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Original article

Synthetic Cannabinoid Use in an Acute Psychiatric Inpatient Unit

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Abstract

This study explores the prevalence of new psychoactive substance use by people admitted into an Australian acute public mental health facility specialising in comorbid mental health and substance use. These substances have since been banned from retail outlets, but the pattern of uptake and reasons people use them is informative in terms of motivations and management of substance use more generally.

A cross sectional study to explore the use of synthetic cannabis by people admitted to an acute adult mental health unit was undertaken. Associations with diagnostic, service use and demographic profiles were explored.

Fifty six % of people reported having used at least one type of new psychoactive substance, including 53.5% who reported using synthetic cannabis alone, and 18.8% who reported using both synthetic cannabis and other new psychoactive substances. Synthetic cannabis use was not associated with any demographic or diagnostic groups. Legality and availability (43% combined) were common reasons for use along with the feeling of intoxication (20%).

The high prevalence of new psychoactive substance use adds weight to the recommendation that clinicians should routinely screen for substances from the time of admission. Accurate information about these substances is required in order to provide accurate guidance and appropriate interventions to people in their care.

Key words

Cannabinoids, Hospitals Psychiatric, Prevalence, Street Drugs, Substance-Related Disorders

Introduction

People with mental health disorders are known to experience high rates of substance use disorders and associated morbidities. Management of these comorbid conditions requires specific approaches to treatment (Stewart et al., 2015) which are predicated on accurate assessment. The availability of new psychoactive substances (NPS) including synthetic cannabis has complicated the assessment process. Not all standardised substance assessment forms include questions relating to new and emerging substances.

Synthetic cannabis is generally sold in the form of green leafy inert plant material of inconsequential origin which is then sprayed with a solution containing one or more synthetic cannabinoids. Synthetic cannabinoids are structurally diverse compounds which bind to CB1 cannabinoid receptors in the brain and act as agonists in much the same way as delta-9-tetrahydracannabinol (THC) which is the major psychoactive chemical in cannabis. Synthetic cannabis does not contain a cannabidiol (CBD) mimetic; CBD is another cannabinoid found in cannabis which does not appear to contribute to the intoxicating effects of cannabis, but instead is thought to modulate some of the effects of THC and may also possess some, mild antipsychotic properties (Leweke et al., 2016). Synthetic cannabinoids have been available for purchase in Australia since 2010 (Barratt, 2012). These products have been sold under a variety of brand names and are often labelled as 'incense' 'not for human consumption' (Brakoulias, 2012). Tobacconists, specialist adult shops, 'head shops' (specialising in smoking paraphernalia and/or herbal products) and a number of other retail outlets in Australia began selling

synthetic cannabinoids around 2009 (Brakoulias, 2012). In the last few years the number of synthetic cannabinoids marketed around the world has grown exponentially and most of them are now banned in many countries (Dargan et al., 2011).

There is limited data available on prevalence and pattern of synthetic cannabinoid use. A recent Australian National Household Survey (Australian Institute of Health and Welfare, 2014), collected this information for the first time, reporting that among Australians over 14 years of age, 1.2% of them had identified as having used synthetic cannabinoids in the previous year and 0.4% had used other NPS.

The health impacts of synthetic cannabinoid and NPS use remains unclear. The situation is complicated by the diverse chemical structures of these products (Hudson & Ramsey, 2011), a number of which have consistently demonstrated greater binding affinity for CB1 and CB2 receptors than THC (Fantegrossi et al., 2014). Nelson and colleagues summarised the literature relating to complications from the use of synthetic cannabis (Nelson et al., 2014). Mental health issues related to their use included agitation, anxiety, irritability, sedation, confusion, paranoia and psychosis, tolerance, dependence and withdrawal. Physical complications included seizures, hyperthermia, tachycardia, dysrhythmia, chest pain, myocardial infarction, hypertension, vomiting, acute kidney injury, hypokalaemia and hyperglycaemia.

There is limited data on the pattern of synthetic cannabinoid use among individuals with mental health issues, (Every-Palmer, 2011; Castellanos & Thornton, 2012), even though this group is potentially more vulnerable to adverse health impacts as a result of use (Pierre, 2011). Routine screening for commonly known substances of abuse is

recommended and conducted in mental health services across Australia (Safety and Quality Partnership Standing Committee, 2013), including New South Wales (NSW Health, 2001). At the time the study was conducted, the questions regarding use of NPS including synthetic cannabinoids were not included in standard self-report screens and the majority of these drugs cannot be detected in standard urine drug screens. Toxicological assessment requires sophisticated and expensive testing (Salomone et al., 2012) not readily available to clinical staff.

Clinicians from a specialist Mental Health and Substance use Service (MHSUS) unit in NSW, Australia, noted that several people admitted to the unit had asked staff for information about these new substances. At the time, very little was known about the pharmacology of the substances or appropriate management. In view of these concerns, it was felt that further information was required regarding the psychoactive properties of these substances. Clinicians were also uncertain about the patterns of use of these substances by people admitted to the acute mental health unit involved. MHSUS developed and implemented a routine screening/assessment tool based on self-report focusing on new psychoactive substances. This assessment was incorporated into the routine substance use assessments conducted on each person admitted to the unit as per state protocols (NSW Health, 2001).

This paper reports the patterns of use of NPS by people admitted to an acute public mental health facility in NSW which specialises in the comorbid mental health and substance use disorders. To our knowledge, this represents the first standardised screening for new and emerging psychoactive substances in an acute psychiatric

population published. This paper expands on a study described in conference proceedings from the 40th International Mental Health Nursing Conference (Clancy et al., 2014).

The aim of this study was to explore the prevalence of NPS use among people admitted to an acute mental health unit specialising in comorbidity of mental health and substance use and explore associations between synthetic cannabis use, demographic factors, service utilisation and diagnoses.

Method

Design and Setting

An exploratory cross sectional study was conducted within a 22 bed acute Mental Health and Substance Use Service (MHSUS) unit situated within a large (100 bed) regional acute mental health facility in NSW, Australia. Admission to the MHSUS Unit is determined by assessment conducted by a Psychiatric Emergency Care Centre (PECC) which manages admission processes for each unit in the 100 bed facility. Those individuals who meet criteria for admission to the acute psychiatric facility and who are also identified as having used illicit substances within the month prior to admission, or who have a serious alcohol use disorder, are eligible for admission to the MHSUS inpatient unit. The mean length of stay for the MHSUS unit is 14.5 days.

A sample size calculation determined that 100 admissions would provide 80% power to detect a point prevalence estimate with a confidence interval of 15% using a 2 tailed test, with an alpha of .05.

Data Collection

The study involved the collection of data from consecutive admissions to the MHSUS unit between October 2012 and January 2013. Routine substance use assessments incorporating NPS assessment were conducted by MHSUS clinicians for each person who was admitted to the unit as soon after admission as practicable.

Instrument

A search of the literature conducted prior to the commencement of screening failed to identify any instrument which had been validated for screening or assessment of NPS use. The absence of specific diagnostic criteria for NPS use disorders and the lack of readily available pathology tests for recent NPS use led the team to develop a simple screening tool for clinical use based on the format of the standardised assessment items from the Mental Health Outcomes and Assessment Tools (NSW Department of Health, 2004) which was already being used in the unit.

A 17 item NPS assessment instrument was drafted by a clinical nurse consultant in mental health and substance use and a psychologist from the MHSUS unit, both with experience in comorbid mental health and substance use and in questionnaire development. Input was provided by consumers and the draft version of the tool was reviewed and refined by a multidisciplinary panel of 9 experts in comorbidity comprising nurses, psychiatrists, psychologists and a social worker. Reviewers were asked to consider comprehensiveness, clinical utility, ease of use and time taken to administer the tool.

The first item in the instrument was a screening item to identify whether respondents had ever used NPS. Respondents who answered 'no' to this question were asked no further questions. The other 16 items related to past and recent use of NPS including: class of substance used (synthetic cannabis, stimulant/hallucinogen, both). Brands used (eg. Kronic, Spice, K2, Smokin' Slurries, White Revolver, Shaman's Dust etc.).

Six additional items were added to the tool based on elements of a newly published Australian survey of synthetic cannabis use reported in the literature (Barratt et al., 2013). These items related to place of purchase, mode of use (bong [waterpipe used for smoking cannabis], joint, other) and questions relating to mixing synthetic cannabis with tobacco etc. (spin) for smoking. The panel of experts involved in the review of the original version of the instrument were asked to review the additional items.

For people, who have ever used synthetic cannabis, the following questions were used. Amount used (in dollars, cones, grams or other), date of first use, date of last use. Number of days that synthetic cannabis was used in the month prior to admission. One item related to subjective rating of the experience of intoxication with synthetic cannabis (positive / negative).

Demographic information and discharge diagnoses were retrieved from electronic medical records to complete the audit.

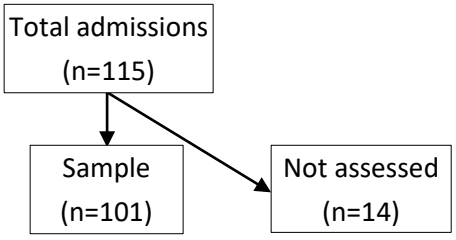
Permission was sought and granted by the Area Human Research Ethics Committee to conduct this prevalence audit.

A copy of the instrument used in this paper may be obtained by contacting the corresponding author.

Analysis

Data were analysed using IBM SPSS Software Version 22 (IBM., 2013). For the purpose of planned comparison within an ANOVA model, patients were categorised into three groups (Figure 1). Group 1 comprised people who reported they had never used Synthetic cannabinoids (but had used other substances). Group 2 comprised people who reported having tried synthetic cannabinoids (SC) in the past, but not in the month prior to admission. Group 3 comprised people who reported using synthetic cannabinoids within the month prior to admission.

ANOVA was used to compare the above groups for association with continuous variables (length of stay, age, number of previous admissions) and Chi Square comparisons were used to analyse associations with categorical variables (discharge diagnoses, gender, employment status and self-reported experience of using synthetic cannabis).



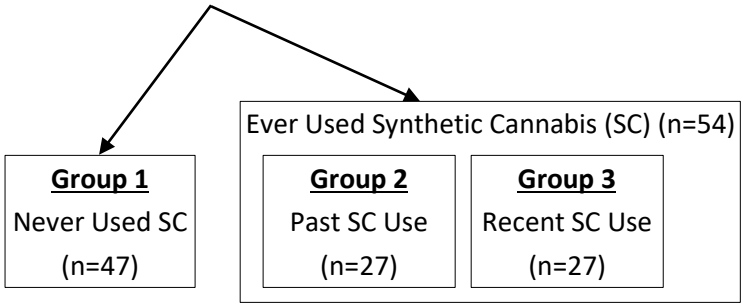


Figure 1: Categorisation of the sample for comparison using ANOVA model

Results

A total of 88% of admissions (101/115) to the unit completed the assessment. Most patients were Caucasian, male with mean age of 33 years (SD 10.9). Characteristics of the sample are described in Table 1.

Data could not be collected from 14 patients for a variety of reasons including patients refusal, discharge before data was able to be collected. There was no significant difference in demographics between those who did or did not complete the assessment.

Table 1: Sample characteristics

Sample (*n*=101)	% (*n*)
Male,	81% (*82*)
English spoken at home	99% (*100*)
Aboriginal & Torres Strait Islander (ATSI)	
Aboriginal	9% (9)

Marital Status,	
Never Married	80% (81)
Married	14% (14)
Divorced, widowed, or separated	5% (5)
Unknown	1% (1)
Currently Unemployed	78% (79)
Discharge Diagnoses[†]	
Psychotic disorder	68% (67)
Mood disorder	31% (30)
Anxiety disorder	20% (20)
Suicidal Ideation	40% (39)
Substance induced disorder	30% (29)
Cannabis related disorder	50% (49)
Other substance use disorder	75% (73)
Tobacco related disorder	80% (78)
Legal Status on admission	
Mentally Ill	41% (40)
Mentally Disordered	19% (18)
Voluntary	40% (43)

[†] Multiple diagnoses recorded for each patient.

Of the 101 patients assessed, 57 patients (56%) reported having used NPS, 54 patients (53.5%) reported using synthetic cannabinoids and 19 patients (18.8%) reported using both NPS and synthetic cannabinoids (Table 2).

Table 2: Self-reported use of NPS

	% (n)	95% CI
Neither	43.6 (44)	34 - 54
Any NPPS	56 (57)	46 - 66
Synthetic cannabinoids only	†34.7 (35)	25 - 45
"Legal High" only	3.0 (3)	0 - 8
Both	†18.8 (19)	12 - 28
Total	100.0 (101)	

† Synthetic cannabinoids used by 53.5% (54) of the total sample [95% CI 43-63].

When comparing the three groups (Figure 1), no significant difference was found in demographic variables, namely age on admission, employment status, gender or relationship status. Similarly, no significant difference was found between the three

groups on clinical variables, namely number of previous admissions, length of admission, legal status on admission or diagnoses (mood disorder, suicidal ideation, substance induced disorder or psychotic disorder). A trend was seen between recent synthetic cannabinoid use and a higher incidence of cannabis related disorder and anxiety disorders (cannabis related disorder $\chi^2(2, N = 98) = 5.683$, $p = .058$; anxiety disorders $\chi^2(2, N = 98) = 5.87$, $p = .053$.

Patients who reported using synthetic cannabinoids were asked reasons for their use of synthetic cannabinoids. A range of reasons is outlined in Table 3.

Table 3: Reasons for using synthetic cannabinoids

	% (*n*)
Legality	24.1 (13)
Feeling state (in intoxication)	20.4 (11)
Availability	18.5 (10)
Curiosity	11.1 (6)
Being "shouted"	9.3 (5)
Work	3.7 (2)
Cost	3.7 (2)
Other	9.3 (5)

In the course of assessment, patients were also asked to rate their experience with using synthetic cannabinoids. More than half of respondents (59%) rated their experience as negative. A negative experience was associated with a higher chance of discontinuing the use of synthetic cannabinoids ($\chi^2(1, N = 50) = 4.778$, $p = .029$), though almost half (46%) of the people who rated their experience as negative, continued to use these substances.

Out of recent synthetic cannabinoids users, twenty one (21/27) reported using regularly in the month prior to admission (current regular use was defined as using 4 or more days

in the month prior to admission). In this group, the mean number of days per month in which synthetic cannabinoids was consumed was 17 (range 1-30). Thirty eight per cent (8) reported daily use while 33% (7) used between 4 to 8 days per month, which equates to weekend use.

The self-reported number of "cones" per day, by synthetic cannabinoid users, varied between 2 to 90 per day. The mean reported consumption was approximately 9 cones per day with a median of 4 cones per day. Eleven patients reported using "spin" with their synthetic cannabinoids (mixing tobacco or other plant material with cannabis is referred to as "spin"). Thirteen patients reported using a "bong" to smoke synthetic cannabinoids, while one respondent reported using a pipe and another reported preferring to smoke "joints".

Patients reported nearly 30 variants (brands and labels) of NPS, with "Kronic" being the most frequently reported. No chemical analysis was undertaken of samples to determine the specific chemical content.

Discussion

This cross-sectional exploratory study took place in a large regional acute mental health inpatient facility specialising in comorbid substance use. At the time of data collection, NPS including synthetic cannabinoids were being sold in Australia with little restriction in tobacconists, online, specialist adult shops and other outlets. Clinicians had little information to guide their practice in relation to NPS and were unaware of the frequency of NPS use by people accessing services.

The only other known study into NPS use by people accessing mental health services (n=15) was conducted in a New Zealand forensic unit (Every-Palmer, 2011) reporting a higher prevalence of use (86% compared to 56% in our case).

Our sample population was predominantly male with the average age being 33 years. The mean age of synthetic cannabis users in community surveys (Barratt et al., 2013; Winstock & Barratt, 2013) is reported to be about 25 years. The mean age in the inpatient study (Every-Palmer, 2011) is comparable (34 years). The higher mean age in the mental health populations, is likely to be attributable to sampling methods used, though it may be possible that older synthetic cannabinoid users could have severe mental health problems requiring inpatient treatment. In this study, the demographic and clinical variables were similar between synthetic cannabinoids and other acute inpatients. It may be that the mental health impact associated with synthetic cannabinoids is similar to other illicit substances used by this client group. It is also possible that the use of synthetic cannabis may be associated with their mental health condition; as a number of mental health symptoms are reported to be associated with synthetic cannabinoid use (Brakoulias, 2012; Hurst et al., 2011; Peglow et al., 2012; Rodgman et al., 2011; Alverio et al., 2012; Benford & Caplan, 2011; Castellanos et al., 2011; Johnson et al., 2011; Muller et al., 2010; Oluwabusi et al., 2012; Tung et al., 2012; Van Der Veer & Friday, 2011; Every-Palmer, 2011). However, mental health issues are often multifactorial in aetiology and hence any direct associations are difficult to quantify. The issue of quantifying the risk is unlikely to be answered in the foreseeable future due to the changing chemical structure and variable concentration of synthetic cannabinoids sold to and used by the public.

Cannabis use is reported to be associated with synthetic cannabinoid use (Barratt et al., 2013; Winstock & Barratt, 2013; Every-Palmer, 2011) . This association between cannabis use disorder and synthetic cannabis use approached statistical significance in our study. Our patients reported that legality and availability were high in their reasons for using synthetic cannabis. The legal availability of synthetic cannabis may have led consumers to perceive that synthetic cannabis was safer than herbal cannabis. These individuals may also have avoided herbal cannabis due to previous adverse experiences. The reasons given by patients for choosing to use synthetic cannabinoids (legality, availability and non-detectability) were similar to the findings of other studies (Barratt et al., 2013; Winstock & Barratt, 2013). The pattern of use in this population may change as these substances are no longer legal. A significant number of patients in our study and the Every-Palmer (2011) study reported negative experiences with synthetic cannabinoid use but continued to use the substance which indicates the addictive property of these substances.

Synthetic cannabis smokers used synthetic cannabis an average of 17 days in the month prior to admission to hospital, consuming a mean of 9 cones of synthetic cannabis on each smoking day. Quantifying the extent of intoxication this level of consumption produces is virtually impossible; however it does appear that some individuals are spending significant portions of time in an intoxicated state.

Limitations

This study was reliant on self-report hence had the limitations therein. The screening tool was conducted as part of routine clinical assessments on all consecutive admissions,

which may have reduced the sampling bias commonly associated with self-reports (Winstock & Barratt, 2013). This study is limited to acute mental health inpatients in one Australian facility with comorbid substance use issues, so the results may not be representative of the general Australian or international population. The tool that was developed for this population has not been tested for concurrent validity nor has it been piloted in other populations.

Further Research

This study further contributes to existing literature regarding adverse mental health consequences associated with synthetic cannabis use. Further studies are needed to comprehensively assess the impact. This study was conducted prior to the introduction of bans restricting the sale of NPS including synthetic cannabis. Changes in pattern of use in different populations with legal changes could also be explored in future studies.

Conclusion

As a baseline measure of the prevalence of use of NPS in an acute psychiatric facility for people with comorbid substance use issues, the data reported here will contribute to the understanding of the impact of the introduction of legislation such as the changes to the NSW Drug Misuse and Trafficking Act and amendments to Australian therapeutic goods legislation Schedules in 2013 on substance use patterns among a complex sub-group of the community. Given that the purchasing methods of this sub-group differ from other samples reported in the literature (Barratt et al., 2013), it is possible that legislation changes will have different impacts on different populations. Ongoing routine assessment for the use of these substances is clearly indicated due to the prevalence

and potential health consequences. The rate at which the uptake of these emerging substances has spread serves as a reminder to clinicians to be vigilant for the introduction of new substances and their associated health impacts in the future.

Relevance for clinical practice

Cannabis intoxication impacts on individuals' concentration, memory, executive function and other cognitive abilities. It is likely that synthetic cannabinoids will similarly impact cognitive function. Bearing in mind that impaired cognition is likely to impact on psychosocial interventions, clinicians in inpatient and community settings are advised to assess all people accessing treatment for NPS use when they assess for other substance use. Clinicians should be aware that many NPS substances are not detected in routine urine drug screens. Our study demonstrates that among acute mental health inpatients who use substances, there are no diagnostic or demographic markers to help identify likely users of NPS.

Where the use of NPS is identified, as with any other substance use, clinicians are recommended to employ motivational strategies to engage and encourage people to consider the impact that substance use is having on their life and consider ways to reduce any current and potential harms associated with their substance use It is helpful to ask the person to refrain from using substances immediately prior to future home visits or centre based appointments in order to reduce the impact of acute intoxication on cognitive function. Scheduling appointments early in the day may also reduce the likelihood of intoxication. If a person is obviously intoxicated at the time of a scheduled visit, it is helpful for clinicians to provide necessary interventions, but consider delaying delivery of complex interventions to a later time if it is likely that a more suitable (less intoxicated) time is likely to be found in the near future. For many people receiving treatment for mental health issues, abstinence is not a goal to which they currently aspire; in this situation clinicians can continue to provide mental health interventions

despite ongoing substance use along with motivational interventions to help the person consider changing their substance use.

It is also important that clinicians are able to provide consumers with accurate information about substances they are using. Due to the evolving nature of NPS, clinicians will need to constantly update their information on the psychoactive profiles of these substances.

As a result of the findings of this study, MHSUS clinicians developed a short educational video and a pamphlet for consumers about synthetic cannabis. Education outlining the major issues relating to synthetic cannabis was delivered to clinicians in MHSUS.

Continued monitoring of NPS use is indicated in this population at the individual clinical level and prevalence monitoring from a broader public health perspective.

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