Full length article

Characterizing marijuana concentrate users: A web-based survey

CrossMark

Raminta Daniulaityte[a,b,*], Francois R. Lamy[a,b], Monica Barratt[g,h,i], Ramzi W. Nahhas[c,f], Silvia S. Martins[d], Edward W. Boyer[e], Amit Sheth[b], Robert G. Carlson[a,b]

[a] Center for Interventions, Treatment, and Addictions Research (CITAR), Department of Population and Public Health Sciences, Wright State University Boonshoft School of Medicine, United States
[b] Ohio Center of Excellence in Knowledge-enabled Computing (Kno.e.sis), Department of Computer Science and Engineering, Wright State University, United States
[c] Division of Epidemiology and Biostatistics, Department of Population and Public Health Sciences, Wright State University Boonshoft School of Medicine, United States
[d] Department of Epidemiology; Columbia University Mailman School of Public Health, United States
[e] Department of Emergency Medicine, Brigham and Women's Hospital, United States
[f] Department of Psychiatry, Wright State University Boonshoft School of Medicine, United States
[g] Drug Policy Modelling Program, National Drug and Alcohol Research Centre, UNSW, Australia
[h] National Drug Research Institute, Faculty of Public Health, Curtin University, Australia
[i] Centre for Population Health; Burnet Institute, Australia

ARTICLE INFO

ABSTRACT

Aims: The study seeks to characterize marijuana concentrate users, describe reasons and patterns of use, perceived risk, and identify predictors of daily/near daily use.
Methods: An anonymous web-based survey was conducted (April-June 2016) with 673 US-based cannabis users recruited via the Bluelight.org web-forum and included questions about marijuana concentrate use, other drugs, and socio-demographics. Multivariable logistic regression analyses were conducted to identify characteristics associated with greater odds of lifetime and daily use of marijuana concentrates.
Results: About 66% of respondents reported marijuana concentrate use. The sample was 76% male, and 87% white. Marijuana concentrate use was viewed as riskier than flower cannabis. Greater odds of marijuana concentrate use was associated with living in states with "recreational" (AOR = 4.91; p = 0.001) or "medical, less restrictive" marijuana policies (AOR = 1.87; p = 0.014), being male (AOR = 2.21, p = 0.002), younger (AOR = 0.95, p < 0.001), number of other drugs used (AOR = 1.23, p < 0.001), daily herbal cannabis use (AOR = 4.28, p < 0.001), and lower perceived risk of cannabis use (AOR = 0.96, p = 0.043). About 13% of marijuana concentrate users reported daily/near daily use. Greater odds of daily concentrate use was associated with being male (AOR = 9.29, p = 0.033), using concentrates for therapeutic purposes (AOR = 7.61, p = 0.001), using vape pens for marijuana concentrate administration (AOR = 4.58, p = 0.007), and lower perceived risk of marijuana concentrate use (AOR = 0.92, p = 0.017).
Conclusions: Marijuana concentrate use was more common among male, younger and more experienced users, and those living in states with more liberal marijuana policies. Characteristics of daily users, in particular patterns of therapeutic use and utilization of different vaporization devices, warrant further research with community-recruited samples.

1. Introduction

Marijuana concentrates, also known as "dabs," "hash oil," "shatter," or "wax," are highly potent tetrahydrocannabinol (THC) preparations derived from cannabis plant material, frequently using solvent-based methods (Drug Enforcement Administration, 2014; Drug Policy Alliance, 2015). Such products contain very high THC levels that can range from 40% to 80% (Drug Enforcement Administration, 2014). In comparison, according to 2014 data, THC content in illicit cannabis plant material was found to be around 12% (ElSohly et al., 2016). Marijuana concentrates are typically vaporized using various types of vaporization devices ranging from discreet e-cigarette-like devices (dabs or wax pens) adapted for concentrate use to large dabs "rigs" (water pipes) that require use of a torch to heat a titanium or glass "nail" to vaporize the concentrate (Budney et al., 2015; Drug Policy Alliance, 2015). They can also be placed on top of dried marijuana

---

plant material and smoked (Drug Enforcement Administration, 2014).

There are numerous slang names that are being used to refer to marijuana concentrates, such as "dabs," "shatter," "wax," and "oil," including names that suggest how the concentrates were produced (e.g., "butane hash oil" or BHO) (Bailey, 2017). The terminology is still evolving as new types of production (e.g., rosin) or use methods (e.g., gravity bong dabs) emerge. "Dabs" is one of the more commonly appearing slang terms that is used to refer to concentrates regardless of how they have been produced (e.g., "BHO dabs" or "rosin dabs") or how they are consumed (e.g., "dabs rig" or "vape pen for dabs" or "vaping dabs") (Chambers, 2017).

Marijuana concentrate use is a growing trend across the United States (Bell et al., 2015; Carson, 2013; Drug Enforcement Administration, 2014; Relyea, 2016; Woods, 2016; Zhang et al., 2016). In states that allow retail of marijuana products for recreational use, they can be obtained legally from licensed retailers and producers. Qualified patients can also have legal access to such products at some medical marijuana dispensaries (Drug Enforcement Administration, 2014).

Because of the increased THC concentration and novel means of administration, use of marijuana concentrates may contribute to more severe problems in terms of the risks associated with cannabis use, such as addiction, psychotic disorders, and potential cognitive impairment (Degenhardt et al., 2013; Hall and Degenhardt, 2009; Keller et al., 2016; Miller et al., 2016; Moore et al., 2007; Stogner and Miller, 2015). Furthermore, with increasing use of more potent marijuana products, findings from older studies on the effects of marijuana use should be reassessed for relevance to current patterns and trends of use (Volkow et al., 2014).

Although media reports about marijuana concentrate use in the U.S. have been increasing (Associated-Press, 2014, 2015; Denson, 2014; Healy, 2015; Wyatt and Johnson, 2015), research remains limited. One prior web-based survey used Craigslist to recruit 357 individuals in the U.S. who reported "dabs" use. The study found that users viewed marijuana concentrates to be more dangerous than herbal/flower cannabis and reported an increase in tolerance and withdrawal symptoms (Loflin and Earleywine, 2014). A study that focused on e-cigarette use to vaporize cannabis among high school students in Connecticut, found that 4.5% of the total sample (N = 3847) had used e-cigarettes to vaporize hash oil (Morean et al., 2015). Several case reports have been presented on adverse medical consequences associated with marijuana concentrate production in patients presenting for treatment in states with more liberal cannabis legalization policies (Bell et al., 2015; Keller et al., 2016).

Analysis of Twitter data demonstrated a greater level of marijuana concentrate-related tweeting activity in states that allow recreational and/or medical use of cannabis (Daniulaityte et al., 2015). Similarly, analysis of Google search data found that dabbing searches were significantly more frequent in states with recreational marijuana legalization, and indicated an increasing trend in the U.S. (Zhang et al., 2016). Another Twitter-based study analyzed a sample of 3540 tweets related to dabbing marijuana concentrates and found relatively few tweets mentioning extreme effects related to dabbing; "passing out" and respiratory issues were among the more commonly mentioned physiologic effects (Cavazos-Rehg et al., 2016a, 2016b). Prior research has also concluded that dabbing-related information is readily available on YouTube (Krauss et al., 2015) and Instagram (Cavazos-Rehg et al., 2016a, 2016b).

There is a lack of data on the characteristics of marijuana concentrate users as well as user knowledge, attitudes, and behaviors related to marijuana concentrate use. This study is based on an anonymous web-based survey conducted via the Bluelight.org web forum. Data obtained from the U.S.-based subsample were analyzed to: 1) identify regional (state-level cannabis policy-related), socio-demographic, cannabis, and other drug use characteristics associated with marijuana concentrate use; 2) characterize marijuana concentrate

users' perceptions of risk and sources, patterns and reasons of use, and 3) identify regional, socio-demographic, and marijuana concentrate use characteristics associated with daily/near daily concentrate use.

2. Methods

2.1. Bluelight web forum

Bluelight.org is a publicly available web forum that is focused on sharing information and experiences related to drug use practices, including cannabis-related discussions. Bluelight is the largest and one of the most popular drug discussion websites (Anderson et al., 2017). Furthermore, the Bluelight community supports research and has been used as data source for web-based research on illicit drug use by numerous prior studies (Anderson et al., 2017; Soussan and Kjellgren, 2014, 2015), including research that used Bluelight as a platform to recruit participants for web-based surveys (Chiauzzi et al., 2013; Soussan and Kjellgren, 2016). The third author (M.B.), who has served as a volunteer research administrator for Bluelight's research portal for the last 10 years, has helped facilitate engagement with the Bluelight community and provided guidance in implementation of participant recruitment procedures.

Recruitment through a web-based forum is likely to produce a sample of respondents who have more extensive drug use histories (Davey et al., 2012; Soussan and Kjellgren, 2016) than a random sample of cannabis users. However, these individuals can be characterized as innovative drug users or trend-setters (Boyer et al., 2005) and thus are a valuable source of information on emerging drug use practices.

2.2. Participants and recruitment

Data were collected between April and June 2016. The web-based survey was completely anonymous (no IP addresses were collected), and developed using Qualtrics (Qualtrics, 2016). The aforementioned administrator (M.B.) posted an invitation to participate in the study in the "Drug Studies" section of Bluelight.org, which is devoted to promoting research opportunities to the community. A banner advertisement was visible to all site members or visitors for the duration of the recruitment period. Bluelight moderators were asked to promote the survey in their respective site pages, including the Cannabis forum. These posts inviting participation in the survey were pinned to forums so that they did not move out of view as the web forum activities progressed. During the recruitment period, the Bluelight research administrator (M.B.) posted several participation reminders to encourage individuals to take part in the study.

Participation was completely voluntary, anonymous, and there was no monetary incentive to participate in the study. The Institutional Review Boards at the participating institutions approved the survey under Exemption 2 (online survey, no personally identifiable information obtained).

To be eligible for participation, individuals had to: 1) be 18 years of age or older; and 2) report use of any form of cannabis at least once in their lifetime. Individuals who chose to click on the survey link were first provided with an online informed consent form and had to click "yes" to indicate their consent to participate in the study. If they indicated agreement to participate, they were linked to eligibility questions. Only those who were eligible were linked to the survey questions.

A total of 1437 respondents clicked "yes" to indicate agreement to participate and were linked to eligibility questions, of whom 18 were not eligible. Of the 1409 eligible respondents, 1082 completed the survey (77%). Thirteen were identified as inconsistent respondents (e.g., indicating age of first cannabis use greater than current age) and excluded, resulting in an international sample of 1069 respondents. The present analysis was limited to the U.S.-based subsample of 673 respondents.