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Medical cannabis use for patients with post-traumatic stress disorder (PTSD)

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Abstract

Common symptoms associated with post-traumatic stress disorder (PTSD) include re-experiencing and avoiding trauma-related situations, negative cognitions and mood, and arousal. Early clinical research studies have shown that medical cannabis may minimize these debilitating symptoms. The present study analyzed patient-reported outcomes in patients using medical cannabis for PTSD in Canada. A voluntary online survey was completed by PTSD patients using medical cannabis at baseline, 4-months, and 10-months after initiating use of cannabis from a single medical cannabis provider. Patients reported on outcomes including present symptoms and medical conditions, quality of life (QOL), and side effects experienced from cannabis use. A total of 588 patients with PTSD, predominantly Caucasian (84.4%) males (77.7%) with an average age of 43 years, completed the survey at baseline. There were 58.3% and 48.3% of PTSD patients that reported also having depression and anxiety disorders, respectively. Seventy-eight of 139 (56.1%) patients reported experiencing severe pain at baseline, compared to only 15 (10.8%) patients after 4-months ($p < 0.0001$). Significant improvements were also seen in patients' ability to cope with pain after 4 and 10 months of cannabis use ($n = 100$, $p < 0.0001$). Patients reported significant improvements in overall QOL ($n = 39$, $p = 0.03$) and general mood ($n = 37$, $p = 0.0005$), as well as experience with sleep ($n = 31$, $p = 0.002$) and concentration ($n = 30$, $p = 0.006$) after 4 and 10 months. Patients suffering from PTSD reported significant improvements in a variety symptoms and QOL indicators after 4 months of cannabis use. Cannabis use in this population should be further studied and considered as an alternative treatment option.

Keywords: Medical cannabis, post-traumatic stress disorder, medical marijuana, quality of life, symptoms

Introduction

Post-traumatic stress disorder (PTSD) is a debilitating trauma and stressor-related disorder that may occur after directly experiencing or witnessing a traumatic

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event(s) (1). The four symptom cluster domains outlined in the Diagnostic and Statistical Manual of Mental Disorders 5th Edition (DSM-5) are re-experiencing, avoidance, negative cognitions and mood, and arousal (1). Re-experiencing may occur in the form of flashbacks, dreams, or psychological distress pertaining to the traumatic event(s), while avoidance symptoms involve avoiding memories, thoughts, or physical reminders of the event(s). Negative cognition and mood pertains to a variety of emotions such as a distorted sense of blame of others or oneself for the traumatic event(s), or a sense of estrangement or surrealism from others or surroundings. Finally, arousal symptoms may manifest in the form of aggressive and reckless behaviour or hypervigilance and sleep-related problems (1).

Reported rates of exposure to a traumatic event(s) in an individual's lifetime have ranged from 39.1% to 89.6% in the United States (2,3). In Canada, a study conducted by telephone survey of 2991 individuals in a nationally representative sample reported that 76.1% of participants had exposure to at least one traumatic event sufficient to cause PTSD (4).

In the United States, the lifetime prevalence of PTSD in adults was estimated to be 6.8% according to the National Comorbidity Survey Replication conducted between 2001 and 2002 (5). The lifetime prevalence was 3.6% and 9.7% among men and women, respectively (5). In another study conducted in a sample of 1002 individuals in Winnipeg, Manitoba, the 1-month prevalence of PTSD was found to be 1.2% in men and 8.2% in women (6). Of 3062 surveyed women in Ontario, a 10.7% lifetime prevalence of PTSD was observed (7). In a nationally representative sample of 2991 Canadian individuals, the lifetime and 1-month prevalence of PTSD was estimated to be 9.2% and 2.4%, respectively (4).

PTSD is associated with several behavioural and mental comorbid conditions. In particular, major depressive disorder (MDD), anxiety disorders, and alcohol and substance abuse/dependence are the most common comorbidities (8–10). In Canada, it has been reported that 74% of PTSD patients also suffered from MDD, 27.8% from alcohol abuse/dependence, and 25.5% from substance abuse/dependence (4).

A variety of psychotherapies may be used to treat PTSD including Prolonged Exposure Therapy and Cognitive Processing Therapy. Pharmacological interventions can reduce PTSD symptoms through the modulation of neurotransmitter activity, particularly the activity of serotonin, norepinephrine, gamma-aminobutyric acid, and dopamine. Selective serotonin reuptake inhibitors are generally used as first-line treatment for PTSD, but other antidepressants, mood stabilizers, atypical antipsychotics, tricyclic antidepressants, monoamine oxidase inhibitors or benzodiazepines may also be used (11).

The mammalian endocannabinoid system contains series of receptors known as cannabinoid receptors 1 and 2 (CB-1 and CB-2), upon which endogenous cannabinoids such as anandamide naturally act. The activation of these receptors can produce a multitude of effects including muscle relaxation, pain reduction, appetite stimulation, and the modulation of mood and memory (12). Medical cannabis has shown potential in managing various symptoms of PTSD, predominantly through the interaction of the cannabinoids cannabidiol (CBD) and tetrahydrocannabinol (THC), with the endocannabinoid system. Further, PTSD patients have been reported to have abnormalities in CB-1 receptors and low levels of the endocannabinoid anandamide (13). Therefore, increasing stimulation of the CB-1 pathway with the use of medical cannabis may have potential as an effective treatment option for reducing PTSD-related symptoms in these patients. However, there are very few studies in the literature reporting the efficacy of cannabis in PTSD symptom management (14). The purpose of the present study was to report the results of a survey of a sample of Canadian PTSD patients on the efficacy of medical cannabis in relieving their symptoms.

Methods

Patients using medical cannabis were invited to complete a voluntary online survey at baseline, prior to initiating treatment with cannabis from the medical cannabis provider. Patients who completed the baseline survey were sent a follow-up (FU) survey 4 months later, which was customized based on their initial baseline responses. Another FU survey was sent to patients 10 months following the completion

of the baseline survey if they completed a FU survey at 4 months.

Survey design

The baseline and follow-up survey consisted of over 100 questions; however, the survey was dynamic and customized to only ask patients questions that were relevant to them (e.g., patients were not asked to answer pain-related questions if they had not experienced any pain at baseline). Therefore, not all patients answered all questions. Patients could also skip questions if they did not want to answer them. The survey was designed to take between 15 and 25 minutes to complete.

Questions were developed based on consultation with nurses and physicians who have experience prescribing medical cannabis to patients, and relevant scientific literature. However, due to the range of patients included and scope of information intended to be collected in this survey, questions were adapted from the literature to be shorter and cover certain parameters in less detail than commonly referenced validated questionnaires. The pain scale used was based on the numeric rating scale, a commonly used method of measuring pain severity in patients with chronic pain (15–17). Questions on patients' ability to cope with pain were based on the Pain Self-Efficacy Questionnaire, which emphasizes the importance of understanding patients' perceived ability to cope with pain (18). The dimensions of quality of life (QOL) covered in the survey were based on a number of validated and commonly used QOL assessment tools (19, 20).

Baseline

The baseline survey collected demographic information including age, sex, ethnicity, and employment status. Patients were asked to indicate whether they suffered from a wide range of conditions including, but not limited to, type and stage of cancer, diabetes, heart disease, anxiety, depression, PTSD, and autism. Patients were also asked to rate the severity of the conditions they reported as mild, moderate, or severe, and to state how many years they have suffered from the condition. Additional FU questions specific to each of the patient's conditions were posed to better characterize patients' experiences with those conditions.

Additionally, based on a large list of symptoms provided, patients were asked to report which symptoms they experienced regularly and the severity of each symptom (mild, moderate, or severe). If patients indicated they had recurring pain at baseline, they were asked to score their pain on a scale from 1-10, where 1 represented dull pain and 10 represented severe pain. They were also asked to rate their ability to cope with pain (very easy, somewhat easy, somewhat difficult, or very difficult).

QOL questions followed, including questions asking patients to rate their overall QOL (very good, good, fair, bad, very bad) and how capable they were of performing their activities of daily living (ADL) (very capable, somewhat capable, somewhat incapable, very incapable, don't know). Additional questions regarding patients' experience with sleep, appetite, concentration, bowel activity, and sexual function (severe difficulty, moderate difficulty, no difficulty, good, very good), and patients' mobility and ability to dress and shower independently (severe, moderate, minimal, or no difficulty) were asked.

Follow-up

FU surveys were sent to patients 4 months after the completion of the baseline survey and for patients that completed the 4-month FU survey, another survey was sent 10 months following the baseline survey. In the FU surveys, patients were first asked to rate the effect of cannabis on their reported condition(s) (significant deterioration, moderate deterioration, slight deterioration, no change, slight improvement, moderate improvement, significant improvement) and then asked how long it took for cannabis to affect their condition(s).

Patients with pain were also asked to score their pain on a scale from 1-10 and to rate their ability to cope with pain after using cannabis (very easy, somewhat easy, somewhat difficult, very difficult). Questions on QOL and symptoms identical to those from baseline were asked. Additionally, questions on

side effects of cannabis use including the type, frequency, duration, and intensity were included.

Patient population

Baseline and FU surveys were completed between January 2015 and October 2016. Only patients that reported having PTSD in the survey were included in this study.

Statistical analysis

Descriptive analysis was conducted using proportions for categorical variables, and mean (range) for age. The Fisher exact test or the Chi-squared test was used as appropriate to look for significant associations between pain and ability responses, improvement status (improvement, no change, or deterioration), the presence of most common medical conditions, quality of life and symptoms between baseline and follow-up. A paired t-test was used for comparing baseline and follow up pain scores. Two-sided p-value < 0.05 was considered statistically significant. All analyses were conducted using Statistical Analysis Software (SAS version 9.4, Cary, NC).

Results

At baseline, 2321 people completed the survey, 588 of which reported having PTSD. Most PTSD patients were male (77.7%) and Caucasian (84.4%) with an average age of 43 years. Of 540 PTSD patients who reported how many years they had suffered from PTSD, 48.3% reported less than 10 years, 27.0% reported 10-19 years, and 24.6% reported 20 or more years. The most common comorbidities reported in PTSD patients at baseline were depression (58.3%), anxiety disorders (48.3%), sleep disorders (35.6%), arthritis (23.2%) and migraines (17.0%). Many patients reported having previous experience with cannabis (78.5%) and currently using cannabis at baseline (85.8%); Table 1 summarizes the demographic information of the PTSD patients included in this study.

Table 1. PTSD patient demographics

Demographic	n (%)
Gender	
Male	457 (77.72%)
Female	131 (22.28%)
Number of years with PTSD	
< 10	261 (48.33%)
10 – 19	146 (27.04%)
≥ 20	133 (24.63%)
Ethnicity	
Caucasian	492 (84.39%)
Spanish/Hispanic/Latino	3 (0.51%)
Native Canadian	38 (6.52%)
Black/African American	1 (0.17%)
Asian	5 (0.86%)
Other	44 (7.54%)
Age (years)	
19 - 29	46 (8.07%)
30 - 39	170 (29.82%)
40 - 49	191 (33.51%)
50 - 59	126 (22.11%)
60 - 69	36 (6.32%)
≥ 70	1 (0.18%)
Average (min, max)	43.25 (19, 70)
Other Conditions	
Depression	344 (58.30%)
Anxiety disorder	285 (48.31%)
Sleep disorder	210 (35.59%)
Arthritis	137 (23.22%)
Migraines	101 (17.00%)
Previous experience with cannabis	
Yes	394 (78.49%)
No	71 (14.14%)
Prefer not to answer	37 (7.37%)
Currently on cannabis	
Yes	339 (85.82%)
No	56 (14.18%)

Pain and ability to cope with pain

Patients who reported experiencing recurring pain were asked to score their pain severity from 1 to 10 at baseline, 4-month FU and 10-month FU. Between baseline and 4-month FU, a significant reduction in the severity of pain was observed ($n = 139$, $p < 0.0001$) from 56.1% patients reporting severe pain (score of 8-10) at baseline to only 10.8% at 4-month FU. Of the 21 patients who completed the question at baseline, 4-month FU, and 10-month FU, 13 patients (61.9%) at baseline, 3 patients (14.3%) at 4-month

FU, and 1 patient (4.8%) at 10-month FU reported experiencing severe pain. This again, demonstrated a statistically significant reduction in the severity of pain following cannabis treatment ($p < 0.0001$).

In all three surveys, patients were asked to describe their ability to cope with pain by selecting one of the following categorical responses: very easy, somewhat easy, somewhat difficult, or very difficult. From baseline to 4-month FU, significantly fewer patients responded 'very difficult' ($n = 48$ at baseline, $n = 3$ at 4-month FU; $n = 100$, $p < 0.0001$). Of the 21 patients who answered this question in all three surveys, 13 (61.9%) responded with 'very difficult' at baseline versus zero patients at 4-month and 10-month FU ($p < 0.0001$). Additionally, only 1 (4.8%) patient at baseline responded with 'somewhat easy' in comparison to 15 (71.4%) and 14 (66.7%) patients at 4-month and 10-month FU, respectively. Table 2 summarizes patients' pain scores and ability to deal with pain at all three time-points.

Improvement in medical conditions

Patients reported changes in other medical conditions from baseline by selecting one of the following categorical responses: significant deterioration, moderate deterioration, slight deterioration, no change, slight improvement, moderate improvement, or significant improvement. At 4-month follow-up, 73.7% ($n = 56$), 78.3% ($n = 47$), 74.0% ($n = 37$), 68.8% ($n = 22$), and 76.9% ($n = 10$) of patients reported an improvement in depression, anxiety disorders, sleep disorders, arthritis, and migraines, respectively (Table 3). Although many patients reported improvements in their conditions, this was not statistically significant.

Improvements in quality of life (QOL)

Questions were asked on overall QOL, general mood, mobility, ability to dress and shower independently, and ability to perform activities of daily living (ADLs) (Table 4), in addition to patients' experience with sleep, appetite, concentration, bowel activity, and sexual function (Table 5). From baseline to 4-month and 10-month FU, improvements in all QOL indicators were observed; for the overall QOL item, significantly more patients reported having 'good' or 'very good' overall QOL ($n = 33$, $p = 0.03$) and a 'positive' or 'very positive' mood ($n = 37$, $p = 0.0005$). More patients also reported 'minimal difficulty' or 'no difficulty' in mobility and ability to dress and shower independently ($n = 36$; $n = 38$), and felt 'somewhat capable' or 'very capable' in their ability to perform ADLs ($n = 39$); however, these were not statistically significant. When asked to describe their experience with several aspects of their QOL, patients were given the following options: severe difficulty, moderate difficulty, no difficulty, good, and very good. Significantly fewer patients had difficulties and more patients used 'good' and 'very good' to describe their experience with sleep ($n = 31$, $p = 0.002$) and concentration ($n = 30$, $p = 0.006$) from baseline to 4-month and 10-month FU. This association was also seen for appetite, bowel activity, and sexual function, but with no statistical significance.

Improvement in symptoms

The most commonly reported symptoms in PTSD patients were anxiety, sleep problems, depression, insomnia, exhaustion, and headaches. Table 6 describes the distribution of the severities of these symptoms. At 4-month FU and 10-month FU, patients reported how the severity of these symptoms had changed since baseline by selecting one of the following options: significant deterioration, moderate deterioration, slight deterioration, no change, slight improvement, moderate improvement, significant improvement, or no longer have this symptom (Table 7). In the 4-month FU survey, 64-79% of patients reported improvements in the symptoms they reported experiencing at baseline. At the 10-month FU survey, 73-83% of patients reported improvements in their symptoms compared to baseline. However, only improvements in exhaustion at 4-month FU were statistically significant ($p = 0.009$).

Table 2. Pain response and ability to cope with pain at baseline, 4-month follow-up, and 10-month follow-up

Patients who responded at baseline and 4-month FU				
	Baseline	**4-month**		**p-value***
Pain level (n = 139)				**< 0.0001**
Mild (1-4)	10 (7.19%)	57 (41.01%)		
Moderate (5-7)	51 (36.69%)	67 (48.20%)		
Severe (8-10)	78 (56.12%)	15 (10.79%)		
Ability to deal with pain (n = 100)				**< 0.0001**
Very easy	2 (2.00%)	13 (13.00%)		
Somewhat easy	8 (8.00%)	69 (69.00%)		
Somewhat difficult	42 (42.00%)	15 (15.00%)		
Very difficult	48 (48.00%)	3 (3.00%)		
Patients who responded at baseline, 4-month and 10-month FU				
	Baseline	**4-month**	**10-month**	**p-value**
Pain level (n = 21)				**< 0.0001**
Mild (1-4)	0 (0.00%)	8 (38.10%)	14 (66.67%)	
Moderate (5-7)	8 (38.10%)	10 (47.62%)	6 (28.57%)	
Severe (8-10)	13 (61.90%)	3 (14.29%)	1 (4.76%)	
Ability to deal with pain (n = 21)				**< 0.0001**
Very easy	0 (0.00%)	1 (4.76%)	3 (14.29%)	
Somewhat easy	1 (4.76%)	15 (71.43%)	14 (66.67%)	
Somewhat difficult	7 (33.33%)	5 (23.81%)	4 (19.05%)	
Very difficult	13 (61.90%)	0 (0.00%)	0 (0.00%)	

*Bolded p-values are statistically significant.

Table 3. Improvement in most common medical conditions at 4-month follow-up

Condition	**Improvement**	**No change**	**Deterioration**	**Total n**	**p-value**
Depression	56 (73.68%)	11 (14.47%)	9 (11.84%)	76	0.7173
Anxiety disorder	47 (78.33)	4 (6.67%)	9 (15.00%)	60	0.9993
Sleep disorder	37 (74.00%)	7 (14.00%)	6 (12.00%)	50	0.8293
Arthritis	22 (68.75%)	5 (15.63%)	5 (15.63%)	32	0.7862
Migraines	10 (76.92%)	2 (15.38%)	1 (7.69%)	13	0.5238

Table 4. Improvement in quality of life at 4-month and 10-month follow-up

Response	**Baseline**	**4-month**	**10-month**	**p-value***
Overall quality of Life (n = 39)				**0.0280**
Very good	2 (5.1%)	5 (12.8%)	3 (7.7%)	
Good	2 (5.1%)	9 (23.1%)	13 (33.3%)	
Fair	18 (46.2%)	18 (46.2%)	15 (38.5%)	
Bad	11 (28.2%)	5 (12.8%)	7 (17.9%)	
Very bad	6 (15.4%)	2 (5.1%)	1 (2.6%)	
General mood (n = 37)				**0.0005**
Very positive	1 (2.7%)	2 (5.4%)	4 (10.8%)	
Positive	7 (18.9%)	9 (24.3%)	12 (32.4%)	
Neutral	13 (35.1%)	24 (64.9%)	12 (32.4%)	
Negative	14 (37.8%)	0 (0%)	8 (21.6%)	
Very negative	2 (5.4%)	2 (5.4%)	1 (2.7%)	
Mobility (n = 36)				0.3686
Severe difficulty	5 (13.9%)	4 (11.1%)	4 (11.1%)	
Moderate difficulty	13 (36.1%)	6 (16.7%)	10 (27.8%)	

Response	**Baseline**	**4-month**	**10-month**	
Minimal difficulty	8 (22.2%)	16 (44.4%)	9 (25%)	
No difficulty	10 (27.8%)	10 (27.8%)	13 (36.1%)	
Ability to dress/shower independently (n = 38)				0.9845
Severe difficulty	1 (2.6%)	1 (2.6%)	0 (0%)	
Moderate difficulty	6 (15.8%)	4 (10.5%)	6 (15.8%)	
Minimal difficulty	14 (36.8%)	13 (34.2%)	12 (31.6%)	
No difficulty	17 (44.7%)	20 (52.6%)	20 (52.6%)	
Ability to perform ADLs (n = 39)				0.6141
Very capable	12 (30.8%)	9 (23.1%)	11 (28.2%)	
Somewhat capable	12 (30.8%)	19 (48.7%)	16 (41%)	
Somewhat incapable	6 (15.4%)	8 (20.5%)	5 (12.8%)	
Very incapable	8 (20.5%)	3 (7.7%)	6 (15.4%)	
Don't know	1 (2.6%)	0 (0%)	1 (2.6%)	

*Bolded p-values are statistically significant.

ADL: activities of daily living.

Table 5. Improvement in experience with sleep, appetite, concentration, bowel activity, and sexual function

Assessment time	**Response**					**p-value**
	Severe difficulty	**Moderate difficulty**	**No difficulty**	**Good**	**Very good**	
Sleep (n = 34)						**0.0015**
Baseline	19 (54.3%)	14 (40%)	1 (2.9%)	0 (0%)	1 (2.9%)	
4-month	5 (14.3%)	14 (40%)	4 (11.4%)	5 (14.3%)	7 (20%)	
10-month	7 (20%)	15 (42.9%)	2 (5.7%)	6 (17.1%)	5 (14.3%)	
Appetite (n = 35)						0.3581
Baseline	6 (16.7%)	11 (30.6%)	8 (22.2%)	10 (27.8%)	1 (2.8%)	
4-month	2 (5.6%)	8 (22.2%)	6 (16.7%)	16 (44.4%)	4 (11.1%)	
10-month	2 (5.6%)	6 (16.7%)	10 (27.8%)	16 (44.4%)	2 (5.6%)	
Concentration (n = 34)						**0.0061**
Baseline	14 (40%)	15 (42.9%)	1 (2.9%)	4 (11.4%)	1 (2.9%)	
4-month	2 (5.7%)	16 (45.7%)	4 (11.4%)	8 (22.9%)	5 (14.3%)	
10-month	14 (40%)	15 (42.9%)	1 (2.9%)	4 (11.4%)	1 (2.9%)	
Bowel activity (n = 36)						0.1426
Baseline	4 (11.1%)	12 (33.3%)	6 (16.7%)	7 (19.4%)	7 (19.4%)	
4-month	0 (0%)	13 (36.1%)	5 (13.9%)	10 (27.8%)	8 (22.2%)	
10-month	3 (8.3%)	9 (25%)	10 (27.8%)	12 (33.3%)	2 (5.6%)	
Sexual function (n = 21)						0.0742
Baseline	11 (32.4%)	6 (17.6%)	7 (20.6%)	2 (5.9%)	8 (23.5%)	
4-month	5 (14.7%)	7 (20.6%)	6 (17.6%)	12 (35.3%)	4 (11.8%)	
10-month	5 (14.7%)	5 (14.7%)	7 (20.6%)	12 (35.3%)	5 (14.7%)	

*Bolded p-values are statistically significant.

Table 6. Severity of most common symptoms at baseline

Symptom	**Mild**	**Moderate**	**Severe**	**Total n**
Anxiety	50 (9.1%)	264 (48.2%)	234 (42.7%)	548
Sleep problems	61 (12.0%)	214 (24.0%)	234 (46.0%)	509
Depression	81 (16.4%)	233 (45.0%)	182 (37.0%)	496
Insomnia	59 (13.7%)	191 (44.3%)	181 (42.0%)	431
Exhaustion	76 (20.5%)	189 (50.9%)	106 (28.6%)	371
Headache	131 (37.2%)	149 (42.3%)	72 (20.4%)	352

Table 7. Improvement in most common symptoms from baseline to 4-month and to 10-month follow-up

Symptom	Improvement	No change	Deterioration	Total n	p-value*
4-month FU					
Anxiety	121 (79.1%)	15 (9.8%)	17 (11.1%)	153	0.0962
Sleep problems	104 (75.4%)	19 (13.8%)	15 (10.9%)	138	0.8678
Depression	109 (78.4%)	15 (10.8%)	15 (10.8%)	139	0.2476
Insomnia	82 (73.2%)	20 (17.9%)	10 (8.9%)	112	0.6330
Exhaustion	60 (63.8%)	25 (26.6%)	9 (9.6%)	94	**0.0086**
Headache	54 (67.5%)	16 (20.0%)	10 (12.5%)	80	0.3063
10-month FU					
Anxiety	30 (83.3%)	2 (5.6%)	4 (11.1%)	36	0.2681
Sleep problems	28 (82.4%)	4 (11.8%)	2 (5.9%)	34	0.9752
Depression	28 (82.4%)	4 (11.8%)	2 (5.9%)	34	0.9752
Insomnia	23 (82.1%)	4 (14.3%)	1 (3.6%)	28	0.7862
Exhaustion	16 (72.7%)	4 (18.2%)	2 (9.1%)	22	0.4003
Headache	20 (83.3%)	3 (12.5%)	1 (4.2%)	24	0.8623

*Bolded p-values are statistically significant.

Table 8. Most common side effects at 4-month follow-up

Side effect	n (%)	Mild	Moderate	Severe
Dry mouth	23 (20.0%)	10 (45.5%)	9 (40.9%)	3 (13.6%)
Psycho-active effects (feeling "high")	15 (13.0%)	6 (40.0%)	7 (46.7%)	2 (13.3%)
Sleepiness	14 (12.2%)	5 (38.5%)	7 (53.8%)	1 (7.7%)
Red/Irritated eyes	9 (7.8%)	6 (75.0%)	2 (25.0%)	0 (0.0%)
Heart palpitations (increased heart rate)	7 (6.1%)	5 (83.3%)	1 (16.6%)	0 (0.0%)
Decreased memory	7 (6.1%)	6 (85.7%)	1 (14.3%)	0 (0.0%)
Total	115			

Side effects

Of the 115 patients that answered questions regarding side effects experienced from cannabis use at 4-month FU, the most common side effects were dry mouth (23.0%), psycho-active effects (13.0%), sleepiness (12.2%), red or irritated eyes (7.8%), increased heart rate (6.1%), and decreased memory (6.1%). The severities of these side effects were mostly mild, with no patients reporting severe for red or irritated eyes, increased heart rate, and decreased memory. Table 8 summarizes the severity of these side effects.

Discussion

This study presents the results of a voluntary online survey administered by a Canadian medical cannabis provider for patients with PTSD.

Few studies have analysed the efficacy of cannabis in reducing symptoms in PTSD patients, and those that have been conducted have shown varying results. A retrospective chart review by Greer et al. (21) of 80 consecutive patients participating in the New Mexico Department of Health's Medical Cannabis Program for PTSD saw an over 75% reduction in all three PTSD symptom clusters as measured by the Clinician Administered Posttraumatic Scale for DSM-IV (CAPS) when on cannabis compared to off cannabis (21). However, these patients were expected to have significant symptom reduction, as all patients had previous experience with cannabis and had already found that cannabis improved their PTSD symptoms. Therefore, they were entering the program for the purpose of legally obtaining cannabis. As well, patients may have experienced some exaggerated PTSD symptoms when off cannabis due to cannabis-withdrawal syndrome; thus, this study's confounding factors make it difficult

to determine the effects of cannabis in the general PTSD population (21). In a study by Fraser (22), nabilone (an orally administered synthetic cannabinoid based drug) use in 47 PTSD patients with a 2-year history of PTSD-related nightmares that were unresponsive to standard treatment resulted in total cessation of nightmares or a reduction in nightmare severity in 72% of patients (22). Roitman et al. conducted an open, pilot study to determine the safety and efficacy of an oral Δ9-tetrahydrocannabinol (THC) as an add-on treatment in PTSD patients in Israel. Of the 10 patients studied, significant reductions in symptom severity were observed in the CAPS hyperarousal symptom cluster as well as sleep quality, frequency of nightmares, and nightmare effects (23). Wilkinson et al. (24) studied 2,276 veterans with PTSD admitted to a Veterans Affairs treatment program. Those who started marijuana use after discharge were associated with significantly worse PTSD symptom severity, more violent behaviour, and more alcohol and drug use compared to those who never used or stopped marijuana use after discharge (24). The present study reports contrasting results, in which after 4 and 10 months of treatment with medical cannabis, PTSD patients reported significant improvements in pain and their ability to cope with pain, as well as medical conditions, QOL, and symptoms.

Dry mouth, psychoactive effects, and sleepiness were the most common side effects of cannabis use reported by PTSD patients in the present study. Of the 10 patients in the open pilot study by Roitman et al. (23), two experienced side effects of dry mouth, one experienced headache, and one experienced dizziness (23). In the study of 47 patients using nabilone for PTSD-related nightmares conducted by Fraser, 13 patients experienced side effects such as light-headedness, forgetfulness, dizziness, and headache resulting in cessation of nabilone therapy (22). Therefore, it is important for physicians prescribing cannabis for PTSD to be aware of possible side effects and to monitor the severity of these side effects closely.

In a study by Bonn-Miller et al. (25), 217 medical cannabis users filled out a series of questionnaires pertaining to cannabis use and efficacy, 18.9% of whom had PTSD and reported cannabis was ‘moderately’ to ‘quite a bit’ helpful. However, cannabis abuse and dependence was observed in 22.5% of PTSD patients (25). Bohnert et al. (26) observed that of 186 patients newly referred for medical cannabis, 23% had a lifetime history of PTSD and the PTSD patients had significantly higher lifetime use of prescription opioids, cocaine, prescription sedatives, and street opioids compared to patients without PTSD in the same sample (26). These studies emphasize the importance of closely monitoring substance abuse, alcohol abuse, and specifically, cannabis abuse or dependence in this population.

The present study suffers from several limitations. Firstly, no validated questionnaires pertaining to PTSD symptoms were used such as the PTSD checklist for DSM-5 (PCL-5). Additionally, the compliance rate for the survey was extremely low, which is reflected in the low patient numbers for certain parameters at FU despite the large sample size. This could explain why even though trends indicated improved QOL, many values were not statistically significant. Also, patients were not required to complete the survey at exactly 4 or 10 months following initiation of cannabis use, thus the survey could have been done at any time-point after the survey request had been sent.

The survey administered for the present study was also unable to account for pain medications or study adverse events or hospitalization occurring during treatment. Additionally, only 1516 of the 2,321 patients (including non-PTSD patients) that initially completed the survey were invited for a follow-up survey. Some patients had not reached the 4-month point after starting cannabis use (n = 552), while 253 patients either stopped medical cannabis treatment or switched providers. Of the 1,516 active patients invited for a follow-up survey, it is uncertain whether these patients were actively taking cannabis. However, it is very likely that they were, based on their active prescriptions with the cannabis provider as well as the fact that they took the time to complete the survey. As the survey is voluntary, it is possible that patients who had a positive experience with medical cannabis were more likely to fill the survey, resulting in a skew towards positive responses in our results. Finally, at baseline, around 86% of patients responded with ‘yes’ when asked if they were currently on cannabis, meaning that the improvements

in symptoms and QOL observed may reflect switching cannabis treatment rather than the efficacy of cannabis in general.

Conclusion

The present study observed significant improvements in PTSD symptoms and QOL in a sample of Canadian PTSD patients after using medical cannabis. Further investigations are required regarding the safety and efficacy of medical cannabis in this patient population. Clinical trials are recommended to determine whether medical cannabis is an appropriate alternative treatment option for symptom relief in PTSD patients.

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