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Understanding cannabis use in Singapore: profile of users and drug progression

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ABSTRACT

Introduction: Cannabis has consistently been the third most commonly abused drug among drug arrestees in Singapore over the past few years. Accordingly, this study aimed to understand the profile of cannabis users in Singapore and explore the effects of cannabis use on drug progression.

Methods: A total of 450 participants who had used cannabis at least once in their lifetime were recruited from the National Addictions Management Service, prisons, the Community Rehabilitation Centre and halfway houses from August 2017 to May 2018. A face-to-face questionnaire was administered and descriptive analyses were conducted.

Results: The mean participant age was 40.9 ± 14.51 years, and 93.1% of them were male. The participants generally initiated cannabis use during adolescence, at a mean onset age of 16.5 ± 4.46 years. Most (89.6%) were introduced to cannabis by peers. Approximately half of them (46.9%) had used cannabis before other illicit drugs and 42.1% of them had used heroin as the succeeding drug.

Conclusion: In Singapore, cannabis use is often initiated during adolescence, largely under peer influence. Cannabis users may progress to other illicit drugs, particularly heroin, later in life.

Keywords: cannabis, drug progression, marijuana, profile, weed

INTRODUCTION

Cannabis, commonly known as marijuana, is a psychoactive substance derived from the cannabis plant.[1] The primary active compound in cannabis, delta-9-tetrahydrocannabinol (Δ9-THC), is a partial agonist that binds to the cannabinoid receptors in the brain to exert psychoactive effects such as feelings of euphoria and relaxation, and altered perception. The receptors are located in several areas of the brain, including the hippocampus and regions related to the reward system, such as the ventromedial striatum. Given their location in the brain, they are known to be involved in a multitude of brain functions, including memory, reward and motor coordination.[1]

According to the World Drug Report 2019, cannabis is the most widely used drug across the globe, with approximately 188 million past-year users among the global population aged 15–64 years as of 2017, ranking ahead of opioids and amphetamines, which had 53 and 29 million past-year users, respectively.[2]

In Singapore, cannabis is listed as a controlled drug under the Misuse of Drugs Act.[3] Under the Act, cannabis abusers undergo mandatory treatment and rehabilitation. The possession or consumption of cannabis carries a sentence of imprisonment for 1–10 years and a fine of up to SGD 20,000. Possession of more than 15 g of cannabis is deemed as trafficking, and the harsh penalties for the trafficking or importation/exportation of cannabis involve a minimum of 20 years of imprisonment and 15 strokes of caning or death. According to the statistics from the Central Narcotics Bureau (CNB), cannabis has consistently been the third most commonly abused drug among arrested drug abusers from 2011 to 2017, following methamphetamine and heroin, and the second among new arrestees from 2015 to 2018.[4]

Amidst the controversy surrounding the legalisation of cannabis for both medical and recreational use, one central argument against legalisation focuses on the increased risk of progressing to other illicit drugs, particularly hard drugs with more adverse impacts and

addictive potential, from prior cannabis use.[5-7] Using data from a national survey conducted in the United States, Lessem et al revealed that after controlling for history of conduct disorder and race, individuals who had used cannabis at least once in their adolescence were 1.8 times more likely than nonusers to initiate the use of other illicit drugs in adulthood.[8] The study further supported the impact of cannabis use on drug progression through evidence from discordant sibling pairs, indicating that the siblings who had used cannabis were 1.9 times more likely than nonuser siblings to have used other illicit drugs later in adulthood, eliminating the possibility of alternative explanations based on genetics or shared environment. In addition, Fergusson and Horwood conducted a 21-year longitudinal study on a New Zealand birth cohort and found that even after controlling for possible confounders such as deviant peer influence and childhood sexual abuse, frequent cannabis users in adolescence (defined by > 50 uses in the past year) had 59.2 times higher likelihood than nonusers of using other illicit drugs.[9] Looking beyond adolescence, the continuous use of cannabis through young adulthood has also been shown to be associated with increased risks of using other illicit drugs. Swift et al conducted a 13-year longitudinal study with a cohort of Australian secondary school students and found that those who had continued to use cannabis occasionally (defined as less than weekly) in young adulthood were 1.9–2.7 times more likely to subsequently initiate amphetamine, cocaine and ecstasy use compared to past users who had stopped their cannabis use.[10] In light of these findings, it is of concern that the use of cannabis may carry a potential downstream risk of progressing to other illicit drugs.

Conversely, the common liabilities model asserts that the use of both licit and illicit substances points to shared risk factors that may be personal, genetic or environmental in nature and that there is no particular temporal sequence in the use of different types of substances.[11-13] Using retrospective data from two nationwide surveys conducted in France, Mayet et al revealed that there was no significant difference between the probability of using cannabis

before other illicit drugs and that of the reverse sequence. In addition, the study showed that those with early onset of substance use were equally likely to have used tobacco, cannabis or other illicit drugs as their first substance.[11] In a similar vein, Kendler et al's population study on Swedish twins and full sibling pairs showed that the common pathway model with a latent factor representing general vulnerability to cannabis, stimulant and sedative abuse had a superior fit compared with a model with distinct pathways, with high factor loadings ranging from 0.89 to 0.94. Moreover, the study also found that 75.0%–90.0% of the genetic risk and all the shared environmental risks were nonspecific in terms of the drug type.[14]

The rates of cannabis abuse, coupled with the associated risk of drug progression, indicate the need to develop a more comprehensive understanding of cannabis use in Singapore. Thus, the aims of this study were two-fold: (a) to understand the profile of cannabis users in Singapore and (b) to explore the effect of cannabis use on drug progression.

METHODS

The study recruited participants from multiple sites in Singapore, including patients from the National Addictions Management Service (NAMS), inmates under the custody of the Singapore Prison Service (SPS), supervisees under supervision by the CNB, and residents from the Community Rehabilitation Centre (CRC) and halfway houses. All participants were aged > 16 years and had used cannabis at least once in their lifetime. Given that the test battery was available only in English, those who could not read and understand English were excluded. Ethical approval for the study was obtained from the Domain Specific Review Board of the National Healthcare Group in Singapore.

Study recruitment was conducted from August 2017 to May 2018 as follows: (a) NAMS – outpatients who met the study criteria were identified at treatment outcome monitoring or treatment sessions by the coordinators or clinicians and inpatients were screened by a study

team member; and (b) SPS, CNB, CRC and halfway houses – an e-mail detailing the objectives and criteria of the study was sent to the directors of the CRC and halfway houses. A copy of the participant information sheet was also sent for dissemination to the residents of the CRC and halfway houses to allow for the consideration of participation. For inmates and supervisees in the SPS and CNB, a verbal announcement regarding the study was made at the prison because no written materials were permitted within the premises. Staff from the mentioned institutions assisted in screening inmates, supervisees and residents for study eligibility. Following screening, a date and time was arranged for the study team members to visit the various sites to brief potential participants and conduct face-to-face recruitment. Upon obtaining verbal consent, the study team members administered an anonymous questionnaire, which took approximately 30–45 minutes to complete. An inconvenience fee of SGD 30 was provided to the treatment-seeking participants for their participation. Because of legal restrictions, the fee was not provided to the participants recruited via the SPS, CNB, CRC and halfway houses.

Demographic information, including age, gender, nationality, marital status, education, housing condition and living arrangements, was collected. Participants were also asked about their medical, psychiatric and suicidality histories. Participants provided information on age of onset, age of problem, introduction to cannabis, reasons for initiation, deterrence factors, dosage, methods of administration, mixture of cannabis with other substances, polysubstance use and cannabis-related forensic history.

Participants were asked about their frequency of cannabis use over the past 30 days, past year and lifetime. For the incarcerated participants, it was specified that these time frames referred to the time before their current imprisonment. Response options for each time period included less than monthly, monthly, once in two weeks, weekly, 2–3 times per week, 4–6 times per week, daily and not applicable. Data was recoded to capture the most frequent use

across the three time frames. Participants were then categorised into three groups of users including infrequent users (less than monthly, monthly, once in two weeks and weekly), frequent users (2–3 times and 4–6 times per week) and daily users.

Participants were asked about their use of other illicit drugs, which included amphetamines, heroin and other opioids, benzodiazepines and other sedatives, barbiturates, ketamine, cocaine, inhalants, hallucinogens and new psychoactive substances. They were then grouped into the following four categories of drug progression based on the onset age of cannabis and of other illicit drugs: (a) cannabis was the only drug used; (b) cannabis use preceded the use of one or more other drugs; (c) cannabis use was initiated after the use of one or more other drugs; and (d) undefined. Because the information on onset age was classified by year rather than specific time period, it was not possible to distinguish whether individuals who reported the same onset age for cannabis and one or more drugs had tried the drugs at the same time, or fell under categories (b) or (c). Hence, these individuals were grouped into a fourth category as undefined.

Descriptive analyses were conducted to derive statistics such as means, standard deviations, frequencies, percentages for the aforementioned demographic, cannabis-related variables, frequency of cannabis use and drug progression. All analyses were conducted using IBM SPSS Statistics version 23.0 (IBM Corp, Armonk, NY, USA).

RESULTS

A total of 450 participants were recruited—150 from NAMS, 161 from SPS, 39 from CNB, 40 from CRC and 60 from halfway houses. Their mean age was 40.9 ± 14.51 years. Most participants (93.1%) were male and Singaporean (95.6%). They were mainly single (56.7%) and had secondary school education (46.3%).

Approximately half of the participants reported that they had been diagnosed with physical chronic illnesses (49.1%). Among them, 41.6% were diagnosed with hepatitis C and 30.8% with hypertension. 30.7% of the participants reported that they had been diagnosed with psychiatric disorders: 62.3% with depression, 24.6% with substance use disorders and 22.5% with anxiety disorders. In addition, 28.2% reported having a history of suicidality or nonsuicidal self-harm. In particular, 91.3% of them had past suicidal thoughts, 38.6% had attempted suicide and 35.4% had made nonsuicidal self-harm attempts. The detailed analysis can be found in Table I.

Table II shows the analysis of cannabis-related information. The mean onset age of cannabis use was 16.5 ± 4.46 years. On average, the participants became aware of their problem with cannabis use at the age of 18.4 ± 5.67 years. Most were introduced to cannabis by friends (89.6%), and their main reasons for trying cannabis were curiosity (83.1%), peer influence (43.8%) and easy availability (25.6%). In terms of deterrence factors, participants mainly cited legal consequences (60.7%) and availability of other drugs (33.3%) as factors that would have stopped their cannabis use. 48.2% of the participants had served penal sentences owing to their cannabis use.

During the time when they used cannabis the most, 62.2% reported using the drug daily. The typical unit of measurement used by the participants was sticks, and the average dosage by sticks was 1.3 ± 1.31 per day. The most common method of administration was smoking rolled sticks (91.6%) and using instruments (71.3%). Most participants mixed cannabis with other substances (89.7%), mainly tobacco (98.2%). Almost all reported polysubstance use, including nicotine and alcohol (99.6%). In terms of illicit drugs, 88.4% indicated polydrug use. The details can be found in Table III.

Four participants had missing data on the onset age of one or more drugs and thus, could not be grouped into any of the drug progression categories. The available data indicates that

about half had used cannabis as their first drug and eventually progressed to the use of other

illicit drugs (46.9%) (Table IV). 42.1% of these participants had initiated the use of heroin as

the succeeding drug to cannabis (Table V).

Table I. Medical, psychiatric and suicide histories.

Variable	No. (%)
Physical chronic illness	221 (49.1)
Hepatitis B	11 (5.0)
Hepatitis C	92 (41.6)
Other liver diseases	19 (8.6)
HIV/AIDS	5 (2.3)
Moderate/severe kidney disease	4 (1.8)
Gastritis	26 (11.8)
Diabetes mellitus	22 (10.0)
Hypertension	68 (30.8)
Hyperlipidaemia	37 (16.7)
Ischaemic heart disease	9 (4.1)
Other chronic illnesses	70 (31.7)
Psychiatric disorder	138 (30.7)
Substance use disorders	34 (24.6)
Attention deficit hyperactivity disorder	8 (5.8)
Anxiety disorders	31 (22.5)
Depression disorders	86 (62.3)
Other mood disorders	18 (13.0)
Psychosis	4 (2.9)
Schizophrenia	8 (5.8)
Other psychiatric disorders	21 (15.2)
Suicide history	127 (28.2)
Suicide thoughts	116 (91.3)
Suicide attempts	49 (38.6)
Nonsuicidal self-harm	45 (35.4)

Table II. Cannabis-related information.

Variable	No. (%)
Introduction	
Immediate family	19 (4.2)
Extended relatives	19 (4.2)
Friends	403 (89.6)
Colleagues	32 (7.1)
Internet	24 (5.3)
Others	69 (15.3)
Reason for initiation	
Curiosity	374 (83.1)
Believed that it would help with medical issues	42 (9.3)
Peer influence	197 (43.8)
Stress coping	49 (10.9)
Easy availability	115 (25.6)
Others	79 (17.6)
Deterrence factor	
Awareness of harm	37 (8.2)
Availability of other drugs	150 (33.3)
Higher price	41 (9.1)
Family support	75 (16.7)
Alternative coping	30 (6.7)
Legal consequences	273 (60.7)
Seen harm in others	37 (8.2)
Others	107 (23.8)
Cannabis-related forensic history	
Yes	217 (48.2)
No	233 (51.8)

Table III. Cannabis use.

Variable	No. (%)
Frequency of use*	
Daily	280 (62.2)
Frequent	68 (15.1)
Infrequent	102 (22.7)
Method of administration	
Smoking with rolled sticks	394 (91.6)
Smoking with instruments	281 (71.3)
Chewing	7 (1.6)
Cooking in food	24 (5.5)
Others	34 (7.6)
Mixing of cannabis with other substances	391 (89.7)
Tobacco	383 (98.2)
Other drugs	20 (5.1)
Food (e.g. curry/brownies)	24 (6.1)
Polysubstance use	448 (99.6)
Polydrug use	398 (88.4)
Dosage per day†	
Grams	54 (3.53 ± 4.88)
Sticks	308 (1.26 ± 1.31)
Spoons	22 (2.87 ± 1.87)
Packets	25 (0.57 ± 0.37)

Frequent users refer to those who had used cannabis 2–3 or 4–6 times per week and infrequent users refer to those who had used less than monthly, once per month, once in two weeks and once per week. †Data expressed as mean ± standard deviation.

Table IV. Drug progression.

Drug progression	No. (%)
Only cannabis was used	51 (11.4)
Cannabis preceded other drugs	209 (46.9)
Cannabis after other drugs	93 (20.9)
Undefined*	93 (20.9)

Undefined group refers to those whose drug progression sequence could not be differentiated because they had initiated cannabis and one or more drugs at the same age; onset ages could only provide year information instead of the specific time sequence.

Table V. Succeeding drug after cannabis in the group where cannabis use preceded other drug use (n = 209).

Drug type	No. (%)
Heroin	88 (42.1)
Other sedatives/hypnotics/tranquillisers	16 (7.7)
Benzodiazepines	12 (5.7)
Amphetamine-type stimulants	11 (5.3)
New psychoactive substances	10 (4.8)
Hallucinogen	6 (2.9)
Other opiates/opioids	4 (1.9)
Inhalants	4 (1.9)
Ketamine	3 (1.4)
Barbiturates	1 (0.5)
Cocaine	1 (0.5)
Other drugs	1 (0.5)
Undefined*	52 (24.9)

Undefined group refers to those who had more than one succeeding drug identified based on onset ages, which could not provide information on the specific time sequence.

DISCUSSION

Participants in the current study sample generally started using cannabis during adolescence at a mean onset age of 16.5 ± 4.46 years. This is consistent with the findings in other countries such as the United States, Canada and Denmark.[15-17] Urbanoski et al studied the profile of individuals seeking treatment at addiction facilities in Ontario and found that patients under the age of 20 years were 4.2 times more likely to report cannabis-related problems than those aged 20 years and above.[16] The prevalence of cannabis use during adolescence may be attributable to adolescents' misconceptions about the detrimental effects of cannabis use. Given the widespread use and easy availability in some countries, adolescents may think that cannabis is less harmful than other drugs, and thus, may be more open to experiment with it. A perception survey conducted by the National Council Against Drug Abuse from 2015 to 2016 showed that the proportion of Singapore youths aged 13–21 years who held permissive attitudes towards drug use increased from 11% in 2013 to 16% in 2016.[18] In particular, the survey also found that close to one-third of the youths perceived that cannabis has fewer detrimental effects and is not addictive, which are misconstrued views from online information regarding the medicinal

use and legalisation of cannabis in other countries. The prevalence of cannabis use in adolescence is worrying because early onset has been found to have more long-term detrimental effects than onset in adulthood in terms of cognitive, psychological and psychosocial functioning.[19-21] For instance, Pope Jr et al found that early-onset participants who initiated cannabis use before the age of 17 years scored significantly poorer on verbal intelligence than late-onset participants who initiated use at 17 years and later, after controlling for age, gender, ethnicity and family attributes.[21] The current findings and corroboration from previous studies highlight the importance of in-depth preventive work with youths to correct their misperceptions by providing evidence-based information on the detrimental effects of cannabis use.

The current study also found that peer influence is an important factor leading to first cannabis use, with 89.6% of the participants having indicated that they were introduced to the drug by their friends. This is not surprising given that most participants initiated cannabis use during adolescence, when peer influence is particularly pronounced. According to Bandura's social learning theory, children and adolescents model behaviours of people in their immediate environment, and the learned behaviours perpetuate if reinforcements are in place.[22] During adolescence, youths spend most of their time in and outside of school with their peers. To gain a sense of belongingness and in-group recognition, adolescents often conform to group norms by modelling the behaviours of their peers. In turn, the acquired sense of belongingness and in-group recognition further reinforce the behaviours. Hence, if adolescents are connected to deviant peers, they are likely to engage in deviant behaviours, such as drug consumption. Following a group of adolescents for ten years from the age of 17, Beardslee et al revealed that peers' cannabis use significantly increased the participant's cannabis use in the following year.[23] Given that peers have such strong influence in an adolescent's life, it is crucial for

parents and schools to connect youths to opportunities that can help them to build healthy friendships.

The current findings revealed that close to half of the participants (46.9%) eventually progressed to other illicit drugs after the initiation of cannabis use. This is consistent with the findings in past studies on the gateway effect of cannabis.[8,9] Having experienced cannabis and not perceiving its detrimental effects, users may become more adventurous and open towards experimentation with harder drugs that have more adverse impacts. Furthermore, the use of cannabis may expose users to drug-taking circles and deviant peer networks that provide easy access to drugs, increasing the likelihood of progression to harder drugs. This finding suggests that the use of cannabis carries a potential downstream risk of using other drugs with more adverse impacts. Of the participants whose cannabis use preceded the use of other illicit drugs, 42.1% had initiated the use of heroin as the succeeding drug to cannabis. The association between cannabis and heroin use may be explained by several factors. Besides the aforementioned psychosocial factors, there has been some neurobiological evidence from experimental animal studies. Some studies revealed that cannabis and heroin exert similar rewarding effects through a shared neuropathway, namely the mesolimbic pathway, through which dopamine is transmitted via the shared mu1 opioid receptor found in the ventral mesencephalic tegmentum.[24,25] Similarly, it has also been shown that regular use of cannabis not only intensifies its own effects, but also those of heroin, resulting in a phenomenon known as cross-sensitisation.[26,27] Past studies that examined the relationship between cannabis use and the use of other illicit drugs mainly used quantitative designs. Future studies may further investigate the phenomenon through qualitative interviews so that more in-depth information such as sequencing of drug use and the impact of misconceptions and deviant networks can be explored.

This study has some limitations. Participants were only required to have tried cannabis once in their lifetime to be included in the study. Hence, it is likely that some participants may have used the drug early in life and thus, experienced difficulty in recollecting cannabis-related information such as age of onset and frequency of use or the sequence of their drug progression. This may have resulted in recall bias, reducing the accuracy of data and findings. Future studies may aim to recruit new or active cannabis users to reduce the possibility of recall bias.

The classification of participants into different drug progression categories was based on onset age (in years) of different drugs, and 20.9% of participants were in an undefined category for which it was uncertain whether cannabis use was started before, after or at the same time as the use of other drugs. Future studies may further examine the role of cannabis in drug progression through longitudinal studies or qualitative interviews so that more in-depth information such as sequencing of drug use and the specified workings can be explored.

Finally, the study had excluded potential participants who could not read and understand English because the test battery was not available in other languages. Accordingly, this may have introduced a recruitment bias that may affect the generalisability of the findings. Future studies may seek to build on the present study with the use of translated test batteries.

In conclusion, the rates of cannabis abuse among drug arrestees in Singapore coupled with the risk of drug progression associated with the use of cannabis are a cause for concern. With the aim of developing an understanding of cannabis users in Singapore, the current study examined cannabis user profiles and the role of cannabis in their drug progression. The findings revealed that users tend to initiate cannabis use in adolescence, largely under peer influence. This calls for early preventive and intervention efforts for helping at-risk adolescents build healthy social relationships. The current study also showed that close to half of the participants had used other illicit drugs after the initiation of cannabis use, and most had used heroin as the succeeding drug. This indicates the downstream risk of cannabis use on drug progression. The

current study has its limitations in terms of recall bias and the operationalisation of drug progression. Future studies may aim to collect richer qualitative information to further assess the relationship between the use of cannabis and progression to other drugs.

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