



Cannabis use for chronic non-cancer pain: results of a prospective survey

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Abstract

There has been a surge in interest in medicinal cannabis in Canada. We conducted a questionnaire survey to determine the current prevalence of medicinal cannabis use among patients with chronic non-cancer pain, to estimate the dose size and frequency of cannabis use, and to describe the main symptoms for which relief was being sought. Over a 6-week period in mid-2001, 209 chronic non-cancer pain patients were recruited in an anonymous cross-sectional survey. Seventy-two (35%) subjects reported ever having used cannabis. Thirty-two (15%) subjects reported having used cannabis for pain relief (pain users), and 20 (10%) subjects were currently using cannabis for pain relief. Thirty-eight subjects denied using cannabis for pain relief (recreational users). Compared to never users, pain users were significantly younger ($P = 0.001$) and were more likely to be tobacco users ($P = 0.0001$). The largest group of patients using cannabis had pain caused by trauma and/or surgery (51%), and the site of pain was predominantly neck/upper body and myofascial (68% and 65%, respectively). The median duration of pain was similar in both pain users and recreational users (8 vs. 7 years; $P = 0.7$). There was a wide range of amounts and frequency of cannabis use. Of the 32 subjects who used cannabis for pain, 17 (53%) used four puffs or less at each dosing interval, eight (25%) smoked a whole cannabis cigarette (joint) and four (12%) smoked more than one joint. Seven (22%) of these subjects used cannabis more than once daily, five (16%) used it daily, eight (25%) used it weekly and nine (28%) used it rarely. Pain, sleep and mood were most frequently reported as improving with cannabis use, and 'high' and dry mouth were the most commonly reported side effects. We conclude that cannabis use is prevalent among the chronic non-cancer pain population, for a wide range of symptoms, with considerable variability in the amounts used. Discussions between patients and health care providers concerning cannabis use may facilitate education and follow up, and would allow side effects and potential interactions with other medications to be monitored. Clinical trials of cannabis for chronic non-cancer pain are warranted.

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1. Introduction

Cannabis sativa preparations have been used for thousands of years as a form of medicine to relieve human suffering. The earliest use was recorded in the Chinese Pharmacopoeia as a treatment for more than 100 ailments including nausea and pain (Russo, 1998). Since that time, pain has been consistently cited in the historical and modern scientific literature as an indication for the use of cannabis preparations (Culpeper, 1653; Kalant, 1972). The past 30 years has seen an increasing number of anecdotal reports of effective cannabis use for chronic pain, along with increasing evidence of a system of receptors and ligands, which are specific for cannabinoids. Cannabinoids appear to be components of a neural circuit which may play a role in

modulating pain (Meng et al., 1998), supporting earlier observations, and providing some rationale for the potential clinical use of cannabis and related medicines.

Little is known about the current prevalence of cannabis use for pain disorders or how and in what amounts it is used. In a telephone survey of over 2000 people in Ontario, Canada, 2% of respondents reported use of cannabis for medicinal purposes in the previous year (Ogborne and Smart, 2000). Pain was often cited as a reason for cannabis use (Ogborne et al., 2000a). In patients with chronic pain following spinal cord injury, between 2.5 and 5% have reported beneficial effects of cannabis use (Ravenscroft et al., 2000; Warms et al., 2002). In our clinical experience, patients with chronic pain are increasingly asking for information about cannabis. We therefore conducted a cross-sectional survey to determine the prevalence of cannabis use in a population of patients presenting to a multidisciplinary

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plinary pain management unit. The study also sought to determine what proportion of patients were using cannabis for pain, as well as to gather information on the patterns of cannabis use for pain purposes. The results of this study may assist in the design of clinical trials examining cannabis in the treatment of chronic non-cancer pain.

2. Methods

A questionnaire was designed to collect data on patient demographics (age, gender, tobacco use), characteristics of pain (cause, location and duration), use of pain medications and use of cannabis. Cannabis preparations included flowering heads ('buds'), leaves, hashish (compressed cannabis resin), and oil (an extract of the active principles of cannabis). Among cannabis users, subjects were divided into either recreational or medical users based on response to a question about whether or not cannabis was used to control pain. Cannabis users were further asked to describe the amounts and frequency of use. The perceived efficacy of cannabis on a range of symptoms (pain, nausea, appetite, sleep, mood) was recorded using 6-point Likert scales (0: no relief, 5: strong relief). Reported adverse effects were tabulated.

The questionnaire was administered to all patients entering the ambulatory pain management unit of the Queen Elizabeth II Health Sciences Center, Capital District Health Authority, Halifax, Nova Scotia, Canada from June 15, 2001 through July 31, 2001. A summer research student was available to discuss any questions or concerns that patients may have had regarding the questionnaire. Patients were given time in a private room to complete the questionnaire. Subjects were advised of the nature of the study by an information sheet at the beginning of the questionnaire. Upon completion, each patient returned the survey to a box in the waiting room area. The questionnaire contained no means of identifying the patient. The completed forms were stored securely away from the medical records of the patients. The study protocol and questionnaire were approved by the QEII Health Sciences Center research ethics committee.

Data were double-entered into a database developed by the Canadian HIV trials network in Vancouver, British Columbia. Subjects were divided into cannabis ever-users and never-users, and demographic data were compared between these groups. Data on effectiveness and side effects of cannabis use were restricted to cannabis ever-users, and further stratified into users for pain relief and recreational users. Pair-wise comparisons were made between the users (either for pain or for recreation) and the never-users. Continuous variables were compared using the two-sampled Student's *t*-test. Categorical variables were compared using Fisher's exact test. Ordered categorical variables were compared using the Cochran–Armitage test for trend. Statistical tests were two-sided, with significance set at the 5% level.

3. Results

3.1. Demographics

Two hundred and twenty surveys were distributed and 217 were returned. Two hundred and nine subjects provided data on cannabis use and constituted the final dataset. The demographic characteristics of the surveyed population are shown in Table 1. Of 209 subjects, 72 (35%) had ever used cannabis and 137 (65%) denied ever having used cannabis. Of the 72 subjects who reported ever-use of cannabis, 32 reported use for pain. Therefore, based on the 220 distributed questionnaires, 32/220 (15%) subjects had used cannabis for pain relief. For the remaining analyses, these patients were categorized as pain users, and the remainder of ever-users ($n = 40$) was categorized as recreational users. The demographic characteristics of pain users, recreational users and never-users are shown in Table 1. Compared to never-users, cannabis use for pain was associated with younger age and tobacco smoking.

3.2. Pain characteristics

The characteristics of the pain syndromes of the 209 subjects are shown in Table 2, categorized by cannabis use. There were three patients with multiple sclerosis, two used cannabis and one did not. There was no significant difference in median number of years with pain between those who had ever used cannabis (median 8 years, interquartile range (IQR) 3,12) and those who had not (median 7 years, IQR 3,13) ($P = 0.7$). Cannabis use for pain was associated with use of pain medications.

For the dose and symptom data, missing responses were common, and data were therefore tabulated and statistical

Table 1
Demographic characteristics of 209 patients, categorized by use of cannabis^a

Characteristic	Cannabis use		
	Ever used		Never used ($n = 137$)
	For pain ($n = 32$)	Other ($n = 40$)	
Age (years)			
< 40	15 (0.001)	13 (0.001)	36
40–49	15	20	28
50–59	2	7	25
> 60	0	0	44
Gender			
Male	15 (0.098)	22 (0.008)	42
Female	17	18	95
Smoke tobacco			
Yes	20 (<0.0001)	25 (<0.0001)	27
No	11	15	110

^a All tests done with Fisher's exact test except for age (Cochran–Armitage test-for-trend). *P*-values shown in brackets.

Table 2
Pain characteristics of 209 patients, categorized by use of cannabis^a

Characteristic	Ever used		Never used (n = 137)
	Pain users (n = 32)	Other (n = 40)	
Cause of pain			
Trauma/surgery	16 (0.103)	21 (0.041)	45
Arthritis	2 (0.535)	3 (0.572)	17
Multiple sclerosis	2 (0.036)	1 (0.230)	0
Infection	0 (0.999)	0 (0.999)	3
Stroke	0 (0.999)	0 (0.999)	1
Site of pain			
Neck/upper body	23 (0.721)	26 (0.056)	57
Myofascial	23 (0.090)	24 (0.014)	4
Back	22 (0.686)	23 (0.464)	85
Head	20 (0.999)	12 (0.999)	50
Back and leg	18 (0.683)	23 (0.732)	74
Abdomen	8 (0.738)	6 (0.999)	26
Duration of pain (years)			
< 5	11 (0.637)	15 (0.890)	55
5–10	10	12	43
11–20	8	10	23
> 20	3	3	16
Pain medication use			
Yes	31 (0.027)	29 (0.096)	116
No	0	11	20

^a All tests done with Fisher's exact test, except for duration of pain (Cochrane–Armitage test). *P*-values shown in brackets.

analyses were not performed. Percentages are expressed using the total sample in each category as the denominator.

3.3. Patterns of cannabis use

The frequency of cannabis use and the last reported use of cannabis for these two groups is shown in Table 3. Of the 32 pain users, 20 reported cannabis use at least weekly, of whom 12 reported use at least once per day. Fifteen recreational users reported rare use; data were missing for the remainder of this group. Twenty-four (75%) pain users had used cannabis in the last month, while 24 (63%) recreational users reported that last cannabis use was more than 1 year ago. Eleven recreational users did not respond to this question.

The method of cannabis administration among pain and recreational users is shown in Table 4. Twenty-three pain users (72%) report use of the flowering tops of cannabis ('buds'), compared to recreational users of whom eight used cannabis buds. Recreational users reported more use of hashish (42%) and cannabis leaves (34%). In both groups, joints were the most common mode of administration (81% of pain users and 68% of recreational users). Forty-seven percent of pain users and 32% of recreational users reported mixing cannabis with tobacco. Fifty-three percent of pain users and 45% of recreational users reported using four or less puffs at each dose, and 25% of pain users and 24% of

Table 3
Frequency of cannabis use among 72 cannabis users

Characteristic	Pain users (%) (n = 32)	Recreational users (%) (n = 40)
Frequency of current use		
Rarely	9 (28)	15 (37)
Weekly	8 (25)	0
Daily	5 (16)	0
> Once daily	7 (22)	0
Missing	3 (9)	25 (63)
Last use of cannabis		
< 24 h	12 (38)	0
1–7 days	9 (28)	1 (2.5)
7–30 days	3 (9)	1 (2.5)
2–12 months	4 (13)	1 (2.5)
> 1 year	4 (13)	24 (60)
Missing	0	13 (32.5)

recreational users reported using one joint as a single dose. Data on the precise frequency of dosing were not collected.

3.4. Relief of symptoms

All 32 pain users rated the overall effectiveness of cannabis. One subject (3%) reported that cannabis use was slightly effective, 16 (50%) reported that it was somewhat effective and 15 (47%) reported it was very effective. Of the 32 subjects who reported cannabis use for pain, 25 (78%) reported at least moderate relief of pain (13 moderate, 11 strong and one complete relief). Of 25 subjects who reported effects on sleep, 23 (92%) reported at least moderate improvement in sleep (8 moderate, 12 strong, two complete). Of 24 subjects who used cannabis for mood

Table 4
Type and method of cannabis self-administration by 32 pain users and 40 recreational cannabis users

Characteristic	Pain users (%) (n = 32)	Recreational users (%) (n = 40)
Type of cannabis used		
Herbal: buds	23 (72)	8 (20)
Herbal: leaves/stems	9 (28)	13 (32.5)
Hashish	7 (22)	16 (40)
Oil	2 (6)	7 (17.5)
Other	3 (9)	2 (5)
Mode of administration		
Joint	26 (81)	26 (65)
Joint + tobacco	15 (47)	12 (30)
Pipe	11 (34)	13 (32.5)
Water pipe	5 (16)	8 (20)
Eaten	3 (9)	5 (12.5)
Single dose size		
1–2 puffs	4 (12)	5 (12.5)
3–4 puffs	13 (41)	12 (30)
Whole joint	8 (25)	9 (22.5)
More than one joint	4 (12)	1 (2.5)
Missing	3 (9)	11 (27.5)

effects, 23 (96%) reported at least moderate improvement (11 moderate, ten strong, two complete). Twenty-two subjects reported cannabis use for muscle stiffness and 20 (91%) reported moderate improvement or better (ten moderate, eight strong, two complete). Nineteen subjects (59% of pain users) claimed that cannabis use decreased the number of doses of their routine medication taken for pain.

3.5. Side effects

Overall experience of side effects were rated by all 32 pain users. Eight subjects (25%) reported no side effects, 12 (37%) reported very mild, nine (28%) moderate, and three (9%) strong side effects. No subject reported severe side effects. The most common side effects among the pain users were 'high' (27 subjects), dry mouth (23 subjects) and drowsiness (20 subjects). Palpitations (nine subjects), paranoia (five subjects) and anxiety (three subjects) were less frequently reported. The duration or frequency of specific side effects was not examined in this questionnaire. Other side effects listed by subjects included constriction of the esophagus, sweats, itching, increased appetite, muscle stiffness, heavy feeling, lung congestion, and prosecution.

Of 39 subjects (including both pain users and recreational users) who reported that they were no longer using cannabis, the most common reason for stopping was that obtaining cannabis was too risky (15 subjects). One subject said that cannabis use made their pain worse, while five said that the side effects were intolerable.

3.6. Future use of cannabis

Of the 72 cannabis ever-users, ten (17%) stated that they would not use cannabis again whilst 25 (42%) might use it again, 11 (18%) would probably use, and 14 (23%) were definitely going to use cannabis again.

3.7. Preferred methods of administration

When asked to select from a range of choices about how they would prefer to use cannabis, the most common choice was joints (34%). Skin patches were chosen by 18%, inhalers (like asthma medications) by 16%, sublingual spray by 13% and pipes by 8%. Only one subject indicated that a rectal suppository would be preferred.

4. Discussion

This cross-sectional survey provides data on the prevalence of cannabis use among an outpatient population of patients with chronic non-cancer pain. To our knowledge, this is the first study to attempt to document the prevalence and patterns of cannabis use in a chronic non-cancer pain population. The results indicate that 35% of this sample of 220 patients had ever used cannabis, 15% had ever used cannabis for pain relief, and 10% were currently using

cannabis for pain relief purposes. These results have important implications for pain professionals and policy makers.

Since the cloning of the first cannabinoid receptor (CB1) (Matsuda, 1990) there has been tremendous growth in our understanding of the role cannabinoids may play in the modulation of pain. The pharmacological toolbox now contains cannabinoid receptor agonists and antagonists, both, naturally derived and synthetic, and some of these compounds are entering clinical trials. Cannabinoid agonists act on CB1 receptors on the terminals of primary afferent neurons, and suppress pain in models of inflammatory peripheral pain (reviewed in Pertwee, 2001). Pre- and post-synaptic CB1 receptors in laminae II and V of the spinal cord modulate pain transmission in rats (Martin et al., 1999), while CB1 receptors in the periaqueductal grey (PAG) and dorsal raphe nucleus (Herkenham et al., 1991) modulate pain transmission centrally (Walker et al., 1999). Evidence for the endogenous release of cannabinoids such as anandamide has triggered speculation of a novel system of pain and movement control (Meng et al., 1998). Although a few small and often poorly controlled trials of single agent orally administered cannabinoids in acute and experimental pain states have not shown dramatic effects (Campbell et al., 2001), anecdotal reports and scientific rationale point to a possible future role for cannabinoids in chronic pain management.

This survey found that cannabis use among chronic pain patients is not uncommon. Ten percent of the population studied was currently using cannabis for pain relief and another 5% had tried cannabis for pain relief. This result needs to be confirmed in surveys in other centers. Cannabis is apparently being used alongside conventional therapy and the reported effects are compatible with our understanding of cannabinoid pharmacology.

Patients reported moderate to strong relief from mood or sleep problems as well as pain. This is compatible with data from previous case series (Ware et al., 2002). A wide range of subjective and objective outcomes should therefore be assessed in clinical trials using validated and robust instruments.

This survey has also revealed the variability of cannabis doses used by chronic pain patients. While the majority of respondents reported using one to four puffs at each dosing interval, a wide variability is evident. Factors which could contribute to this may include inter-individual differences in smoking technique, pharmacokinetics, symptom severity, and cannabinoid content of the herbal material used. For instance, we noted that 70% of patients using cannabis for pain used herbal cannabis flowers, compared to only 20% of recreational users, while 40% of recreational users used hashish compared to 22% of pain users. We can only speculate whether this apparent difference is a result of drug availability or preference. While the cannabinoid content of these particular preparations is unknown, hashish is known to have a different profile of tetrahydrocannabinol (THC) and cannabidiol (CBD) compared to herbal material

(ElSohly et al., 2000). In addition, it recognized that CBD influences the pharmacokinetics (Hollister and Gillespie, 1975) and pharmacodynamics (Zuardi et al., 1982) of THC. Therefore the cannabinoid profile of cannabis preparations must be determined and standardized in clinical studies of this material. Furthermore, the variability in cannabis doses used may reflect the ability of patients to self-titrate their cannabis dose to a tolerable effect. Whether this variance can be minimized using standardized cannabinoid preparations in carefully controlled trials remains to be seen. In the interim, the approximate order of magnitude of exposure to cannabis estimated in this survey provides a starting point for dose estimation, and may be useful when assessing the potential risks of cannabis smoking.

This study has several limitations. The 220 subjects were recruited consecutively from an ambulatory pain management unit and not from a random sample, and therefore there is a risk of selection bias. The questionnaire was administered to all patients attending the clinic during a 6-week period, regardless of reason for their visit. However, neither the distribution of pain syndromes presenting to the clinic, nor the prevalence of cannabis use among those subjects, is likely to differ during this period than at other times of the year. Unpublished data from our clinic databases (M.W. and A.J.C.) suggest that the distribution of pain syndromes surveyed here is consistent with that seen over the last decade in our clinics. The prevalence of cannabis ever-use in the current study is also consistent with that of the general Canadian population (Ogborne et al., 2000b).

Because of the illegal status of cannabis, subjects may have been reluctant to answer questions about cannabis use honestly. This would reduce the overall prevalence estimate. The information collected was confidential and subjects' identities were protected by the anonymous nature of the study. Of the 220 distributed questionnaires, 209 subjects returned data on cannabis use, giving a 95% response rate which is superior to many surveys of cannabis use (Braitstein et al., 2001; Sidney, 2002).

For the questions about cannabis doses, symptoms and side effects, there was considerable missing data. This was probably due to a flaw in the questionnaire; for example, if a particular symptom listed in the questionnaire was not present in an individual, they may not have responded 'no' but left the space blank. Therefore, we have not made assumptions about the missing data and we have not conducted any formal statistical tests on these data. The data are tabulated to generate discussion and to prompt more accurately designed instruments.

Finally, our separation of subjects who reported cannabis use into medicinal users and recreational users may be viewed as arbitrary. While recreational cannabis users may have wrongly claimed to be medical users, given that the questionnaire was distributed only to patients attending a pain management unit, this misclassification is improbable. Furthermore, these data suggests that most ever-cannabis users who were not using cannabis for pain were also not

current cannabis users, and that their last use was often more than 1 year prior to the study. This suggests that in this population, current cannabis use may be equated with medicinal cannabis use.

In spite of these limitations, this study finds that cannabis use is prevalent among this sample of chronic non-cancer pain patients, and effects are reported for a wide range of subjective symptoms. Health care workers need to be able to discuss cannabis use with patients and to be able to accurately describe possible risks and benefits of cannabis use. Controlled clinical trials and long term surveillance studies are needed to supply this information, while surveys such as this may provide basic information of the current prevalence and patterns of medicinal cannabis use.

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