



Full length article

User characteristics and effect profile of Butane Hash Oil: An extremely high-potency cannabis concentrate



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ABSTRACT

Background: Recent reports suggest an increase in use of extremely potent cannabis concentrates such as Butane Hash Oil (BHO) in some developed countries. The aims of this study were to examine the characteristics of BHO users and the effect profiles of BHO.

Design: Anonymous online survey in over 20 countries in 2014 and 2015. Participants aged 18 years or older were recruited through onward promotion and online social networks. The overall sample size was 181,870. In this sample, 46% (N = 83,867) reported using some form of cannabis in the past year, and 3% reported BHO use (n = 5922).

Measurements: Participants reported their use of 7 types of cannabis in the past 12 months, the source of their cannabis, reasons for use, use of other illegal substances, and lifetime diagnosis for depression, anxiety and psychosis. Participants were asked to rate subjective effects of BHO and high potency herbal cannabis.

Findings: Participants who reported a lifetime diagnosis of depression (OR = 1.15, $p = 0.003$), anxiety (OR = 1.72, $p < 0.001$), and a larger number of substance use (OR = 1.29, $p < 0.001$) were more likely to use BHO than only using high potency herbal cannabis. BHO users also reported stronger negative effects and less positive effects when using BHO than high potency herbal cannabis ($p < 0.001$).

Conclusion: Mental health problems and other illicit drug use were associated with use of BHO. BHO was reported to have stronger negative and weaker positive effects than high potency herbal cannabis.

1. Introduction

Cannabis is the most widely used illicit substance globally and this is particularly the case in developed countries. For example, the prevalence of past year cannabis use is 13%, 10% and 12% in the US (SAMHSA, 2014), Australia (AIHW, 2014) and Canada (Rotermann and Langlois, 2015) respectively. There is also evidence that cannabis use has spread to low- and middle-income countries, with a reported prevalence of 7.5% in African countries (UN Office on Drugs and Crime, 2015).

Cannabis users often report relaxation, euphoria, increased sociability and sexual pleasure as the main positive effects (Green et al., 2003). These effects are largely attributable to delta-9-tetrahydrocannabinol (THC), the primary psychoactive constituent in

cannabis, but they may also be modulated by cannabidiol (CBD) (Curran et al., 2016; Englund et al., 2017; Iversen, 2001). Cannabis potency is usually defined by THC content, which varies by preparation type (for example, resin, oil or herbal), strain of cannabis and method of cultivation. In 2008, the domestic UK market was dominated by high potency, indoor-grown varieties (e.g., skunk, sensimilla) that contain the highest THC content (approximately 15%), followed by outdoor-grown herbal cannabis (9%) and hash/resin (5%) (Hardwick and King, 2008). Similar results were found for cannabis obtained from UK cannabis users in a naturalistic setting (Freeman et al., 2014), but recent monitoring data are lacking (Freeman and Swift, 2016). In the Netherlands, popular indoor grown herbal cannabis increased in THC content from 9% in 2000 to 20% in 2004 (Pijlman et al., 2005) before decreasing to 15% in 2015 (Niesink et al., 2015). Data from drug

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enforcement agency seizures (ElSohly et al., 2016) indicated high potency herbal cannabis has become increasingly prevalent in the USA with the overall potency of illicit cannabis rising from 4% in 1995 to 12% in 2014. Based on the results of a single study, the Australian cannabis market is similarly dominated by high potency herbal cannabis containing approximately 15% THC (Swift et al., 2013). There is some evidence that use of high potency herbal cannabis (e.g., skunk, sensimilla) is associated with greater harms (Hall and Degenhardt, 2015), including higher levels of dependence (Freeman and Winstock, 2015) and an increased risk of developing a psychosis (Di Forti et al., 2015).

More efficient methods of hash/resin production have also been used to produce higher potency products (e.g., 30–40% THC in the United States and Netherlands) (ElSohly et al., 2016; Niesink et al., 2015). Recently, new refined cannabis products with unprecedentedly high THC content (cannabis concentrates) have received increased media coverage in the US (Cavazos-Rehg et al., 2016; Daniulaityte et al., 2015; Stogner and Miller, 2015a, 2015b). Their production appears to have been driven by growth in the medicinal cannabis industry in the US, with the intention of allowing users to limit their exposure to smoked herbal products by using smaller doses of more potent cannabis extracts. Butane Hash Oil (BHO) is one example, commonly referred to as “earwax”, “dabs”, “butter” and “shatter”. It can be prepared through a process called blasting, which involves passing butane through a steel or glass tube packed with dried cannabis trimmings to dissolve the THC. The butane-THC solution is then filtered and BHO obtained by evaporating the butane (Stogner and Miller, 2015b). Alternative methods of extraction include different solvents (e.g., propane) or carbon dioxide extraction. These new methods can produce “cannabis concentrates” with THC content as high as 76% (Raber et al., 2015). The maximum THC content achievable using these new extraction techniques exceeds more traditional methods (e.g., dry extraction to ‘kief’, water extraction to ‘bubble hash’) (Raber et al., 2015) and is considerably stronger than high potency herbal cannabis (e.g., 15%). Cannabis concentrate users often obtain a very high dosage of THC in a single hit through a process known as “dabbing”, in which they heat up the product with a blow torch and inhale the vapor via a bong or oil pipe. With e-cigarettes becoming more popular and accessible, a small but significant number of young people report using e-cigarettes to vaporise liquid hash oil (Morean et al., 2015). Additional concerns are that the solvent-based extraction methods (e.g., BHO) pose a significant risk of explosion and associated injury or death during production (Crawford, 2016; Jensen et al., 2015a). They also leave residual solvents in the final product (Raber et al., 2015). These concerns may be offset by using different extraction methods (e.g., carbon dioxide), but the prevalence of use of these respective methods is currently unclear.

The high THC content in cannabis concentrates and the rapid ingestion of THC might be associated with higher level of dependence, stronger withdrawal and the swifter development of tolerance (Loflin and Earleywine, 2014). While the long-term effects of cannabis concentrates such as BHO use are largely unknown, a recent study suggests that their use may heighten short term harms and produce more extreme acute effects, such as fainting (Miller et al., 2016). Use of concentrates has also been associated with an increased incidence of orthostatic hypotension leading to falls and injuries and emergency department visits for burns from explosions caused by overheated elements in “vape pens” (Russo, 2016).

There are other health risks associated with concentrates. A recent study found that up to 70% of pesticide residues may be recruited into the smoked product (Sullivan et al., 2013) even in concentrates produced industrially for markets in US states where use is legal (Russo, 2016). Along with the increased popularity of e-cigarettes and vaping devices, there is an emerging trend for young people to use these devices to vaporise cannabis concentrate (Morean et al., 2015). This might add extra health risk because data from e-cigarette research has shown that the solvents propylene glycol and glycerine, when overheated can

produce formaldehyde, a known carcinogen (Jensen et al., 2015b). This finding has been confirmed in studies of thinning agents used by cannabis oil commercial producers in Colorado (Troutt and DiDonato, 2017). Users also described a qualitative difference between the effects of BHO and traditional herbal cannabis, with the high produced from BHO more like that achieved by using “harder” drugs (Miller et al., 2016). Despite public health concerns about the recent popularity of BHO and other high potency extracts, there is limited research on their effects. To date the few published studies have been limited by small sample sizes, and these have not yet adequately characterized users. The aims of this study were to examine the profile and characteristics of BHO users, and to compare the effect profiles of BHO and high potency herbal cannabis in a very large sample of drug users recruited in the Global Drug Survey (GDS) in 2015 and 2016.

2. Methods

2.1. Sample

GDS is the largest annual survey of drug use in the world. It uses anonymous, encrypted online survey methods to provide rapid access to very large numbers of sentinel drug-using populations (Winstock et al., 2015). As such it is a useful tool for identifying new trends in drug use, drug-related harms and routes of administration (Barratt et al., 2017; Hindocha et al., 2016; Winstock et al., 2011). Data from GDS 2015 and GDS 2016 were used for this study. The overall sample size after data cleaning was 181,870. Sixty three percent of the participants were males and the mean age was 29.01 (SD = 11.38; Median: 25). Among this sample, 46% (n = 83,867) reported using some form of cannabis in the past year, and 3% reported BHO use (n = 5922).

2.2. Procedure

GDS 2015 and GDS 2016 were launched in November 2014 and 2015 respectively through global media partners. Participants were recruited through onward promotion and online social networks on websites including The Guardian, Vice, Ziet-on-Line, Liberation, Fairfax Media in Australia and New Zealand and other international publications. The survey was translated into 10 languages and has partners in over 20 countries. All participants confirmed that they were aged ≥ 16 years, and consented for the information they gave to be analysed. Ethical approval was received from the joint South London and Maudsley and Institute of Psychiatry, Psychology and Neuroscience National Health Service (NHS) Research Ethics Committee.

2.3. Measures

2.3.1. Cannabis use

Participants were shown pictures of seven forms of cannabis products, including indoor grown high potency herbal cannabis, resin/hash, outdoor grown herbal weed/bush/pressed, edible cannabis, kief, oil and BHO. Self-reported measures of cannabis type have previously been validated against objective THC and CBD content (Freeman et al., 2014; van der Pol et al., 2013). Pictorial aids were used to improve their acceptability among an international sample with diverse cannabis terminology (Potter and Chatwin, 2012). Participants were asked to indicate which types of cannabis they had used in the last 12 months, and were then assigned to four cannabis user groups, 1) *Non-user (NON)*, 2) *Cannabis user – No high potency herbal cannabis and BHO use (CANN)*, 3) *High potency herbal cannabis users with no BHO use (HI-POT)*, and 4) *BHO users*. These categories were mutually exclusive. Table 1 shows the types of cannabis used by the four groups. For participants who classified as CANN, 95% used normal weed and none used high potency herbal cannabis or BHO; for participants who were HI-POT, all of them used high potency herbal cannabis but no BHO use; BHO users tended to use a wide range of cannabis products.

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