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Original Study

Factors Influencing Knowledge of Synthetic Cannabinoids - Study Conducted Among Future Healthcare Professionals

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SUMMARY

Introduction: Although the consumption of synthetic cannabinoids (SC) has become more and more widespread recently, future healthcare professionals, according to the currently available curriculum, receive minimal information about diagnosis and treatment thereof.
Aim: The main goal is to assess the level of knowledge of students of health professions about SC and examine the factors that influence that knowledge.
Material and methods: A cross-section academic study was conducted among 510 students of medicine, dentistry and pharmacy at the Faculty of Medicine, University of Novi Sad, Serbia, during 2017 using a structured questionnaire.
Results: Forty-nine percent of students answered positively to the question if they knew what SCs were, whereas when they were offered three definitions regarding SCs - 92.2% gave the correct answer, with male students demonstrating a better knowledge than female ones (p=0.014). There was no correlation between previous knowledge about SCs and professional qualifications of the student's parents (p=0.953 mother, p=0.500 father) or the student's social media profile existence (p=0.057) . Pharmacy students showed better previous knowledge about SCs in comparison with students of other courses (p=0.000) as well as the final year students when compared to those from the 1st and 2nd year of study (p=0.000). The repetition of a year level did not affect student's knowledge (p=0.616). Students with experience in alcohol usage showed better previous knowledge of SCs in comparison with alcohol non-users (p=0.008). However, most of the respondents answered „do not know" on the majority of statements about SCs offered.
Conclusion: Superficiality in students' knowledge and insufficiency of formal education contributes to the necessity for revising curriculum regarding SCs for future health care professionals.

Keywords: Synthetic Cannabinoids, Knowledge, Students, Medicine, Questionnaire

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INTRODUCTION

Synthetic cannabinoids (SCs), sometimes referred to as „synthetic marijuana", are designer drugs of abuse functionally similar to delta-9-tetrahydrocannabinol (THC), the psychoactive principle of cannabis [1].

SCs compounds originally were developed to facilitate studies of cannabinoid (CB1, and later CB2) receptors pharmacology, as full or partial agonists, antagonists or inverse agonists, but in recent years they have emerged as drugs of abuse [2]. In 2005, SCs products marketed as „Spice" first appeared in European countries, before their entering the United States in 2009 [3]. Today, they are sold in „smart shops" and tobacco and convenience stores under labels such as „herbal incense" and „spice." Products are often packaged with disingenuous labels such as „not for human consumption", but health professionals and legal authorities are keenly aware that these products are smoked as an alternative to marijuana [4]. They contain non-psychoactive plant material sprayed with SCs compounds that exert psychoactive effects when smoked. In addition, substantial variation may exist in content and concentration of SCs compounds in many available SCs products, even within the same brand or batch. Such variability coupled with potential bioactivity at low doses increase their toxicity risk [5]. Despite many national, federal or state regulations to prohibit SCs sale and distribution, illicit use continues, and reports of illness are increasing [3].

Consumers of such preparations report that SCs possess a stronger psychotropic effect than marijuana [4]. They exert THC-like effects: changes in mood, perception, sleep and wakefulness, body temperature, but their other effects vary greatly and they are unpredictable and more profound than those of THC. The most common ones being reported are: tachycardia, arterial hypertension, hyperglycemia, hypokalemia, dizziness, hallucinations, agitation and panic attacks. However, more recently a newergeneration of SCs with more severe toxicity including collapses, seizures, and cardiac toxicity has emerged [6]. Cases with acute kidney injury have also been described [3], as well as induction of psychotic symptoms (including new-onset psychosis and psychotic relapses) and even death after consuming SCs [7,8]. The effects of the SCs are typically short-lasting compared with amphetamine-type substancesthus, fortunately, short-time monitoring and supportive care is sufficient to treat most cases with intoxication [9]. Recognition of symptoms of SCs use and data from patients' medical history are essential for doctors because SCs cannot be easily detected in biological samples of the consumers [4].

Although the consumption of synthetic cannabinoids (SC) has become more and more widespread recently, future healthcare professionals in Serbia, according to the currently available curriculum, receive minimal information about diagnosis and treatment thereof. On the other hand, they will be the ones who will come in touch with SC users or diagnose the SCs consumption in patients, and will be responsible for their treatment.

AIM

The main goal is to assess the level of knowledge of medical, pharmacy and dentistry students regarding SC and to examine factors that influence such expertise. Taking into account many research articles regarding cannabinoids, this is the first detailed study of this type conducted not just in Serbia but also in the region.

MATERIAL AND METHODS

A non-commercial (academic) cross-section study was conducted at the Faculty of Medicine, University of Novi Sad, Serbia, during 2017 among students of healthcare professions - medicine, dentistry and pharmacy. Upon Ethics Committeeof Faculty of Medicine, University of Novi Sad approval of the survey (number: 01-09/11/17), data were collected byanonymous questionnaire which was randomly distributed to students of each year of the above mentioned study groups during their practical lectures (in order to provide high compliance rate). Verbal informed consent was obtained from those who accepted to fill the questionnaire. The anonymous nature of participation in the study was emphasized.
A questionnaire, containing a combination of questions and claims adapted to ensure sincere answers suitable for prospective doctors, dentists and pharmacists, was created. It was based on the thorough review of literature, detailed discussions and peer review. The pilot questionnaire was pre tested on 30 students in order to check theunderstanding of items

in it. The questionnaire consists of 3 parts. The first one contains questions related to demographic data of the participants (age, gender, year of study, place of residence, parents' professional qualifications, social network profile existence).The second part includes data about previous habits regarding smoking and the consumption ofalcohol, energy drinks and psychoactive substances. The third part involves questions created to test participants' knowledge regarding SCs. Among them there were close-ended questions in order to estimate students' potential use of synthetic cannabinoids. The last part contains multiple response claims created to collectparticipants' opinions regarding measures to protect vulnerable populations from illegal cannabinoid use.

After data collection and data entry, the processing was done by SPSS software 23 for Windows (IBM, Armonk, NY) and by MS Office Excel 2010. The impact of tested factors (such as course of the study, year of study, repeating a year level, social media profile existence, previous habits towards psychoactive substances consumption, etc.) on knowledge regarding synthetic cannabinoids was estimated. Chi square test was used to compare nominal variables. Significance level was set at $p < 0.05$.

Course	N (%)
Pharmacy	155 (30.40)
Medicine	209 (41.00)
Dentistry	146 (28.60)
Total	*510 (100.00)*
Year of study	**N (%)**
1	96 (18.80)
2	92 (18.00)
3	88 (17.30)
4	104 (20.40)
5	93 (18.20)
6	37 (7.30)
Total	*510 (100.00)*
Repetition of a year level	**N (%)**
Yes	89 (17.45)
No	421(82.55)
Total	*510 (100.00)*

Table 1. Demographic and other characteristics of tested students

Parents' educational level	N (%)	
	Father	Mother
Primary school	10 (1.96)	10 (1.96)
High school	266 (52.16)	267 (52.35)
College	51 (10)	55 (10.78)
University	183 (35.88)	178 (34.91)
Total	*510 (100.00)*	*510 (100.00)*

Table 2. Parents' professional qualifications

RESULTS

The survey was completed by 510 students of all healthcare professional courses.More than two-thirds of them (73.5%) were female. The average age of participants was 21.59 ± 2.16 years. The majority of students were from the department of medicine (41.00%) and the most students were those attending the 4th year (20.40%) (Table 1). Also, more than two-thirds of students left their parents' home while studying and lived with a roommate (29.60%), alone in an apartment (28.00%) or in the dormitory (11.60%). Almost all (97.00%) of the examined students had a social media profile. Most of the participants' parents graduated from high school (Table 2).

Some participants confirmed previous experience with substances, but in very different frequency (Table 3). Almost all students have tried alcohol (93.53%) and energy drinks (87.06%). About a half of tested students have ever smoked cigarettes (52.94%) and around a third of questioned students have confirmed that they tried marijuana (34.12%). Only 9.5% of participants have tried some other psychoactive substances where heroin, cocaine, LSD or other hallucinogens and amphetamine like derivatives were mentioned.

Only 11.5% of respondents reported that they had been offered SCs, in most cases by friends (45%) or in a club/party (50%).

Habits / consumption	Frequency of use N (%)				
	Regularly	Sometimes	Rarely	Never	Total
Cigarettes smoking	79 (15.49)	107 (20.98)	84 (16.47)	240 (47.06)	510 (100.00)
Alcohol	22 (4.31)	409 (80.20)	46 (9.02)	33 (6.47)	510 (100.00)
Energy drinks	20 (3.92)	169 (33.14)	255 (50.00)	66 (12.94)	510 (100.00)
Marijuana	11 (2.16)	97 (19.02)	66 (12.94)	336 (65.88)	510 (100.00)

Table 3. Frequency of some habits (smoking), alcohol beverage and energy drinks consumption and the use of psychoactive substances like marijuana

Table 4. Degree of agreement with claims about synthetic cannabinoids (SCs)

*PAS – psychoactive substances

Claims regarding SCs	Degree of agreement N (%)			
	Agree	Do not know	Disagree	Total
Their usage is legal in Serbia	48 (9.41)	151 (29.61)	311 (60.98)	510 (100.00)
Their chemical structure is constantly changed (improved)	207 (40.59)	285 (55.88)	18 (3.53)	510 (100.00)
Their psychoactive action is unpredictable	244 (47.84)	228 (44.71)	38 (7.45)	510 (100.00)
Their usage is safer than marijuana use	21 (4.12)	285 (55.88)	204 (40)	510 (100.00)
They can cause death	174 (34.12)	304 (59.61)	32 (6.27)	510 (100.00)
They are easily detectable in blood and urine	189 (37.06)	270 (52.94)	51 (10)	510 (100.0)
Their intermittent usage is not dangerous	36 (7.06)	265 (51.96)	209 (40.98)	510 (100.00)
The users of SCs are obligatory dependent on other illegal PAS*	134 (26.27)	284 (55.69)	92 (18.03)	510 (100.00)

Only 2% of the students have consumed SCs, with all (100%) saying it was due to curiosity. Lethargy, relaxation, irritability, sluggishness, nausea and itching were listed as the effects they had felt. Of the total surveyed, 11.8% knew someone who consumes SCs.

Slightly less than half of the students (49%) answered positively to the question if they knew what synthetic cannabinoids were, whereas when they were offered three definitions regarding SCs - 92.2% of them gave the correct answer. There was a statistically significant difference between males and females considering previous knowledge about SCs(p=0.014). Male students knew better.

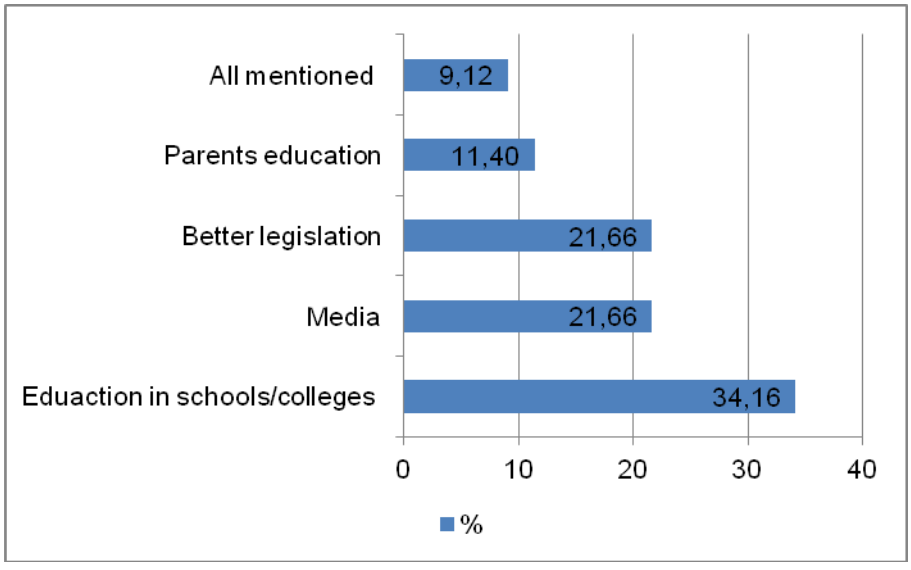
Moreover, considering previous knowledge about SCs, a statistically significant difference was observed between the courses (p=0.000) as well as the years of study (p=0.000). The students of pharmacy showed better previous knowledge in comparison with students of other courses as well as the final year students compared to those from the 1st and 2nd year of study. The repetition of a year level did not affect student's knowledge about SCs (p=0.616).

Taking into account previous experience regarding cigarettes smoking, alcohol, energy drinks and marijuana consumption, only those with experience in alcohol usage showed better previous knowledge of SCs in comparison with alcohol non-users (p=0.008). Neither parents' professional qualifications (p=0.953 mother, p=0.500 father) nor social media profile existence (p=0.057) affected students' previous knowledge about SCs.

The degree of agreement with the claims about SCs is shown in Table 4. The largest number of respondents answered „do not know" on the majority of claims offered.

Regarding the last question related to the ideas for protecting vulnerable populations from the use of SCs, 34.16% of participants pointed that the best way would be raising educational efforts in schools/colleges (Chart 1).

Chart 1. Opinion on the best way to protect vulnerable populations from the use of SCs



DISCUSSION

This study aimed to reflect the knowledge of the future healthcare professionals regarding SCs and its possible relation to both previous use of other psychoactive substances and socio-demographic characteristics of the respondents. To the best of our knowledge, this is the first detailed study of this type conducted not just in Serbia but also in the region.

Slightly less than a half of the students (49%) answered correctly to the question if they knew what SCs were, whereas male students in a larger percentage gave a correct answer in comparison with female counterparts. One of the reasons might be a greater propensity of the male students for psychoactive substances, which has been noted in the recent publications [10, 11, 12]. On the other hand, Blevins et al.,comparing participants who had never used SCs with SCs lifetime users, did not find gender differences among the groups [13].

Final year students showed better previous knowledge in comparison with students of the 1st and the 2nd year of the study, which is consistent with results by other authors. In the study by Haddad et al. a comparison was made between grade 10 and 11 high school students, where older students reported more awareness towards substance abuse [14]. Moreover, a total of 33% rated their knowledge of substance use as „very good" and most of these were students in the higher grade. Similarly, in the study by Shafiq et al. seniors (4th and 5th year's students) reported fewer benefits of substance use compared to juniors (1st, 2nd and 3rd year's students) [15]. In our study the pharmacy students showed better previous knowledge in comparison with those of other courses, which might imply that students who had had additional (extra) pharmacology and toxicology classes and those who had passed the subject gained better knowledge of SCs. Confirmation of the importance of pharmacology in the knowledge about SCs provides that the repetition of a year level did not affect students' knowledge about this PAS. Even though medical students attend psychiatry lessons during fifth year of studies, they were not singled out regarding their knowledge about the topic. In the study evaluating a source of information about SCs among last grade medical students, the pharmacology lectures were in second place (40.5%), while the first place was reserved for internet/social media (48.6%) [16]. Similarly, in the same study it was identified that students who had had social media accounts demonstrated significantly better awareness of SCs abuse. On the other hand, our results have shown that social media account existence did not affect students' previous knowledge about SCs.

Our findings that parents' professional qualifications did not affect students' previous knowledge about SCs, are not in line with a broader literature indicating that some forms of substance use as well as patterns of use are more common among students whose parents have university education. The authors agreed that many SCs compounds are currently „legal" and available for purchase in convenient stores and on the internet, making them easily accessible for young adults, especially those with economic means to purchase [17, 18, 19], SCs users were more likely to report lower parent education compared with current marijuana-only users [12].

No use of marijuana was reported by 65.88% of the students in our investigation. These results are comparable with other similar studies including medical students. According to Shafiq et al. a predominant anti-drug opinion among medical students was noted, and 78% had no intention of ever using a drug [15]. Khalid et al. reported an even higher number of medical students finding no justification for the use of cannabis regardless of circumstances [20]. Marijuana consumption had no significant effect on the knowledge about SCs in our survey, but the opposite was shown in studies supporting the hypothesis that attitudes and knowledge regarding the substance are major influencers of intention to use [21, 22]. The lifetime use of SCs was reported by only 2% of the students surveyed (for all of them the main reason was curiosity). Similarly, the consumption rate of SCs among student-athletes in the USA in 2017 was 1.9% [10].

The lifetime use of alcohol was reported by 93.53% of the students in our study and those who use alcohol showed better knowledge of SCs. Although according to Egan et al. current drinkers were more likely to use SCs, Blevins et al. showed that SCs use was not associated with alcohol or other drug use [10, 13].

Most of the respondents stated that they had been offered SCs in a club/party

(50%) or by a friend (45%). Similar findings have already been demonstrated in earlier study in USA.5 In the Netherlands it was discovered that novel psychoactive substances users had significantly more peers who use substances when compared to non-users and illicit drugs users, which is in good correlation with our study [23].

About 50% of interviewed students answered „do not know" in 7 out of 8 statements when the degree of the agreement with the statement was tested. Consequently, they are ready to make an extra effort in their education to gain additional knowledge regarding the topic. In a study conducted in Serbia, which evaluated the knowledge of medical students regarding medical cannabis, it was shown that education did (to some extent) influence the students' knowledge, as we have demonstrated [24]. Moreover, the majority of the medical and pharmacy students, in previous studies in Serbia knew that the usage of SCs is illegal, which is in agreement with our study [24, 25].

CONCLUSION

Superficiality in students' knowledge and insufficiency of formal education contributes to the necessity for expanding lectures about synthetic cannabinoids for future health care professionals. It is highly advisable to raise awareness of synthetic cannabinoids among future doctors, who should be trained with accurate and most recent information.

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CONFLICT OF INTEREST

All authors declare no conflict of interest.

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Faktori uticaja na znanje o sintetskim kanabinoidima - studija sprovedena među budućim zdravstvenim radnicima

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KRATAK SADRŽAJ

Uvod: Prema postojećem nastavnom planu i programu, budući zdravstveni radnici dobijaju minimalan broj informacija o dijagnostici i lečenju posledica konzumiranja sintetskih kanabinoida (SC), čija je upotreba sve raširenija u posljednje vreme.
Cilj: Cilj je ispitati znanje studenata zdravstvenih zanimanja o SC i ispitati faktore koji utiču na stečeno znanje.
Materijal i metode: Unakrsna studija među 510 studenata medicine, stomatologije i farmacije sprovedena je na Medicinskom fakultetu Univerziteta u Novom Sadu, Srbija, tokom 2017. godine korišćenjem strukturiranog upitnika.
Rezultati: Četrdeset i devet posto učenika je odgovorilo potvrdno na pitanje da li znaju šta su SC, dok kada su im ponuđene tri definicije u vezi sa SC – tačan odgovor je dalo 92,2% njih, pri čemu su osobe muškog pola pokazale bolje znanje od pripadnica ženskog pola (p=0,014). Ni profesionalne kvalifikacije roditelja (p=0,953 majka, p=0,500 otac) niti postojanje profila na društvenim mrežama (p=0,057) nisu uticali na prethodno znanje studenata o SC. Studenti farmacije su pokazali bolje znanje o SC u odnosu na studente drugih smerova (p=0.000), kao i studenti završnih godina u odnosu na studente 1. i 2. godine studija (p=0.000). Obnavljanje godine nije uticalo na znanje koje su studenti pokazali prilikom popunjavanja upitnika (p=0,616). Studenti koji su konzumirali alkohol pokazali su bolje znanje o SC u odnosu na one koji nisu konzumirali alkohol (p=0,008). Međutim, većina ispitanika je na najveći broj tvrdnji o SC odgovorila sa „ne znam".
Zaključak: Površno znanje studenata i nedovoljno formalnog obrazovanja iz ove oblasti govori u prilog neophodnosti revizije nastavnog plana i programa u vezi SC za buduće zdravstvene radnike.

Ključne reči: sintetski kanabinoidi, znanje, studenti, medicina, upitnik

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