAST and the knowledge score, attitude items, DUKE-AD and DUREL scores. Two multiple linear regression analyses were conducted to predict alcohol and drug use. The standard error, *P*-value, and 95% confidence interval for the regression coefficients were estimated using the bootstrap technique (27). This is a nonparametric statistical technique that can provide more-accurate

inferences when the sample size is small or in case assumptions of normality or homoscedasticity are violated. In the bootstrap analysis, 1000 random samples of 231 participants are drawn, with replacement of participants from the original data set. In these samples some participants may be repeated while others may be omitted while keeping the sample size of 231. This 1000 samples are needed for accurate estimation of confidence intervals (27).

## Results

Our sample comprised 231 medical students out of the 690 eligible, a 33.3% response rate. The average response rates were 47.7% for 2nd year students, 21.1% for 3rd year students and 31.2% for 4th year students. Table 1 describes the sample characteristics. There were 194 students (90.3%) aged under 25 years; the age range was 21–28 years, mean 23 [standard deviation (SD) = 1.18] years. Around two-thirds of the sample perceived their economic status to be similar to that of their peers; 28.4% reported attending church or mosque  $\geq 1$  time per week and just over half reported engaging in private religious activity  $\geq 1$  time per week.

Fifty five students (25.3%) reported smoking (Table 1). Only 220 students answered the alcohol questions; of those 127 (57.7%) stated they drank alcohol, including 30 (13.6%) who drank  $\geq 2$  times per week. Forty seven students (35.6%) reported consuming  $> 2$  drinks on a typical day. According to the DAST score, 117 students (53.2%) had no drug problems; only 20 (9.1%) were at moderate or substantial risk. The DUKE-AD results showed that 126 students (59.7%) were at risk of anxiety and/or depression. Bivariate analysis using the median test showed men to report significantly higher rates of alcohol use (median AUDIT scores 3 in men vs 1 in women,  $P = 0.003$ ) and drug use (median DAST scores 1 in

**Table 1 Personal characteristics of medical students in Lebanon (n = 231)**

Characteristic	No.	% <sup>a</sup>
<b>Age under 25 years</b>	194	90.3
<b>Male</b>	104	48.6
<b>Year of training</b>		
Med II	101	43.7
Med III	51	22.1
Med IV	79	34.2
<b>Perceived economic status compared to peers</b>		
Poorer than most	21	9.9
About the same as most	138	64.8
Richer than most	54	25.4
<b>Frequency of attending church or mosque</b>		
Never	46	21.8
Once/a few times a year	69	32.7
A few times a month	36	17.1
≥ 1 time per week	60	28.4
<b>Frequency of private religious activity (prayer, meditation)</b>		
Rarely/never	59	28.0
A few times a month	40	19.0
1–6 times a week	72	34.1
Daily	40	19.0
Smokes tobacco	55	25.3
<b>Drinks alcohol<sup>b</sup></b>		
Never	93	42.3
≤ 1 time a month	48	21.8
2–4 times a month	49	22.3
≥ 2 times a week	30	13.6
<b>No of drinks consumed on a typical day when drinking</b>		
1–2	85	64.4
3–4	26	19.7
> 5	21	15.9
<b>Drug use screening (DAST)</b>		
No problem	117	53.2
Low risk	83	37.7
Moderate level	15	6.8
Substantial level	5	2.3
At risk for anxiety and/or depression (DUKE-AD)	126	59.7

DAST = drug abuse screening test.

DUKE-AD = Duke Anxiety Depression Scale.

<sup>a</sup>Where there is missing data, a valid percentage is reported.

<sup>b</sup>n = 220.

men vs 0 in women,  $P = 0.004$ ). Moreover, a higher AUDIT score was noted among smokers (median 4 in smokers vs 1 in nonsmokers,  $P = 0.001$ ) but no difference in the DAST score (median in both groups zero,  $P = 0.924$ ) using the median test.

Table 2 shows the results of the knowledge scale. More than 70% of the students knew the classification of caffeine, benzodiazepine and nicotine. However, only 114 (53.0%) knew the classification of alcohol, 147 (66.5%) that of LSD and 96 (46.6%) that of

Ritalin. Over 90% thought that substance dependence is defined by physiological criteria alone.

One hundred and sixty three students (70.9%) knew that heavy alcohol use is associated with hypertension, and 150 (69.4%) knew the importance of psychological symptoms in the spouse in diagnosing alcoholism (Table 2). However, only 130 students (59.1%) knew the means of elimination of alcohol and only 38 (17.3%) knew the effect of abrupt alcohol withdrawal. A total of 186 students (81.6%) knew that withdrawal from benzodiazepine may cause seizures, but only 72 (32.6%) knew the acute effect of cannabis. The mean total knowledge score was 52.7% (SD = 14.4); only 22 students (9.5%) had a total knowledge score  $\geq 70\%$ .

Bivariate analysis showed a significant difference in knowledge between the students by class ( $F = 11.2$ ,  $P < 0.0001$ ). Third year students had the highest knowledge score (57.5%, SD = 13.8), whereas the 2nd year students had the lowest score (48.5%, SD = 12.7) and the final year students scored 57.4%, SD = 15.4. Second year students had significantly lower scores than 3rd ( $P = 0.004$ ) and 4th year students ( $P < 0.001$ ), with the differences being in the knowledge of the classification of some drugs, dependence criteria and alcohol withdrawal. No difference was noted between male and female students in the knowledge score. Knowledge was not significantly correlated to the AUDIT score ( $P = 0.85$ ), but the correlation with the DAST score approached significance (Spearman rho =  $-0.12$ ,  $P = 0.088$ ).

A total of 86 students (38.2%) considered that their medical training in alcohol abuse was adequate and 77 (34.4%) that their training in drug abuse/dependence was adequate; only 66 (29.1%) expressed interest in working in the field (Table 3). Around three-fourths of the participants agreed that the doctor must intervene when patients use substances at hazardous

**Table 2 Knowledge about alcohol/drug use among medical students in Lebanon (n = 231)**

Item	Correct	
	No.	% <sup>a</sup>
<b>Classification of substances</b>		
Caffeine	214	93.0
Benzodiazepine	202	87.8
Tobacco (nicotine)	170	73.8
LSD	147	66.5
Dexamphetamine	147	65.3
Alcohol	114	53.0
Methylphenidate (Ritalin)	96	46.6
<b>Dependence on alcohol/drugs is defined by physiological criteria alone</b>	211	91.6
<b>Alcohol related items</b>		
Regular heavy alcohol use is strongly associated with hypertension	163	70.9
Psychological symptoms in the spouse are common in diagnosing alcohol-related problems	150	69.4
Alcohol withdrawal seizures occur within 72 hours after the last drink	136	61.5
Main method of alcohol elimination from the body	130	59.1
Recommended upper limit for women is 21 units/week	106	47.8
Recommended upper limit for men is 6 units on one occasion	81	36.7
Abrupt withdrawal from alcohol is most likely to be fatal	38	17.3
No serious drug interaction occur between alcohol and erythromycin	39	17.3
Someone tolerant of alcohol is likely to be tolerant of benzodiazepines	102	45.7
<b>Heavy drinking causes elevation in:</b>		
Magnesium	114	50.9
MCV	108	48.0
Urea	93	41.3
HDL	66	29.3
<b>Benzodiazepine-related items</b>		
Benzodiazepine prescription is indicated in:		
Alcohol dependence	137	59.6
Depression	103	44.6
Sleep disturbance	70	30.4
Anxiety	41	17.9
<b>Conjunctival injection is an acute pharmacological effect of cannabis</b>	72	32.6
<b>Participants with total knowledge score &gt; 70%</b>	22	9.5

LSD = lysergic acid diethylamide.

MCV = mean corpuscular volume.

HDL = high density lipoprotein cholesterol.

<sup>a</sup>Where there is missing data, a valid percentage is reported.

levels but only 28% agreed that such interventions are rarely successful.

One hundred and thirty three students (60.2%) were in favour of physicians self-medicating with legal psychoactive drugs (Table 3), but only 55 (23.7%) agreed for pharmacists and < 20% for other health professionals or the public. Only 63 students (29.7%) agreed that patients with substance

abuse problems are readily identified. Over 80% agreed that the prognosis of patients with dependence is influenced by supportive relationships, the patient's motivation, or appropriate management. A total of 159 students (76.1%) agreed that the doctor should discuss the alcohol/drug problem with the patient alone (Table 3).

Only 108 students (47.0%) felt they would be most effective in helping patients reduce alcohol intake (Table 3); the figure for reducing illicit drug use was 97 (42.1%) and for assisting with quitting smoking 95 (41.4%). When asked what they would do if they noticed their colleague abusing drugs, 186 students (80.5%) reported that they would advise him/her to seek help and

**Table 3 Attitudes about drug/alcohol use among medical students in Lebanon (n = 231)**

Item	Agree/strongly agree		Disagree/strongly disagree		Uncertain	
	No.	%	No.	%	No.	%
My medical training was adequate in:						
Alcohol abuse/dependence	86	38.2	88	39.1	55	24.4
Drug abuse/dependence	77	34.4	77	34.4	70	31.3
<i>Interested to work in drug dependence field</i>	66	29.1	92	40.5	70	30.4
<i>The doctor must intervene when patients use alcohol/drugs at potentially hazardous levels</i>	170	75.9	29	13.0	25	11.2
<i>Intervention when alcohol/drugs are used at hazardous levels is rarely successful</i>	62	27.6	107	47.6	56	24.9
<i>A doctor can adequately intervene only when physical dependence occurs</i>	62	27.6	101	44.9	62	27.6
<i>A doctor can responsibly self-medicate with legal psychoactive drugs</i>	133	60.2	58	26.2	30	13.6
<i>A pharmacist can responsibly self-medicate with legal psycho-active drugs</i>	55	23.7	133	58.0	42	18.3
<i>Other health professional can responsibly self-medicate with legal psycho-active drugs</i>	38	16.7	60	26.3	31	13.6
<i>The general public can responsibly self-medicate with legal psycho-active drugs</i>	27	11.7	177	77.1	26	11.3
<i>Patients with substance abuse are readily identified</i>	63	29.7	86	40.6	63	29.7
<i>Prognosis of patient with alcohol/drug dependence is influenced by:</i>						
Supportive relationships	187	85.4	17	7.8	15	6.9
Patient's motivation to change	180	82.6	16	7.3	22	10.1
Appropriate management	176	80.4	16	7.3	27	12.3
<i>The doctor should discuss the patient's alcohol/drug problem with:</i>						
The patient alone	159	76.1	31	14.83	21	9.1
The patient and close family, with the patient's permission	164	77.7	23	10.90	24	11.4
Patient's motivation is required for intervention	167	80.7	24	11.6	16	7.7
<i>How effective do you feel in helping patients:</i>						
Reduce alcohol intake	108	47.0	33	15.4	81	37.7
Reduce illicit drug use	91	42.1	46	21.3	79	36.6
Quit smoking	89	41.4	56	26.0	70	32.6

\*Where there is missing data, a valid percentage is reported.

only 27 (11.8%) stated that they would report him/her to their supervisor. Finally, 187 students (81.0%) said that they would reject an offer of stimulants to boost their concentration during exams.

The AUDIT score was significantly correlated with the DAST score (Spearman rho = 0.34,  $P < 0.001$ ), perceived

adequacy of medical training in alcohol use (rho = -0.23,  $P = 0.001$ ) adequacy of medical training in drug use (rho = -0.13,  $P = 0.048$ ), interest in working in the field (rho = -0.23,  $P = 0.001$ ), the doctor must discuss substance use problems with the patient alone (rho = -0.16,  $P = 0.025$ ), and intrinsic religiosity (rho = -0.38,  $P < 0.001$ ). Table 4

shows the regression analysis for predicting alcohol use using the significant correlates above, sex and smoking status. Medical training in drug use was not included in the regression due to its high co-linearity with medical training in alcohol use. The model explained 51% of the variance in alcohol use and the significant predictors were intrinsic

religiosity, interest in working in the field and drug use (DAST score).

The DAST score was significantly associated with the DUKE-AD score (Spearman  $\rho = 0.15$ ,  $P = 0.033$ ), intrinsic religiosity ( $\rho = -0.20$ ,  $P = 0.004$ ), interest in working in the field ( $\rho = -0.15$ ,  $P = 0.028$ ), and the belief that patient motivation is a prerequisite to intervention success ( $\rho = 0.15$ ,  $P = 0.039$ ).

Table 5 shows the results of the regression analysis to predict drug use using the above significant correlates, AUDIT, sex and knowledge score (since the  $P$ -value in the bivariate analysis for knowledge was  $< 0.1$ ). The model explained 44% of the variance in drug use and the only statistically significant predictor was alcohol use (AUDIT score).

## Discussion

This study examined knowledge and attitudes related to substance use as well as the prevalence and predictors of this behaviour among medical students in Lebanon. The findings reflect low knowledge, some negative attitudes, and rates of drug and alcohol use that raise concern over the wellbeing of these students. The suboptimal knowledge of substance abuse was evidenced by the score 52.7%, which is less than the 70% cut-off. The low level of knowledge is supported by the finding that the majority of students perceive their medical training to be inadequate and less than half report being effective in helping patients in this area. Although greater knowledge was noted in the 4th year students compared with the 2nd year (57.4% vs 48.5%), final year students still had a score lower than 70%; this compares with the findings of Cape et al. (17), who reported a significant increase in scores from 23.4% in the 2nd year to 71.8% in the final year of medical education. In our study, the greatest gaps in knowledge related to

alcohol, classification, the upper limit for drinking, alcohol–drug interaction and the effects of heavy drinking, similar to findings by other researchers (17,28). Medical curricula were not examined in this study, nevertheless these findings raise concern about the adequacy of preparation of medical students in managing alcohol abuse.

In terms of attitudes, few findings are worth noting. For instance, students reported high confidence in physicians' ability to manage drug use in themselves and others, while at the same time they did not perceive themselves to be effective in this area. This confidence could predict future behaviour, as in a study of Lebanese medical residents where two-thirds of those with suicidal ideation were self-prescribing psychotropic drugs rather than seeking health care (15). This attitude reflects society's image of doctors as capable of managing any health problem, but raises concerns considering the suboptimal knowledge demonstrated in our sample. Moreover, substance addiction was perceived by the students to be highly influenced by psychosocial factors such as social support and motivation, yet 91.6% thought that dependence is defined by physiological criteria alone. The uncertainty about whether or not addiction is merely physiological relates to the students' self-perception of being incompetent in treating addiction.

Another interesting finding was the students' report that they would advise their peers who abuse substances to seek help rather than report them to their supervisor; this may be due to the fear of career repercussions of reporting a colleague. Alternatively, these students may not appreciate the seriousness of substance abuse, as was found in a 2014 study on physicians and medical students (29). The findings of low knowledge concur with this explanation, and suggest the need for counselling and a confidential non-punitive mechanism to help medical students with risky behaviours seek psychological support.

Substance use raises concern in this study, especially the positive correlation between alcohol and drug use, a finding consistent with a recent study in Lebanon (15). Alcohol use was significant, with 16% reporting excessive drinking ( $\geq 5$  drinks), which is more frequent than the prevalence among Turkish (7%) (5) and Iranian medical students (9%) (6), but lower than that in the United Kingdom (UK) and the United States of America (USA) (7,8). These differences could be attributed to the effect of religion since the population in Turkey and the Islamic Republic of Iran is mostly Muslim, where drinking is forbidden (17). The multivariate analysis showed intrinsic religiosity to predict lower alcohol intake, supporting this assumption. Religiosity has been found to predict alcohol use by other researchers (14). We did not ask the participants about their religious affiliation since it is considered a sensitive topic and not accepted in our culture. In Lebanon there are Muslims and Christians and the sample probably included both groups. Nevertheless, the rate of alcohol use, which is similar to that reported by Talih et al. in Lebanon (15) raises concern, since poor decision-making (that may result in harm) is positively correlated with heavy drinking (30), and medical students are often faced with challenging decisions. The multiple regression analysis showed that students who are interested in working in the field of substance use were less likely to drink alcohol. Moreover, there was a trend towards lower alcohol use in those who reported that their training was adequate in regard to alcohol use, though this was not statistically significant. On the other hand, drug use was a significant predictor of alcohol use. These findings raise concern given the co-occurrence of drug and alcohol use. Improving medical training in managing alcohol abuse is recommended to improve the students' wellbeing and clinical skills.

**Table 4 Regression analysis for variables that predict alcohol use among medical students in Lebanon (n = 185)**

Variable	B	SE	95% CI		P
			Lower bound	Upper bound	
Constant	8.925	1.88	5.13	12.52	0.001
Sex	-0.905	0.68	-2.16	0.48	0.184
Smoking status	1.249	0.91	-0.53	3.09	0.164
Intrinsic religiosity	-0.181	0.09	-0.37	-0.02	0.034
Adequacy of training in alcohol abuse	-0.468	0.26	-0.98	0.07	0.078
Interest in working in the field	-0.732	0.27	-1.25	-0.21	0.004
The doctor must discuss alcohol/drug dependence with the patient alone	-0.229	0.21	-0.61	0.21	0.291
DAST score	2.648	0.34	1.85	3.26	0.001

Adjusted R<sup>2</sup> = 0.51.

SE = standard error.

CI = confidence interval.

DAST = drug abuse screening test.

The prevalence of drug use was also alarming at 47%, with 9% at moderate to substantial risk. The rates were lower than in the USA and UK (7,8), but higher than in Turkey (5). The rate was substantially higher than that reported among Lebanese residents by Talih et al., who used the same measure and reported 14% drug abuse, with 12% at low level risk and none at severe level (15). Residents have more responsibility and are expected to experience more stress than generic medical students, who constituted our sample. However, the students in our study may be using drugs to help them in their studying,

as reported in a previous study (10); we did not ask what drugs they were using. Another possible explanation is the differences between the study samples: our sample was representative of various geographic regions and social strata, whereas the sample in the study by Talih et al. was more homogeneous, including residents from a single institution only (15). We found that 19% of our sample would consider or accept an offered stimulant, which raises concern considering the adverse effects of drugs (30).

Alcohol use was the only significant predictor of drug use in the multivariate

analysis. Mental health problems did not predict substance use in this sample. However, having two-thirds of the sample at risk for depression or anxiety, similar to prior findings in Lebanon (13,15) and Turkey (5), is worrisome. It is worth noting that the DUKE-AD is only a screening tool and an accurate diagnosis of depression or anxiety requires more validated tools, which may explain the non-significant correlation. Still, the findings suggest the need for further mental health assessment of these students as their mental health problems may increase as they progress in their training and assume more

**Table 5 Regression analysis for variables that predict drug use among medical students in Lebanon (n = 182)**

Variable	B	SE	95% CI		P
			Lower bound	Upper bound	
Constant	0.319	0.60	-0.78	1.50	0.599
Sex	-0.086	0.19	-0.46	0.30	0.657
Knowledge	-0.020	0.02	-0.05	0.01	0.201
Intrinsic religiosity	-0.001	0.03	-0.05	0.05	0.980
Alcohol use	0.149	0.03	0.08	0.21	0.002
Interest in working in the field	0.004	0.07	-0.13	0.14	0.947
Patient motivation is prerequisite for intervention	0.076	0.07	-0.06	0.21	0.255
DUKE-AD score	0.041	0.03	-0.014	0.093	0.154

Adjusted R<sup>2</sup> = 0.44.

SE = standard error.

CI = confidence interval.

DUKE-AD = Duke Anxiety Depression Scale.

responsibility as residents unless they seek help. Furthermore, depression may increase the risk of substance abuse (2). Thus, raising awareness on this issue and providing counselling are needed.

This study had some limitations. First we could not recruit the 274 participants needed according to Golden's formula, but got 231 (84.3%). Moreover, the study is limited by the low response rate (33.3%); recruitment was especially low among 3rd and 4th year students, who were difficult to recruit due to their very busy schedules; the under-representation of medical students in their final year of study has been reported by others (17). These factors may have influenced the results, so they ought to be interpreted with caution.

Another limitation stems from the possibility of under-reporting substance use because of social disapprobation. Nevertheless, the reported rates echo those of other investigators (15). Another limitation was our inability to get an overall score for the attitude scale and instead doing analyses per item, which could lead to multiple testing of multiple variables.

In conclusion, this study found knowledge of substance abuse lacking, particularly on alcohol, among medical students, and their perception of the inadequacy of their related medical training along with rates of substance use raise concern. This is a public health issue that must not be underestimated, and medical training on substance

abuse needs to be strengthened. For instance, substance use content may be integrated within training using didactic lectures, case-based learning, internships and objective, structured, clinical examination (21). Furthermore, medical students should have access to safe and confidential psychological support, although more-focused investigation of this aspect is required to support this conclusion. This support is 2-fold: it allows students who are abusing substances to have professional support and alleviates the risks associated with depression and anxiety. Such support can protect these students from continued substance abuse in the future.

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## References

1. Diagnostic and statistical manual of mental disorders, 4th ed. Washington DC: American Psychiatric Association; 2000.
2. Diagnostic and statistical manual of mental disorders: DSM-5. Washington DC: American Psychiatric Association; 2013.
3. Kumar P, Basu D. Substance abuse by medical students and doctors. *J Indian Med Assoc.* 2000;98(8):447-52. PMID:11294326
4. Tyssen R, Vaglum P, Aasland OG, Grønbold NT, Ekeberg O. Use of alcohol to cope with tension, and its relation to gender, years in medical school and hazardous drinking: a study of two nation-wide Norwegian samples of medical students. *Addiction.* 1998;93(9):1341-9. PMID:9926540
5. Akvardar Y, Demiral Y, Ergor G, Ergor A. Substance use in a sample of Turkish medical students. *Drug Alcohol Depend.* 2003;72(2):117-21. PMID:14636966
6. Jodati AR, Shakurie SK, Nazari M, Raufie MB. Students' attitudes and practices towards drug and alcohol use at Tabriz University of Medical Sciences. *East Mediterr Health J.* 2007;13(4):967-71. PMID:17955780
7. Frank E, Elon L, Naimi T, Brewer R. Alcohol consumption and alcohol counselling behaviour among US medical students: cohort study. *BMJ.* 2008;337:a2155. PMID:18996938
8. Newbury-Birch D, White M, Kamali F. Factors influencing alcohol and illicit drug use amongst medical students. *Drug Alcohol Depend.* 2000;59(2):125-30. PMID:10891625
9. Horowitz A, Galanter M, Dermatis H, Franklin J. Use of and attitudes toward club drugs by medical students. *J Addict Dis.* 2008;27(4):35-42. PMID:19042589
10. Kjøbli J, Tyssen R, Vaglum P, Aasland O, Grønbold NT, Ekeberg O. Personality traits and drinking to cope as predictors of hazardous drinking among medical students. *J Stud Alcohol.* 2004;65(5):582-5. PMID:15536766
11. Tyssen R, Vaglum R. Mental health problems among young doctors: an updated review of prospective studies. *Harv Rev Psychiatry.* 2002;10(3):154-65. PMID:12023930
12. Shafiq M, Shah Z, Saleem Z, Siddiqi MT, Shaikh KS, Salahuddin FF, et al. Perceptions of Pakistani medical students about drugs and alcohol: a questionnaire-based survey. *Subst Abuse Treat Prev Policy.* 2006;1:31. PMID:17064420
13. Mehanna Z, Richa S. Prevalence of anxiety and depressive disorders in medical students. Transversal study in medical students in the Saint-Joseph University of Beirut. *Encephale.* 2006;32(6 Pt 1):976-82. PMID:17372542
14. Ghandour L, Karam E, Maalouf W. Lifetime alcohol use, abuse and dependence among university students in Lebanon: exploring the role of religiosity in different religious faiths. *Addiction.* 2009;104(6):940-8. PMID:19466919
15. Talih F, Warakian R, Ajaltouni J, Shehab AS. Correlates of depression and burnout among residents in a Lebanese academic medical center: a cross sectional study. *Acad Psychiatry.* 2016;40:38-45. PMID:26246222
16. Roberts LW, Warner TD, Rogers M, Horwitz R, Redgrave G. Medical student illness and impairment: a vignette-based survey study involving 955 students at 9 medical schools. *Compr Psychiatry.* 2005;46(3):229-37. PMID:16021594
17. Cape G, Hannah A, Sellman DA. Longitudinal evaluation of medical student knowledge, skills and attitudes to alcohol and drugs. *Addiction.* 2006;101(6):841-9. PMID:16696628
18. Miller N, Sheppard L, Colenda C, Magen J. Why physicians are unprepared to treat patients who have alcohol- and drug-related disorders. *Acad Med.* 2001;76(5):410-8. PMID:11346513
19. Isaacson JH, Fleming M, Kraus M, Kahn R, Mundt M. A national survey of training in substance use disorders in residency programs. *J Stud Alcohol.* 2000;61(6):912-5. PMID:11188498
20. Fang WL, Applegate SN, Stein RM, Lohr JA. The development of substance-abuse curricular content by five North Carolina schools. *Acad Med.* 1998;73(10):1039-43. PMID:9795618
21. Yoast RA, Wilford BB, Hayashi SW. Encouraging physicians to screen for and intervene in substance use disorders: obstacles and strategies for change. *J Addict Dis.* 2008;27(3):77-97. PMID:18956531

22. Godden B. Sample size formulas. Chicago: William Godden [website] 2004 (<http://williamgodden.com/samplesizeformula.pdf>, accessed 17 June 2017).
23. Babor TF, Fuente JR, Saunders J, Grant M. AUDIT: The Alcohol Use Disorders Identification Test: guidelines for use in primary health care. Geneva: World Health Organization; 1992.
24. Skinner HA. The drug abuse screening test. *Addict Behav.* 1982;7(4):363-71. PMID:7183189
25. Parkerson GR Jr, Broadhead WE. Screening for anxiety and depression in primary care with the Duke Anxiety-Depression Scale. *Fam Med.* 1997;29(3):177-81. PMID:9085098
26. Koenig H, Büsing A. The Duke University Religion Index (DUREL): a five-item measure for use in epidemiological studies. *Religions.* 2010;1(1):78-85.
27. Efron B, Tibshirani RJ. An introduction to the bootstrap. New York: Champan & Hall; 1993.
28. Granville-Chapman J, Yu K, White P. A follow-up survey of alcohol consumption and knowledge in medical students. *Alcohol Alcohol.* 2001;36(6):540-3. PMID:11704619
29. Dumitrascu C, Mannes P, Gamble L, Selzer J. Substance use among physicians and medical students. *Med Student Res J.* 2014;3:26-35.
30. Goudriaan AE, Grekin ER, Sher KJ. Decision making and binge drinking: a longitudinal study. *Alcohol Clin Exp Res.* 2007;31(6):928-38. PMID:17403069