Original Research Article

USE OF CANNABIDIOL PRODUCTS BY PET OWNERS IN SLOVENIA: A SURVEY-BASED STUDY

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Abstract: The aim of the present study was to obtain information about the experiences of Slovenian pet owners on the use of cannabidiol (CBD) products in their pets. An open online survey targeted Slovenian owners of cats and dogs who have used CBD to treat their pets. Questions pertained to demographic data, animal data, health status of the animals, CBD formulations and experiences with use. Descriptive statistics and frequency distributions were performed using the survey software. A total of 41 respondents participated in the survey, most of whom were female (87.8 %) and between 31 and 50 years old (56.1 %). Most respondents (90.2 %) were dog owners. Cannabidiol (CBD)-based products were mainly used to treat orthopedic and oncologic conditions, as adjunctive therapy to other medications. Oil formulations were used by most dog (85.2 %) and all cat owners. Participants predominantly reported positive effects, such as improved well-being, increased activity, and reduced pain. The results suggest that Slovenian pet owners who used CBD-based products as a treatment for their pets were overall satisfied with the effects of these products. However, there were still reports of some adverse effects, such as drowsiness, increased appetite, and thirst. Further research is essential to improve practices related to cannabis-based medicines for pets, especially CBD, and to put an end to the trial- and error- based therapeutic approach of pet owners and veterinarians. Long-term, large-scale research studies are needed to clarify the role of CBD as a treatment option for osteoarthritis, chronic pain, cancer, behavioral problems, and other chronic inflammatory conditions in dogs and cats.

Key words: cannabis; cannabidiol; cats; dogs; survey

Introduction

Cannabis and cannabis products have been widely used since ancient times as a remedy for many diseases (1, 2). The criminalization of cannabis occurred throughout the 20th century, beginning in the United States, where cannabis was banned for all use in 1970 with the Controlled Substances Act (1, 3), and spreading to European and other countries (4). In the 21st century, new laws were enacted to loosen the legal grip on cannabis use (1, 3), as the importance of its medicinal properties gained new attention due to renewed scientific and medical interest in the early 1990s (1, 2).

The use of cannabis for medicinal purposes is permitted in Slovenia under the Medicinal Products Act (5) and the Pharmacy Practice Act (6). Currently, there are no cannabidiol (CBD)-based products medicinal products approved for veterinary use in Slovenia. However, CBD-based medicinal products used in human medicine could also be used for veterinary purposes according to the principle of cascade (5). In addition, products derived from *Cannabis sativa* containing mainly CBD and less than 0.2 % delta-9-tetrahydrocannabinol (THC) are sold as dietary supplements. In fact, according to the Novel Food Catalogue of European Union (7), some products derived from *Cannabis sativa* are not novel and thus legally allowed.

Cannabinoids are active chemical substances isolated from the cannabis plant that exert

psychoactive and non-psychoactive effects (8, 9). They act as exogenous ligands that interact with G-protein-coupled cannabinoid receptors (10). There are two main types of cannabinoid receptors, CB1 and CB2 (11). The CB1 receptors are widely distributed in the brain and correlate with cannabinoid effects on cognition, appetite, emotion, memory, perception, and movement control. The CB2 receptors are highly concentrated in the peripheral nervous system and immune system, where they play a role in regulating inflammation and pain (11).

One of the best-known psychoactive cannabinoids is (THC), which may cause toxicosis in dogs (12 - 14), and cats (15, 16). Cannabidiol (CBD) is the most promising non-psychoactive cannabinoid, with many beneficial effects attributed to it (8, 9).

The first studies on the effects of cannabis in pets were mostly reports of poisoning in dogs (12 - 14). In recent years, new clinical studies aimed to elucidate the role of CBD in the treatment of various diseases in dogs, such as osteoarthritis (17 - 21), seizures (22, 23), atopic dermatitis (24) and anxiety (25). In addition, recent studies investigated the safety and side effects of various cannabinoid dosages and formulations for dogs (1, 26-30) and cats (1, 26, 31). Two of the most studied canine diseases, treated with CBD-basd products, are osteoarthritis (17 - 21), and epilepsy (22, 23). While CBD appeared to improve mobility, relieve pain, or reduce the need for other analgesics in some reports of dogs with osteoarthritis (17 - 20), this has not been confirmed by other researchers (21). In addition, clinical data on the use of CBD to treat epilepsy have shown promising results (22, 23).

Pet owners also use CBD-based products as sole or adjunctive treatment for oncological diseases in their pets (32 - 34). Although there is some preclinical evidence of CBD efficacy with or without chemotherapy on canine neoplastic cells (35, 36), there are no clinical data to date to confirm these findings.

Cannabidiol-based products are purchased by pet owners to relieve pain, reduce inflammation, control anxiety (32 - 34), and improve other medical conditions such as epilepsy (22), gastrointestinal problems, and cancer (32 - 34). The socioeconomic phenomenon of cannabis-based treatments for pets has been addressed by researchers who aimed to survey pet owners (32 - 34, 37), veterinarians (38), and veterinary students (39) about their attitudes and experiences with cannabis-based products to alleviate health related problems in pets.

The aim of the present study was to obtain information about the experiences of Slovenian owners on the use of CBD products in their dogs and cats. Our main hypotheses were that CBD products are well accepted by Slovenian pet owners and that most owners observe positive effects of the products in their cats and dogs, while adverse effects are rarely observed.

Material and methods

The methods are reported according to the Checklist for Reporting Results of Internet E-Surveys (40). An open online survey targeted Slovenian owners of cats and dogs who have used CBD as a treatment for their pets. Participation in the survey was voluntary and no incentives were offered for participation. An introductory text indicated the anonymity and confidentiality of the data collected and provided information about the investigator, the purpose of the study, and the length of the survey (approximately 5 minutes). The survey was created using Google Forms, a freely available survey software, and was tested by the investigators prior to use. The survey was accessible to visitors of the website of the Small Animal Clinic, Veterinary Faculty, University of Ljubljana (www.kmz.si) from February 25 to July 7, 2019. Initial contact with potential participants was made online only, by advertising on the clinic's website and Facebook page. The nonrandomized questionnaire (Table 1) consisted of a single page with 22 questions. Responses could be reviewed and changed by scrolling the questionnaire page. The questionnaire could be submitted if all mandatory questions were answered.

Respondents were selected by convenience sampling (i.e., cat and dog owners that visited the website or Facebook page of the Small Animal Clinic, Veterinary Faculty, University of Ljubljana). View and participation rates were not recorded. Descriptive statistics and frequency distribution were performed using the survey software. Since not all questions were answered by all participants, total responses for each question vary. The percentages reported are based on the total responses for each individual question. Due to the size of the sample, results are also reported as the number of responses to each question, where appropriate.

Table 1: Contents of the questionnaire

	Demographic data
Q1	Age (18-30, 31-50, 51 or more years) *
Q2	Sex (female, male) *
	Animal data
Q3	Species (cat, dog) *
Q4	Breed
Q5	Age (0-1, 2-5, 6-10, more than 10 years) *
Q6	Sex and reproductive status (female, spayed female, male, neutered male) *
Q7	Body weight (0-5, 6-10, 11-20, 21-30, more than 30 kg; other) *
	Animal health status
Q8	The type of the condition that caused you to use CBD (orthopedic disease (e.g., joint pain, lameness), oncologic disease, skin disease (e.g., itching), neurologic disease (e.g., epilepsy), behavioral disorder (e.g., fear, anxiety), gastrointestinal disease, other) *
Q9	Please provide the name of the disease or symptoms.
Q10	Does your pet have any other known medical conditions? *
Q11	If yes, which ones?
Q12	Is the animal receiving any medications, supplements, or nutritional supplements in addition to CBD? (yes, no, other) *
	CBD formulations and experiences with use
Q13	What type of product do you use? (oil, rectal suppositories, ointment, coated tablets, capsules, other) *
Q14	What is the concentration of CBD in the product? (3 %, 7 %, 10 %, other) *
Q15	Does the product contain THC? (yes, no, other) *
Q16	What is the THC content in the product?
Q17	When did you start noticing the effects of the CBD product? (immediately after starting, within a week, within a month, more than a month after starting, other) *
Q18	What positive effects do you observe in your pet when the product is administered? (improved well-being, increased activity, decreased pain, increased appetite, decreased nausea, no effect, other) *
Q19	What negative effects do you observe in your pet when the product is administered? (fatigue, drowsiness, decreased appetite, nausea, increased thirst, excessively increased appetite, no effect, other) *
Q20	Why did you decide to use CBD? (on recommendation of a veterinarian, at my own discretion, on recommendation of others) *
Q21	Where did you get information about the use of CBD? (from a veterinarian, from a pet store, on the Internet, from other people, other)
Q22	Do you have any other opinion, comment, or advice on the use of CBD in your pet?

Q question; * mandatory question

Due to the small number (n = 4) of cat owners that participated in the study, the results are reported separately for dogs and cats, except for demographic data, and sources of information and purchase of products.

Results

A total of 41 people participated in the survey. Although view and participation rates were not recorded, a total of 281 page views were recorded for the page on the clinic's website that advertised the survey study from February 25 to July 7, 2019.

Demographic data

The respondents were mostly female (36/41, 87.8 %). Most respondents (23/41, 56.1 %) were 31 - 50 years old; 24,4 % (10/41) were 18 - 30 years old, and 19,5 % (8/41) were 51 or more years old.

Animals data

Most of the respondents (37/41, 90.2 %) were dog owners, while four (4/41, 9.8 %) had cats. Among dogs, crossbreeds were overrepresented (8/28, 28.6 %), followed by Maltese dogs (2/28, 7.1 %), Labrador Retrievers (2/28, 7.1 %), and

other (16/28, 57,1 %). Age, sex, and reproductive status of the dogs are shown in Table 2. The majority of dogs (34.1 %) weighed more than 30 kg, followed by dogs weighing 6 - 10 kg (18.9 %).

Health status of dogs

Cannabidiol based products were mostly used to treat orthopedic (e.g., joint pain, lameness), and oncologic disease (Table 3). Other conditions included gingivitis, age-related problems, thyroid disease, lack of energy, chronic sinusitis, heart disease, allergies, chronic bronchitis, cognitive dysfunction, and recovery from surgery.

The disease treated with CBD was the only health problem in 75.7 % of the dogs (28/37). Of those with multiple diseases (9/37, 24.3 %), the most common comorbidities were heart disease (3/9, 33.3 %) and chronic kidney disease (2/9, 22.2 %). In 29.7 % (11/37) of the dogs, CBD was used as the only treatment, while 70.3 % (26/37) received several different medications or supplements such as natural remedies, non-steroidal anti-inflammatory drugs (NSAID), corticosteroids or disease-specific treatments (e.g., chemotherapeutics, antihypertensives, bronchodilators, antiepileptic drugs, etc.).

Table 4: The type of CBD products used in dogs

CBD product type	n (%)
Oil	23/37 (62.2 %)
Rectal suppositories	2/37 (5.4 %)
Ointment	2/37 (5.4 %)
Coated tablets	1/37 (2.7 %)
Capsules	0/37 (0 %)
Other	9/37 (24.3 %)

Cannabidiol formulations and experiences with use in dogs

Details of the products used are given in Table 4. Other product types included resin, CBD paste, CBD oil mixed with olive oil, and tablets.

The most frequent CBD concentration in the product was 10 % (10/37, 27 %) or 7 % (6/37, 16.2 %), while a 3 % CBD product was used by 5.4 % (2/37); other concentrations (19/37, 51.4 %) ranged from 5 – 50 % or were not reported. When asked about the THC content in the product, 17/31 (54.9 %) of the owners confirmed that the product contained THC. Of those who revealed the THC concentration in the product (n = 14), the majority indicated that it was less than or equal to 0.2 % (7/14, 50 %), while 4/16 (25 %) used

Table 2: Age, sex and reproductive status of the dogs

Age (years)	n (%)	Sex and reproductive status	n (%)
0-1	1/37 (2.7 %)	Female	6/37 (16.2 %)
2-5	7/37 (18.9 %)	Spayed female	16/37 (43.2 %)
6-10	14/37 (37.8 %)	Male	8/37 (21.6 %)
> 10	15/37 (40.5 %)	Neutered male	7/37 (18.9 %)

Table 3: Type of disease treated with CBD in dogs

Type of disease	n (%) *
Orthopedic disease (e.g., joint pain, lameness)	15/37 (40.5 %)
Oncologic disease	9/37 (24.3 %)
Skin disease (e.g., itching)	6/37 (16.2 %)
Neurologic disease (e.g., epilepsy)	5/37 (13.5 %)
Behavioral disorder (e.g., anxiety, restlessness)	4/37 (10.8 %)
Gastrointestinal disease	2/37 (5.4 %)
Other	7/37 (18.9 %)

*Since this was a multiple-choice question, the sum of percentages is greater than 100 %.

Table 5: The observed positive effects of CBD in dogs

Observed positive effects	n (%) *
Improved well-being	28/37 (75.7 %)
Increased activity	16/37 (43.2 %)
Reduced pain	16/37 (43.2 %)
Increased appetite	9/37 (24.3 %)
Decreased nausea	4/37 (10.8 %)
No effect	1/37 (2.7 %)
Other	12/37 (32.4 %)

*Multiple-choice question: the sum of the percentages is greater than 100 %.

products with more than 0.2 % THC (ranging from 0.3 to 70 %) and 4/16 (25 %) did not know the exact concentration. Most respondents observed an effect immediately (8/37, 21.6 %), or within a week of treatment (14/37, 37.8 %) and 24/37 (64.9 %) noted more than one positive effect (Table 5).

When asked about adverse effects, 28/37 (75.7 %) of owners reported none. The most common adverse effect was drowsiness (8/37, 21.6 %). Individual owners also reported increased appetite (3/37, 8.1 %) or thirst (2/37, 5.4 %), urinary incontinence (1/37, 2.7 %), and occasional vomiting (1/37, 2.7 %).

Results for cats

Four respondents were cat owners. One of the cats was purebred (Maine Coon), and the rest were domestic shorthair cats. Reproductive status included one female intact cat, one male neutered cat and two female neutered cats. Three cats weighed 6 to 10 kg; one cat weighed less than 5 kg. The owners used CBD for the treatment of oncological disease (n = 2), chronic respiratory disease (n = 1) and behavioral disorders (n = 1). Three of the respondents used oil products, one of respondents used only resin an one used a combination of oil, resin, and rectal suppositories. The content of CBD used for cats ranged from 3 to 16 %, and 3/4 (75 %) owners reported that the product contained THC in a concentration ranging from less than 0.2 % to 70 %. Each respondent noticed the effects of CBD at different times (i.e., immediately, within a week, within a month, never). The owners noted positive effects in 3/4 (75 %) of cats, while one cat owner reported none. Positive effects included improved wellbeing (n = 3), increased activity (n = 2), increased appetite (n = 2) and decreased pain (n = 1). Two cat owners noted adverse effects in their cats such as unspecified skin changes, and changes in cat's behavior (staring at the wall, focusing its shadow).

Sources of information and purchase of products

A 53.7 % (22/41) of respondents who answered the question, reported using commercial products while 29.3 % (12/41) used homemade products. One respondent (1/41, 2.4 %) used CBD on the recommendation of a veterinarian; the rest used the product at their own discretion (30/41, 73.2 %) or on the recommendation of others (10/41, 24.4 %). The most frequently reported sources of information were the Internet (18/41, 43.9 %) and experiences from other users (15/41, 36.6 %); 5/41 (12.2 %) of respondents obtained information from a veterinarian and 3/41 (7.3 %) from a pet store. Other responses included information from the manufacturer and other literature sources. Responses to the last question (n = 17) were overall positive (14/17, 82.4 %). Respondents described positive effects of CBD on their animals, recommended products, or expressed a reduced need for conventional medications, NSAIDs, or corticosteroids. Two respondents (2/17, 11.8 %) reported no effect. One respondent described ataxia in his dog that resolved spontaneously.

Discussion

The results of the present survey study show that most respondents observed positive effects of CBD products in their pets and that negative effects were rarely noticed. Furthermore, CBD products are well accepted among pet owners who participated in our study.

In our study, dog owners were overrepresented compared to cat owners, which was also found in other studies (32, 37). In fact, there are many more studies looking at the use of CBD products in dogs (8, 17 - 30) than in cats (26, 31). Deabold et al. (2019) emphasized the importance of further research into CBD applications in cats as CBD metabolism in cats is different than in dogs (26). In our study, most dog owners had large breed dogs, probably because these dogs are more prone to orthopedic conditions and resulting chronic pain, which is also the most common reason for using CBD products in dogs (33, 34). In addition, most of the animals in our study were adults, which may have correlated with disease incidence (41).

Orthopedic and oncologic conditions were the most common reasons for using CBD products in our study, followed by behavioral and neurologic problems, which agrees with previously reported studies (32 - 34), with the exception of skin conditions (e.g., itching), which were also strongly represented in our study. Indeed, Campora et al. (2012) suggested that the endocannabinoid system might be a target for the treatment of immune-mediated and inflammatory disorders such as allergic skin diseases in dogs (42). For the most part, pets received CBD products with other medications, implying that CBD was used as complementary therapy. These results are consistent with previous studies in which most respondents agreed that cannabis products might be appropriate as an adjunct therapy (32 - 34). However, CBD was used as the only treatment for 29.7 % of the dogs, which could mean that dog owners resorted to CBD products to help their pets before or without consulting a veterinarian, or that they were not satisfied with the conventional treatment approach (32 – 34, 37). Cannabidiol oil formulations are the most popular among CBD products and already proven to be well tolerated and effective in dogs (8, 17 - 19, 22, 26, 27, 31). Most respondents were aware of the concentrations of THC and CBD in the products used, probably because they were mostly commercial products. Nevertheless, some studies indicated that there may be discrepancies between the cannabinoid concentrations stated in the declaration and the actual cannabinoid concentrations in the product (28, 32, 43, 44).

Most respondents noticed the effect of CBD within a week or immediately. These results are difficult to discuss because the time of onset of the effect depends on the dosage. In addition, this information was not included in previous survey studies (32 - 34). The most commonly observed beneficial effects (improved well-being, increased activity, and pain relief) are generally consistent with previous studies in which pain relief was the most commonly perceived effect of CBD treatment in dogs (32 - 34). The reported adverse effects in our study such as sedation and/or drowsiness, excessive drinking, excessive appetite, skin changes and vomiting have been reported by pet owners in other studies (28, 33, 34). On the other hand, urinary incontinence, which was described by one respondent, was reported in cases of cannabis poisoning in dogs (12, 45). One dog owner reported ataxia that resolved spontaneously and as indicated by the owner, may have been the result of THC overdose (12, 45). The varying or unknown concentrations of THC in the population treated here may have influenced the occurrence of adverse effects caused by THC and not by CBD. According to research studies, the therapeutic dose of CBD for osteoarthritis and epilepsy in dogs is 2 mg/kg of a CBD-dominant product administered twice daily. However, since most of the products used also contain other cannabinoids, including THC, it is advisable to start with microdoses (i.e., 0.5 mg/kg twice daily) and titrate the dose until therapeutic effect is achieved and THC-related side effects are avoided (46, 47).

There are limited data on the safety and efficacy of CBD use in cats (1, 31). Pharmacokinetic studies show that cats have lower oral absorption kinetics and longer retention time compared with dogs, suggesting different dosing recommendations for cats and dogs (26, 31).

In our survey, most respondents reported using commercial CBD products and 35.3 % used homemade products. It is important to point out that CBD is preferred to conventional medications because it is perceived as a natural remedy (33,34, 37, 48). Many people rely on CBD formulations as a treatment for themselves (37, 48, 49) or their family members (50, 51) and pets (33, 34, 37). Cannabidiol products are often purchased from uncertified manufacturers or are homemade, and the products usually contain an unknown concentration of cannabinoids (28, 43, 44), which can lead to product inefficacy or the occurrence of adverse effects. Controlled clinical trials and pharmacokinetic studies have already demonstrated the beneficial effects of CBD in dogs and cats, and have also described the adverse effects (1, 8, 17 – 31). As highlighted in other studies, there is a need to establish standardized, independent laboratory analyses of the concentrations of cannabinoids and other elements in cannabis-based products (33, 34, 43, 44).

One of the 41 respondents started using CBD on the recommendation of a veterinarian. As noted in other studies, veterinarians are reluctant to prescribe CBD-based treatments due to lack of information, legal controversies, and limited clinical research (38). Moreover, pet owners may be discouraged to speak about the use of CBD in their pets due to the ambiguity regarding the permitted use of CBD and especially THC preparations. This

means that they must rely on other sources of information and take responsibility for treating their pets with supposedly natural remedies (33, 34, 49). The most common sources of information about CBD products in our study were the Internet and experiences of other users. This is generally consistent with similar studies in which the Internet was the most popular source of information about CBD products (33, 34, 37, 48).

The authors acknowledge certain limitations of the study. First, all survey-based studies in veterinary medicine require vicarious reporting, which may be biased by pet owner subjectivity. A caregiver placebo effect, which has been described in evaluating patient response to other treatments, may also be present in our study (21, 52). Since the survey was conducted online, selection bias may have occurred as older populations are generally not as proficient at using the Internet as middle-aged people, who were the most frequent participants in the present survey. Due to the small sample size, selection bias, and subjectivity of the responses, the results should not be generalized to all Slovenian pet owners.

The present study is the first to look into the experiences of Slovenian owners on the use of CBD products in their pets. The results suggest that Slovenian dog and cat owners who used CBD-based products as a treatment for their pets were overall satisfied with the effects of these products, although there were still reports of some adverse effects. Further research is imperative to improve practices related to CBD-based medications in pets to treat conditions such as osteoarthritis, chronic pain conditions, cancer, behavioral problems, and other chronic inflammatory conditions. Slovenian veterinarians should be informed about the indications, efficacy and current knowledge in this emerging field to enable safe use and maximize the potential of CBD-based treatment in cats and dogs, and to support their owners.

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UPORABA KANABIDIOLA PRI LASTNIKIH HIŠNIH LJUBLJENČKOV V SLOVENIJI – ANKETNA ŠTUDIJA

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Izvleček: Namen raziskave je bil pridobiti informacije o izkušnjah slovenskih lastnikov psov in mačk z uporabo izdelkov s kanabidiolom (CBD) pri svojih živalih. Raziskavo smo izvedli na podlagi anonimne spletne ankete, ki je bila namenjena slovenskim lastnikom psov in mačk, ki so uporabljali CBD za zdravljenje svojih živali. Vprašanja so se nanašala na demografske podatke, podatke o živalih, njihovem zdravstvenem stanju, vrste pripravkov s CBD-jem in izkušnjah z uporabo. Za opisno statistiko in frekvenčno porazdelitev smo uporabili programsko opremo za anketiranje. V raziskavi je sodelovalo 41 anketirancev, med katerimi je bilo največ žensk (87,8%) in starih med 31 in 50 let (56,1%). Večina anketirancev (90,2%) je bila lastnikov psov. Izdelki na osnovi CBD-ja so se večinoma uporabljali za zdravljenje ortopedskih in onkoloških obolenj kot dopolnilno zdravljenje. Največ lastnikov psov (85,2%) in vsi lastniki mačk so uporabljali oljne pripravke. Sodelujoči so večinoma poročali o pozitivnih učinkih, kot so boljše počutje, povečanje aktivnosti in zmanjšanje bolečine. Rezultati kažejo, da so slovenski lastniki psov in mačk, ki uporabljajo izdelke na osnovi CBD-ja za zdravljenje svojih živali, na splošno zadovoljni z učinki teh proizvodov. Poročali so tudi o nekaterih neželenih učinkih, kot so zaspanost, povečan apetit in žeja. Nadaljnje raziskave so bistvenega pomena za izboljšanje praks uporabe zdravil na osnovi konoplje za pse in mačke, zlasti CBD, in za odpravo terapevtskega pristopa lastnikov in veterinarjev, ki temelji na poskusih in napakah. Dolgoročne in obširne raziskave so potrebne za jasno opredelitev vloge CBD-ja pri zdravljenju kroničnih bolečin, raka, vedenjskih težav, osteoartritisa in drugih kroničnih vnetnih stanj pri psih in mačkah.

Ključne besede: konoplja; kanabidiol; mačke; psi; anketa