




Prevalence and associated risk factors of cannabinoid abuse among Egyptian university students: a cross-sectional study

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Abstract

Global surveys have highlighted rise in consumption of cannabinoids among residents of both developed and developing countries. Cannabinoids cause severe damage to the cardiovascular, nervous, respiratory, and renal systems, and have been linked with several deaths. Despite these adverse health effects, the use of cannabinoids has rapidly increased. This work seeks to estimate the prevalence of cannabinoid abuse among Egyptian university students and explore the associated risk factors. A cross-sectional study was carried out over 3 months (1st of July–1st of October 2020) and included 2380 students. Participants were subjected to a pre-designed self-administered questionnaire that included demographic data, Addiction Severity Index, and Depression Anxiety Stress Scale. Among the participating students, 4.9% of them reported cannabinoid abuse and 41% reported smoking cigarettes. The most used substances were hashish (96.5%), Strox (41.3%), Bhang (34.4%), voodoo (34.4%), and Tramadol (31.1%). Gender and social status were also significantly related to rates of substances abuse; most illicit drug users were males (93.1%), and the majority was of low (41.3%) or moderate (50.8%) socioeconomic status. The most significant risk factors associated with substance use were positive history of family conflict (OR=6.48; CI95%: 5.08–8.64, $p<0.001$), encouragement by peers (OR=2.95; CI95%: 1.73–5.05, $p<0.001$), male gender (OR=5.46; CI95%: 2.40–12.44, $p=0.001$), positive history of child abuse (OR=2.85; CI95%: 1.96–3.04, $p=0.001$), having a stay-at-home mother (OR= 1.56, CI95%: 1.19–2.04, $p=0.001$), living in an urban area (OR=2.22; CI95%: 1.53–5.0, $p=0.002$), and positive family history of substance use (OR=1.98; CI95%: 1.48–2.08, $p=0.045$). This study emphasizes the possible significant rise in substance use among university students. Awareness campaigns should target both students and student families.

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Introduction

The *Cannabis sativa* plant is the most commonly abused illicit drug worldwide (Hermanns-Clausen et al. 2013). Cannabis contains over 90 different cannabinoids, with delta9-Tetrahydrocannabinol (THC) being the primary psychoactive ingredient (Bramness et al. 2010). The natural cannabinoids extracted from dried leaves, fruits, and flowers are used to produce hashish and a form of marijuana known as Bhang, both of which can be smoked, inhaled, or ingested with other substances (Sharma et al. 2012). Synthetic cannabinoids (SCs) are artificial, mind-altering chemicals. Although SCs produce similar effects to cannabis, however, their effects are more potent as they acquire higher cannabinoid receptor affinity (Clayton et al. 2017). On the other hand, SCs do not

contain cannabidiol or cannabinol (naturally occurring substances in cannabis), which produce different side effects from cannabis (Davidson et al. 2017).

THC produces transient and dose-related psychotic symptoms, as well as memory impairment (D'Souza et al. 2004). Cannabis use has also been reported to cause an increase in susceptibility to schizophrenia, hallucinations, violence, and self-injuring behavior (Davidson et al. 2017). SC users could suffer from serious side effects as SCs could affect many bodily systems including the cardiovascular system. SCs can also affect the respiratory system causing coughing, pneumothorax, and other respiratory diseases. They can also lead to acute tubular necrosis which devastates the renal system. Cannabinoids have also been linked to several cases of death (Davidson et al. 2017). Despite these hazardous side effects, SCs are spreading rapidly in different societies.

Global surveys have documented the increase in the consumption of cannabinoids among different populations in both developed and developing countries. According to a 2015 survey conducted in Western Australia, 12.1% of 472 Western Australians aged between 18 and 35 years reported using cannabinoids (Goggin et al. 2015). A report that gathered data from 130 public and private schools throughout the 48 contiguous states of the United States found that 2.9% of high school seniors reported using SCs (Palamar et al. 2017). Studies carried out in Egypt in 2013 revealed cannabinoids to be the most commonly used illicit drug among Egyptians (Hamdi et al. 2013). It was estimated that 10.4% of the Egyptian population is estimated to abuse drugs, which is nearly double the world average. Unfortunately, an even higher prevalence of drug abuse was reported among high school students and teenagers (Rabie et al. 2020).

A strong association has been established between cannabinoid use and other illicit substance abuse. Alcohol and nicotine are some of the most common substances ingested with cannabis, especially among young adults (Swift et al. 2012). Considering the lack of research in this field and under-reporting of such cases despite high prevalence, especially among young adults, the current study aims to clarify the prevalence of cannabinoid abuse among a sample of Egyptian university students and explore the associated risk factors.

Subjects and methods

Ethical considerations

This study obtained ethical approval from the Institutional Review Board of Menoufia University, Faculty of Medicine (ID: 191219COM). The data were collected in accordance with the “Declaration of Helsinki.” Informed consent was obtained from each study participant and each participant was

informed about all aspects of the study and granted the right to quit the study without any negative repercussions. All responses were kept anonymous to maintain the confidentiality of respondents.

Study design and setting

A cross-sectional study was carried out over 3 months starting from the 1st of July until the 1st of October 2020. This study was performed at a randomly chosen Egyptian university, where 4 colleges, and 2 practical and 2 theoretical ones, were chosen randomly.

Sampling and sample size

After calculating the required sample number from each selected college based on the proportionate allocation method, a systematic random sampling technique was adopted for student's selection. All students were informed of their right to refuse to share information or withdraw from the study at any time. Based on previous estimation of the prevalence of cannabinoid use to be 7.4% (Hamdi et al. 2013), the sample size was calculated using the following equation: $n = (z^2 \times p \times q) / D^2$ at CI 95%, which resulted in a necessary sample size of 2327 participants. If the non-response rate were 15%, 2585 subjects would be recruited. With a response rate of 92.1%, this study collected 2380 complete questionnaires; 205 students either refused to participate or delivered incomplete questionnaires.

Inclusion and exclusion criteria

Egyptian students who were attending on-campus programs at the specified colleges and consented to participate in the study were considered eligible and included in the present study. Non-Egyptian and non-attending students, those who refused or hesitated to participate in the study even after signing a consent form, and those who submitted incomplete questionnaires were excluded.

Data collection tool

Participants were subjected to a pre-designed, self-administered questionnaire composed of three sections. The first section reported demographic data such as age, sex, education level, occupation, socioeconomic status (SES), smoking, and drug abuse. The second section included the Addiction Severity Index (5th Edition) (McLellan et al. 1998). The last section included the Depression Anxiety Stress Scale (DASS), a quantitative measure of distress along the three axes of depression, anxiety, and stress. It is not a categorical measure that can clinically diagnose patients. DASS scores ranged from normal passing to mild, moderate,

severe, and extremely severe. These ranges correspond to the numerical ranges of 0–4, 5–6, 7–10, 11–13, and ≥ 14 , respectively, for depression; 0–3, 4–5, 6–7, 8–9, and ≥ 10 , respectively, for anxiety; and 0–7, 8–9, 10–12, 13–16, ≥ 17 , respectively, for stress (Parkitny and McAuley 2010).

Two weeks before the actual study commenced, the survey was piloted on 80 randomly selected participants of the same population to ascertain if the questions were well defined, easy to understand, and presented in a consistent manner. This pilot survey allowed the researchers to test the comprehensiveness and appropriateness of the questionnaire. The questionnaire was modified according to the pilot study results. To assess the validity of the questionnaire, two independent public health and community medicine specialists reviewed the survey. All participants were interviewed, and the survey was explained for participants thoroughly.

To clarify the risk factors associated with substance use, students who abuse drugs (116 students) were first identified. Subsequently, a random selection of students was chosen from among the non-substance-abusing students to compare with substance-abusing students. The ratio of substance-abusing students to non-substance-abusing students was 1:4, with a total of 116 substance-abusing students and 464 non-substance-abusing students.

Statistical analysis

Analyses were conducted using SPSS version 26.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics were expressed in number (No), percentage (%), mean (\bar{x}), and standard deviation (SD). The significance of associations between the two groups according to qualitative variables was determined using Chi-squared (χ^2) test. Fisher's exact test was used when the number of an expected cell was less than 5. An unpaired *t*-test (*t*) was used to compare between two means for normally distributed quantitative variables. Binary logistic regression was carried out to ascertain the predictors of substance abuse among participants. *Z* test was used to compare between proportions. A *p* value of < 0.05 and a 95% confidence interval were considered significant.

Results

The mean age of the studied students was 20.5 ± 1.35 (range: 18–24 years old). 66.1% of the participants were males and 33.9% were females. Practical college students represented 65.6% of all respondents; 26.7% of whom were sophomores and 35.5% of whom were juniors. Of the participating students 46.8% had a moderate SES. Among the participants, 39.3% reported studying for more than 15 h per week. Working students constituted 38.3% of all the participants; 11% of them were working on full-time basis, while 73.2%

were working only during vacations. 59.3% of the study participants reported good academic performance. The need for private courses was reported by 34.3% of students (Table 1).

Concerning substance use, 41% of students reported smoking cigarettes and 4.9% reported abusing illicit substances. Among substance-abusing students, 51.7% reported using illicit substances regularly, 41.3% of whom reported the abuse of more than one substance. The most used substances were Hashish (96.5%), Strox (41.3%), Bhang (34.4%), Voodoo (34.4%), and Tramadol (31.1%). Regarding the illicit drugs which students reported abusing regularly, the most common were hashish (25%), Bhang (30%), voodoo (30%), Strox (33.3%), Heroin (28.6%), and Tramadol (22.2%). Among illicit substance abusers, 50% reported drinking alcohol. During the COVID-19 quarantine, substance abuse increased by 79.3% among illicit substance users. Health problems were reported among 17.2% of drug

Table 1 Characteristics data of studied students (no = 2380)

	no	%	no	%
Age (years)				
Mean \pm SD	20.5 \pm 1.35		<10 h	576
Range	18–24		10–15 h	868
			>15 h	936
				39.3
Sex			Free time/week	
Male	1572	66.1	<10 h	512
Female	808	33.9	10–15 h	740
			>15 h	1128
				47.4
Residence			Working	
Rural	1472	61.8	Yes	912
Urban	908	38.2	No	1468
				61.7
Type of college			Type of work (no = 912)	
Practical	1568	65.9	Daily full-time	100
Theoretical	812	34.1	Daily part-time	144
			On vacations only	668
				73.2
Study grade			Source of expenses	
1 st	636	26.7	Family	2172
2 nd	844	35.5	Personal	208
3 rd	412	17.3		8.7
4 th	448	18.8	Personal expense/month	
5 th	28	1.2	<500	516
6 th	12	0.5	500–1500	1544
			>1500	320
				13.4
Family income (EGP/Month)			Study performance	
<4000	1016	42.7	Bad	180
4000–9000	1076	45.2	Good	1412
>9000	288	12.1	Excellent	788
				33.1
Socioeconomic status			Private educational courses	
Low	992	41.6	Yes	816
Medium	1108	46.8	No	1564
High	280	11.7		65.7

users, while only 20.7 % received addiction therapy (Table 2).

History of child abuse and family conflict were reported by 47.9% and 28.4% of students, respectively. A family history of substance abuse was reported by 2.5% of students. 18.2% of illicit substance abusers reported being encouraged by peers. Regarding mental health among those who reported substance abuse, 33.1% suffered from depression, while 25% suffered from anxiety, and 14.8 % suffered from stress (Table 3).

There was no significant difference regarding age, type of college, the education level of one’s father or mother, or family income between substance users and non-users. However, there were significant differences regarding gender (93.1% of substance users were males), residency (51.7% of substance users lived in rural areas), occupation of a respondent’s mother (65.5% of substance users had stay-at-home mothers), and SES (41.3% of substance users

were of low SES and 50.8% were of moderate SES (Table 4).

Poor academic performance may be considered either a cause or a result of substance use (OR=2.40; CI95%: 1.34–4.33). Substance use was significantly associated with a tendency to study more than 10 h per day (OR= 2.40; CI95%: 1.34–4.33), having more than 10 h per day of spare time (OR=1.61; CI95%: 1.01–2.56), being a self-funded student (OR = 2.92; CI95%: 1.67–5.11), history of child abuse (OR=1.60; CI95%: 1.06–2.40), family history of conflicts whether financial or legal (OR=2.02; CI95%: 1.29–3.14), family history of substance use (OR=5.83; CI95%: 2.40–14.21), and encouragement by peers (OR=4.41; CI95%: 2.85–6.82) (Table 5).

Binary logistic regression revealed that the most significant risk factors associated with substance use were positive history of family conflict (OR=6.48; CI95%: 5.08–8.64, $p<0.001$), encouragement by peers (OR=2.95; CI95%: 1.73–5.05,

Table 2 Prevalence and pattern of substance use among studied students (no = 2380)

	no	%		no	%
Cigarette smoking			Bhang (no = 40)		
Yes	976	41.0	Once	16	40.0
No	1404	59.0	More than once	12	30.0
			Regular	12	30.0
Substance abuse			Strox (no = 48)		
Yes	116	4.9	Once	20	41.7
No	2264	95.1	More than once	12	25
Frequency (no = 116)			Regular	16	33.3
Regular	60	51.7	Voodoo (no = 40)		
Not regular	56	48.33	Once	20	50.0
Substance type (no = 116)			More than once	8	20.0
Hashish	112	96.5	Regular	13	30.0
Bhang	40	34.4	Tramadol (no = 36)		
Strox	48	41.3	Once	8	22.2
Voodoo	40	34.4	More than once	8	22.2
Tramadol	36	31.1	Regular		
Heroin	28	24.1	Heroin (no = 28)		
Alcohol	40	34.4	Once	16	57.1
More than one type (no = 116)			More than once	4	14.3
Yes	48	41.3	Regular	8	28.6
No	68	58.7	Alcohol (no = 40)		
Hashish (no = 112)			Once	12	30.0
Once	56	50.0	More than once	8	20.0
More than once	28	25.0	Regular	20	50.0
Regular	28	25.0			
Substance abuse increased during the COVID-19 quarantine among substance abusers (no=116)	92	79.3			
Health problems among substance abusers (no=116)	20	17.2			
Substance abusers receiving addiction therapy (no=116)	24	20.7			

Table 3 Substance use and medical history among studied group (no = 2,380)

	no	%
History of child abuse		
Yes	1140	47.9
No	1240	52.1
Family conflicts		
Yes (legal or financial)	680	28.4
No	1700	71.6
Family history of substance use		
Yes	68	2.5
No	2312	97.5
Encouraged to use a substance by peers		
Yes	432	18.2
No	1948	81.8
Started substance use during quarantine period		
Yes	24	1
No	2356	99
Psychological problems		
Anxiety	596	25
Depression	788	33.1
Stress	424	14.8
Hallucinations	64	2.7
Suicidal thoughts	140	5.9
Visited a psychiatrist		
Yes	164	6.9
No	2216	93.1

$p < 0.001$), male gender (OR=5.46; CI95%: 2.40–12.44, $p=0.001$), positive history of child abuse (OR=2.85; CI95%: 1.96–3.04, $p=0.001$), having a stay-at-home mother (OR=1.56, CI95%: 1.19–2.04, $p=0.001$), living in an urban area (OR=2.22; CI95%: 1.53–5.0, $p=0.002$), and positive family history of substance use (OR=1.98; CI95%: 1.48–2.08, $p=0.045$) (Table 6).

Discussion

The current study revealed that 4.9% of interviewed university students between 18 and 24 years old are illicit substance users, and 41% are current cigarette smokers. Hashish was the most used substance, followed by marijuana (commonly referred to as Bhang), and SCs, such as Strox and Voodoo. Hashish is made by drying the resin secreted from the flowing buds of the cannabis sativa plant (Sharma et al. 2012). The popularity of hashish reported in the current study agrees with previous studies conducted in Egypt and elsewhere (in the US, Khiabani et al. 2006 and Palamar et al. 2017; In Egypt, Hamdi et al. 2016). Smokable marijuana is usually obtained from the stems, leaves, and dried flowers of the plant and constitutes one of the most commonly smoked forms of cannabinoids,

especially among young adults (Sharma et al. 2012). Since Hashish is an extracted resin, it is more potent and hence more frequently used compared to marijuana and other cannabinoids.

Strox is a novel SCs that is synthesized from other ingredients, including the *Atropa belladonna* plant. Existing studies show that in the last decade, the use of Strox has increased among Egyptian populations. Similarly, voodoo abuse has also increased rapidly in Egypt, and the drug is currently listed as prohibited substance by the Egyptian government (Sobh and Sobh 2020).

The high prevalence of cannabinoids abuse resembles the estimated rates of abuse of opioids such as Tramadol, alcohol, and other substances that have been reported by the World Health Organization (WHO). In 2012, The WHO has reported that 2.5 to 5% of the global population abuses cannabinoids, compared to 0.5% for opioid abuse. This might be explained by cultural norms that consider cannabinoids to be less harmful than other substances and to have less apparent withdrawal symptoms (Kleczkowska et al. 2016). However, these cultural assumptions lack scientific evidence. Craving and abstinence-associated symptoms of different severities related to cannabinoid abuse have been reported in the literature (Coffey et al. 2002).

The current study revealed that students consumed alcohol and opioids (Tramadol and heroin) less frequently than cannabinoids. Approximately 34.40% of substance abusers were dependent on alcohol, and 31.1% were also Tramadol abusers. In contrast with other substances, alcohol was the only substance that was more likely to be regularly abused (50%) than used just once or more than once. Our findings agreed with (Coffey et al. 2002), and it could be explained by the physical and psychological tolerance of alcohol abuse.

In contrast to our study, a systematic review carried out in Saudi Arabia found a high prevalence of alcohol abuse (9–70.3%) among populations compared to a lower prevalence of cannabinoid abuse (1–60%). This discrepancy could be explained by the difference in the study designs and settings. Unlike our study, that review included only patients reported in a treatment setting; therefore, the study may not reflect rates of substance abuse among the actual population (Bassiony 2013).

Among substance abusers, 41.3% reported using more than one type of substance. These findings are in line with those of Australian and Turkish studies (Swift et al. 2012; Besli et al. 2015). Moreover, controlling cannabinoid consumption was reported to be associated with higher rates of cessation for other drugs, which strengthens these findings (Swift et al. 2012). Gateway theory justifies this relationship and identifies nicotine and alcohol abusers as more susceptible than non-users to becoming illicit drug abusers (Haug et al. 2014).

Table 4 Distribution of the participants’ characteristics regarding substance use

	Substances use				χ^2	p value	OR [CI 95%]
	Yes No = 116		No No = 464				
	no	%	no	%			
Age (Years)							
Mean ±SD	20.6 ± 1.4		20.4 ± 1.3		T = 1.40	0.161	-
Sex							
Male	108	93.1	314	67.7	30.28	<0.001	6.4[3.06–13.57]
Female	8	6.9	150	32.3			
Residence							
Rural	60	51.7	296	63.8	5.70	0.017	1.64[1.09–2.48]
Urban	56	48.3	168	36.2			
Type of collage							
Practical	92	79.3	385	83	0.853	0.356	-
Theoretical	24	20.7	79	17			
Study grade							
1 st , 2 nd , 3 rd	96	82.7	389	83.2	0.01	0.911	-
4 th , 5 th , 6 th	20	17.3	78	16.8			
Father’s education							
Basic	8	6.9	65	14	5.37	0.068	-
Secondary	52	44.8	170	36.6			
High	56	48.3	229	49.4			
Father’s occupation							
Not work	8	6.9	40	8.6	0.36	0.546	-
Working	108	93.1	424	91.4			
Mother’s education							
Basic	16	13.8	70	15.1	0.892	0.640	-
Secondary	52	44.8	224	48.3			
High	48	41.4	170	36.6			
Mother’s occupation							
Housewife	76	65.5	256	55.2	4.06	0.043	1.54[1.01–2.36]
Working	40	34.5	208	44.8			
Socioeconomic status							
Low	59	50.8	182	39.2	6.94	0.031	2.49[1.17–5.28]
Moderate	48	41.3	213	45.9			
High	9	7.8	69	14.8			

This study found a high prevalence of cannabis exposure among male adolescents, a finding which agrees with other studies in developing countries, including Egypt (Faeh et al. 2006; Hamdi et al. 2016) and developed countries such as Australia and Switzerland (Hayatbakhsh et al. 2013; Haug et al. 2014). The predominance of male abusers could be explained by their relatively higher vulnerability to externalizing disorders, including substance abuse and aggression, compared their female counterparts, who are more vulnerable to internalizing disorders, such as depression and anxiety (Eaton et al. 2012). The high prevalence of cannabinoid use among

males is also influenced by cultural norms and where substance abusers live. For example, the overrepresentation of male drug users in rural residents might be attributed to social stigma surrounding drug use in rural areas, and rural women’s apprehensive to disclose their substance abuse habits (Hamdi et al. 2016). Surprisingly, previous cohort studies reported a narrowing gap between male and female cannabis users; the female: male cannabis use ratio increased from 1: 2 to 1: 1.3. Indeed, a greater increase in cannabis consumption has been reported among young females compared to males (Chapman et al. 2017).

Table 5 Distribution of academic performance as well as family and personal characteristics of substance use groups

	Substances abuse				<i>p</i> value	OR CI 95%
	Yes No=116		No No= 464			
	no	%	no	%		
Academic performance						
Bad	20	17.2	37	8.0	0.002	2.40[1.34–4.33]
Good or excellent	96	82.7	427	92.0		1.0
Studying hours/week						
<10 h	40	34.5	101	21.8	0.004	1.0
>10 h	76	65.5	363	78.2		2.40[1.34–4.33]
Free time/week						
≤10 h	32	27.6	89	19.2	0.046	1.0
>10 h	84	72.4	375	80.8		1.61[1.01–2.56]
Working						
Yes	68	58.6	167	36.0	<0.001	2.52[1.66–3.82]
No	48	41.4	297	64.0		1.0
Type of work (no=235)						
Daily (full-time or part-time)	52	76.5	142	85.1	0.116	-
During vacations only	16	23.5	25	15.0		
Source of personal expenses						
Family	92	79.3	426	91.8	<0.001	2.92[1.67–5.11]
Self	24	20.7	38	8.2		1.0
History of child abuse						
Yes	64	55.2	202	43.5	0.024	1.60[1.06–2.40]
No	52	44.8	262	56.5		1.0
Family conflicts						
Yes (legal or financial)	40	33.4	96	20.7	0.001	2.02[1.29–3.14]
No	76	65.5	368	79.3		1.0
Family history of substance use						
Yes	12	10.7	9	1.9	<0.001	5.83[2.40–14.21]
No	104	89.3	455	98.1		1.0
Invited substance use by peers						
Yes	56	48.3	81	17.5	<0.001	4.41[2.85–6.82]
No	60	51.7	383	82.5		1.0
Psychological problems						
Yes	84	72.4	363	78.2	0.182	-
No	32	27.6	101	21.8		
Psychological problems						
Anxiety	32	27.5	119	25.6	0.764	-
Depression	40	34.4	140	30.1	0.433	-
Stress	20	17.2	74	15.9	0.742	-
Hallucinations	16	13.7	5	1.1	<0.001	-
Suicidal thoughts	20	17.2	23	4.9	<0.001	-
Visited a psychiatrist	8	6.9	40	8.6	0.684	-

Although 61.8% of study participants lived in rural areas, those living in urban areas reported higher rates of cannabis abuse. In support to our data, it was reported previously that

substance abusers were primarily urban residents and he explained this by that strong social and family bonds in rural areas function to discourage substance abuse (Hamdi et al.

Table 6 Risk factors for substances abuse among university students using binary logistic regression analysis

	<i>P</i> value	OR	95% CI
Positive history of family conflict	<0.001	6.48	5.08–8.28
Encouraged to use a substance by peers	<0.001	2.95	1.73–5.05
Male sex	0.001	5.46	2.40–12.44
Positive history of child abuse	0.001	2.85	1.96–3.04
Stay-at-home mother	0.001	1.56	1.19–2.04
Urban Residency	0.002	2.22	1.35–3.64
Positive family history of substance use	0.045	1.98	1.48–2.08
>10 h Free time/day	0.095	1.50	0.93–2.43
Low Socioeconomic status	0.132	1.33	0.91–1.94
Working student	0.164	1.43	0.86–2.40
Self-funded student	0.543	0.811	0.41–1.59

2016). This also could be explained by a more excepting attitude toward cannabis use and legalization in urban areas (Winhusen et al. 2020).

Although the current study shows significant differences between abusers and non-abusers regarding SES and maternal occupation (being a housewife), the association between these factors and their relationship to susceptibility of drug abuse is not fully elucidated. These findings partially agree with previous studies, which found that SES and paternal education status were risk factors for drug abuse (Hamdi et al. 2013, 2016; Haug et al. 2014). More highly educated parents are more likely to monitor their children, which reduces involvement in illicit drug abuse. The high prevalence of cannabis abuse among Egyptian students working in semiskilled or skilled work agrees with an earlier Egyptian study (Hamdi et al. 2013).

The current study demonstrated that dysfunctional social relationships are predictors of cannabis and other substance abuse. More than one-third of adolescent abusers reported suffering from legal or financial family conflicts. This agrees with previous studies in Australia and Switzerland that describe early paternal divorce and unstable marital relationships as predictors of cannabis abuse among adolescents (Hayatbakhsh et al. 2013; Haug et al. 2014). This association is not limited to cannabinoid abuse, but also extends to the other substance. Indeed, an intact family structure is crucial for maintaining the wellness of young adolescents and protecting them from substance abuse (Van Ryzin et al. 2012). The association between adolescent substance abuse and family conflict can be explained in reference to multiple theories, such as family system theory, strain theory, as well as social and cognitive theories (Vakalahi 2001). Such an investigation, however, is outside the scope of this study.

In order to further explore the impact of social relationships on substance abuse, this study noted that being encouraged to

engage in substance use by a friend was a predictor of substance abuse. The relationship between having friends engaged in delinquency as a risk factor for cannabinoid abuse was identified previously (Van Ryzin et al. 2012). Peer pressure and having friends who abuse cannabinoids were reported as cannabinoid abuse predictors among young adolescents (Pérez et al. 2010; Haug et al. 2014). Moreover, the current study found a strong association between being a victim of child abuse and becoming a cannabinoid abuser. Previous studies have identified a comorbid association between child abuse and illicit drug use (Cross et al. 2015). The association between child abuse and becoming an illicit drug abuser might be attributable to abuse-induced stress and depression, which showed a significant interpersonal variability (Agrawal et al. 2012).

The current study reveals that approximately 79.3% of substance abusers reported increased drug use during the COVID-19 pandemic, and 1% of substance abusers started abusing an illicit substance during the pandemic. The increased consumption of illicit drugs during the current pandemic agrees with previous studies carried out within Egypt and worldwide (Vanderbruggen et al. 2020; Fayed and Sharif 2021). These findings may be related to the reported higher prevalence of substance abuse (72.4%) among students who reported psychological problems. Pandemic lockdowns and social distancing can exacerbate levels of anxiety, stress, and depression, which can lead to substance abuse (Martinotti et al. 2020).

Moreover, the current study reports that patients suffering from depression, anxiety, hallucinations, stress, and suicidal thoughts are vulnerable to becoming substance abusers. This association agrees with previous studies and is relevant to both cannabinoid abuse and the abuse of other illicit drugs (Krebs et al. 2019). Studies have also documented that, compared to cannabinoids, the abuse of SCs (Strox and voodoo) is associated with more serious and long-lasting psychiatric illnesses (Cohen et al. 2019). Furthermore, amphetamine was reported to be associated with violence, aggression, schizophrenia, obsession, and paranoid thinking (Zweben et al. 2004). Alcohol abuse is a common finding among psychotic patients, those suffering from stress and anxiety disorders, and suicidal individuals (Pompili et al. 2010). Similarly, a significant proportion of opioid abusers report suffering from depression and anxiety (Sullivan et al. 2005).

Studies clarifying the association between psychiatric illness and substance abuse, especially cannabinoids, display ambiguous results. A wealth of studies suggests that cannabinoids can induce psychiatric illness. These studies refer to dose-dependent psychiatric symptoms and the reported regression of symptoms after substance withdrawal to support their conclusions (Krebs et al. 2019). Conversely, some studies claim that cannabinoid abuse is a consequence of psychiatric illness or is merely associated with psychiatric illness.

Such studies propose a shared genetic predisposition to both psychiatric illness and cannabis use (Christopher 2016).

This theory of shared genetic predisposition might explain the findings reported in the current study and other studies, in which significant abuse was reported among the students of families with a positive history of cannabis abuse (Krebs et al. 2019). An association between reported hypersensitivity to the psychotomimetic properties of cannabis, early drug abuse, and psychosis strengthens this theory (Goldberger et al. 2010). However, complex environmental interactions reduce the reliability of different theories in different contexts. Nevertheless, experimental studies have hypothesized common links between the endocannabinoid system and chronic stress. The complex role of the endocannabinoid system in coping with chronic stress might explain the higher prevalence of substance abuse among students who study for more than 10 h per week and low achievers in this study (Agrawal et al. 2012).

Apart from cannabinoids-associated psychiatric illnesses, the injurious effects of cannabinoids include other health disorders. Airway disease, lung cancer, increased cardiovascular activity, acute myocardial infarction, sudden arrest, and cardiomyopathy are all associated with cannabinoid use (Cohen et al. 2019). In addition to lung cancer, *in vitro* studies have mentioned that cannabinoids modulate the immune system and disturb the T helper cell and cytokines expression, which might induce carcinogenesis in the head and neck as well as other organs (Tanasescu and Constantinescu 2010). Despite lacking strong evidence from studies on humans, disturbance of reproductive system function has been reported in experimental studies on chronic cannabis exposure (Smith et al. 2004).

Strength and limitations

The variations in affiliations between the study participants strengthen the current study and enhance the rigor of its methodology. However, including more participants from different geographical regions would increase the reliability of the study. Given the sensitivity of the study topic, the conservative values of Egyptian society, and students' apprehensiveness to share details of their personal lives, the response rate of the study (92.1%) was acceptable. The study recruited 2380 students, which provided a high statistical power and reduced the Type 2 error probability (Cohen 1988).

Conclusion

The current study highlighted a potential high prevalence of substance abuse among Egyptian university students. The most used substances, in order of prevalence, were Hashish,

followed by Strox, Bhang, voodoo, and Tramadol. Prolonged lockdown has unfavorable effect on substance use, apparently due to the associated stress and anxiety. Governmental efforts should be focused on reducing the prevalence of cannabinoid use among university students. Simultaneously, student and family counseling programs should deal with the issue of substance abuse. Orientation campaigns that correct misconceptions about cannabinoids and highlight their adverse effect should be employed to modify social norms regarding illicit substances.

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Data availability The data sets used and analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate The current study received Research Ethical Committee approval (ID:191219COM).

Consent for publication Not applicable.

Competing interests The authors declare no competing interests.

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