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Utilization of Cannabis for Chronic Pain Disorders: National Inpatient Sample (NIS) Database Analysis

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ABSTRACT

Background: Over the last decade, cannabis (marijuana) use has increased for a various medical condition. However, there is very little data on marijuana use for chronic pain disorders and associated predictors of its use.

Aim: To evaluate national trends of marijuana utilization for various pain disorders and epidemiological characteristics.

Method: We queried sample using ICD 9 CM code from a National Inpatient Dataset (NIS) from 2008 to 2014. We included patients with ICD-9 codes 304.30-304.32, which were defined as CBD Use-related Disorder (CUD), and those with ICD-9 codes 305.20-305.22, defined as a Non-CUD group. All comparisons were performed between the CUD *vs.* Non-CUD groups. Categorical variables and continuous variables were assessed by the Rao Scott χ^2 test and Wilcoxon rank-sum, respectively.

Result: Out of 17,675,000 CUD patients, the most common use was to treat back pain disorders (84.8%), followed by chronic pain syndrome (10.09%), neoplasm pain (3.25%), and post-operative pain (0.28%). The utilization was more prevalent among the males than females (61.8% *vs.* 38.2%; p<0.001). The median Length of Stay (LOS) for the CUD patients was higher compared to the MNU patients (3.19 days *vs.* 2.83 days; p<0.001). Compared to Non-CUD, CUD had lower odds of CHF (OR: 0.84, CI: 0.79 - 0.89; p<0.001) and depression (OR: 0.95, CI: 0.92-0.98, P=0.001) and higher odds of alcohol abuse (OR: 1.42, CI:1.38-1.47; P<0.001) and anxiety disorder (OR:1.11, CI:1.07-1.14; P<0.001).

Conclusion: Our analysis revealed a substantial prevalence of marijuana use among patients with chronic pain disorders. Back pain emerges as the predominant indication for CBD usage, with the 41-60 age group being the most prevalent demographic. While CUD patients exhibit a longer hospital stay and varied outcomes for certain medical conditions, including both positive and negative associations, our study underscores the urgent need for more extensive and standardized research.

Keywords: THC: Delta-9-tetrahydrocannabinol; CBD: Cannabidiol; Cannabis (Marijuana); Chronic pain disorder; NIS: National (Nationwide) Inpatient Sample database

INTRODUCTION

Marijuana is illegal at the federal level as a Schedule I drug under the federal Controlled Substances Act, but several states continue to take action to legalize marijuana through legislation and ballot initiatives. In 2021, 4 states (Connecticut, New Mexico, New York, and Virginia) passed legislation to legalize marijuana for recreational purposes. In the United States, there are now 19 states, plus the District of Columbia, which has legalized the recreational use of marijuana. Medical marijuana uses the marijuana plant or chemicals derived from it to treat disease conditions. Medical marijuana is similar to recreational marijuana, and delta-9-Tetrahydrocannabinol (THC) and Cannabidiol (CBD) are the main chemicals used in medical marijuana. While both THC and CBD have therapeutic effects for Alzheimer's disease, appetite loss, Crohn's disease, HIV-AIDS, Multiple Sclerosis (MS), anorexia, epilepsy, glaucoma, pain, seizures and mental health conditions like schizophrenia and Posttraumatic Stress Disorder (PTSD), THC has significant psychotic effects and impairs cognition. There is significant evidence for the therapeutic effects of CBD (which is typically dispensed as a combination of THC and CBD in various ratio) in reducing chronic pain, chemotherapy-associated nausea, and spasticity due to MS [1-4].

FDA has only approved the cannabidiol “Epidiolex” in 2018 for treating seizures associated with two rare and severe forms of epilepsy, namely Dravet syndrome and Lennox-Gastaut syndrome. Recently, the FDA has also approved two other cannabinoid medicines ‘Dronabinol’ and ‘Nabilone’ both used to treat nausea and vomiting from chemotherapy. CBD is consumed in various forms, it can be smoked, used as oil, vaporized or added to edible products such as candy, cookies, chocolates or eaten as pills or capsules. Most people use CBD to manage pain, assuming it to be harmless since it is plant-derived, and stop using prescribed medications such as opiates, despite little understanding of the potential risks and benefits of cannabis. With the legalization of marijuana in many states, cannabis use is increasing among the general population and little information is available about its use in health care settings. Marijuana is mostly used to temporarily relieve pain and it does do by interacting with the body’s natural cannabinoid receptors and reducing pain signaling and pain perception. Chronic pain stemming from systemic inflammation may also benefit from marijuana’s anti-inflammatory effects. CBD may also stimulate an immune response and attenuate pro-inflammatory cytokines [5-7].

As of April 24, 2023, 38 states, three territories and the District of Columbia allow the medical use of cannabis products and As of November 8, 2023, 24 states, two territories and the District of Columbia have enacted measures to regulate cannabis for non-medical adult (recreational) use. (ncsl.org/research/health/state-medical-marijuana-laws.aspx.) Limited information is available on CBD’s evidence based medical use, it’s safe administration,

variability in dosage, packaging and dispensing; adverse health consequences and deaths attributed to marijuana intoxication; therapeutic indications based on actual clinical data and additionally, implications with regards to its regulations for use in the acute care hospital setting. Therefore, the goal of our study was to evaluate national trends of CBD utilization for various pain disorders, and co-morbidities associated with cannabis use and the patient demographic characteristics, hospital characteristics, discharge status and length of hospital stay associated with CBD use. To this end we used the National (Nationwide) Inpatient Sample (NIS) which is the largest publicly available all-payer inpatient health care database in the United States that yields national estimates of hospital inpatient stays [https://www.hcup-us.ahrq.gov]. The NIS database contains clinical and resource-use information that is included in a typical discharge abstract, with safeguards to protect the privacy of individual patients, physicians, and hospitals. It contains clinical and nonclinical data elements for each hospital stay that includes primary and secondary diagnoses and procedures, severity and comorbidity measures, patient demographic characteristics, hospital characteristics, discharge status and length of hospital stay.

METHODS

Study population for this analysis was derived from the Nationwide Inpatient Sample (NIS) from 2008-2014, which is part of the Healthcare Cost and Utilization Project (HCUP), sponsored by the Agency for Healthcare Research and Quality (AHRQ). The NIS is a database of hospital inpatient stays derived from billing data submitted by hospitals to statewide data organizations across the United States. Utilizing a complex survey design, the NIS is powered to calculate national estimations (weighted admissions) of the delivery of care representing 96% of all US inpatient care. The special features of the NIS database we used are: a) each year of the NIS includes over 7 million un weighted inpatient stays, and it estimates more than 35 million weighted hospitalizations nationally; b) the NIS approximates a 20-percent stratified sample of discharges from U.S. community hospitals, excluding rehabilitation and long-term acute care hospitals; c) the self-weighting design of the NIS reduces the margin of error for estimates and delivers more stable and precise estimates; d) protects patient confidentiality because State and hospital identifiers are not provided, and above all; e) the NIS retains a large sample size, which enables analyses of rare conditions, uncommon treatments, and unique patient populations such as patient cohorts using unconventional treatments, such as use of medical/recreational marijuana (cannabis) to treat pain.

In the current analysis, we queried the primary sample Chronic pain disorders by using most common pain disorders (ICD 9 CM code 337.2 Reflex sympathetic dystrophy; 729.2 Neuralgia, neuritis, and radiculitis; 338.21 Chronic pain due to trauma; 338.28 chronic postoperative pain; 338.0 Central pain syndrome; 338.4 Chronic pain syndrome; 338.3 acute or chronic neoplasm related pain; 724 unspecified back disorders; 722 Intervertebral disc disorders. We included patients with ICD-9 code of 304.30-304.32 which were defined as Cannabis dependence (CUD) and those with ICD-9 code of 305.20-305.22 defined as non-dependent cannabis users (Non-CUD). We eliminated subjects less than 18 years of age, any entries that were missing gender identification and same day admission entries that is admission that were less than 1-day Length of Stay (LOS) leading to the final cohort of 17,570,985.

Patient level variables obtained from the dataset included: age, race, gender, Length of Stay (LOS), and co-morbidities. Hospital level variables isolated from the NIS were: bed size, teaching status, location and geographic

region of country and disposition were included in comparisons between. All of these variables were queried using the AHRQ database classification and using ICD 9 CM classification. The NIS dataset includes all the patients admitted under observational or inpatient status into NIS participating hospitals. We used the definition of c use, in the NIS database in conjunction with that used previously by other investigators [8,9]. The rationale for which is that, currently, there is no specific ICD-9-CM code for medical cannabis use, therefore, the classification is based on an assumption that patients with clinical diagnoses of cannabis abuse represent patients with recreational cannabis use. Several studies show that a large share of medicinal users also use cannabis recreationally, and approximately 86% of people who report ever using cannabis for medicinal purposes also use it recreationally [10-12].

STATISTICAL ANALYSIS

All comparisons were performed between CUD *vs.* Non CUD in pain disorders cohort. Firstly, the baseline characteristics of participants were summarized using descriptive statistics. Categorical variables and continuous variables were assessed by the Rao Scott χ^2 test and Wilcoxon rank-sum, respectively. Categorical variables were expressed as percentages of the group of origin, and continuous variables were reported as mean (median; lower - upper quartile (Q1-Q3)). Reported probability values were 2-tailed and were considered statistically significant if $P < 0.05$. Secondly, we used a univariable survey-weighted logistic model to determine the differences in cannabis utilization for individual predictors. Thirdly, we used a multivariable logistic regression model to predict the probability of cannabis users. Variables with a significant association ($p<0.1$) with based on the univariate analyses were entered into a multivariable model. The predictive accuracy of a logistic regression model was determined by the Concordance (C) statistic. We used sampling weights (discharge weight) provided in the NIS database to generate the national estimates. Data analysis was performed using SAS 9.4 (SAS Institute Inc, Cary, North Carolina). Any frequency or count <11 was not presented as per the restrictions and the data user agreements with the AHRQ.

RESULTS

Baseline characteristics

Table 1 shows baseline characteristics for 2 groups of patients. Group 1 (CUD)-Patients with pain disorders who used marijuana/ CBD *vs.* Group 2 (Non-CUD)-Patients with pain disorders who did not use marijuana/CBD. Out of a total of 18,077,478 population, we eliminated subjects less than 18 years of age, any entries that were missing gender identification, and same day admission entries (entries which were less than 1 day LOS) resulting in using a total population of 17,675,000 individuals. Demographic data shows that in the CUD group, 18.2% were African American, 61.7% Caucasian, 6.3% Hispanic, and 3.3% were Asian or Pacific Islander or Native American, while the demographic distribution in the Non-CUD group was 9.3% were African American, 71.7% Caucasian, 5.5% Hispanic, and 3.5% were Asian or Pacific Islander or Native American, respectively. Gender data shows that in the CUD group, 61.8 % patients were male and 38.2% were female, while the gender distribution in the Non- CUD group was 42.4% male and 57.6 % female, respectively. The age median in the CUD group was 42.85 % and that in the Non-CUD group was 60.5%, respectively.

Table 1: Baseline Characteristics of CUD *vs.* non CUD (N=17,675,000).

	Total Population	Non- CUD (N=17406073; 98.4%)	CUD (N=268927; 1.52 %)	Univariate Odds Ratio (OR)	Confidence Interval (CI)	P-value
Age Median	59.7	60.05	42.85	0.93	0.93-0.93	<.001
(Q1-Q3)	(48.1-72.4)	(48.5 - 72.7)	(31.5 - 51.6)			
LOS Median	2.83	2.83	3.19	1.01	1.01-1.01	<.001
(Q1-Q3)	(1.5 - 5.1)	(1.5 - 5.1)	(1.7 -5.7)			
Gender						
	Total Population	**Non - CUD**	**CUD**	**OR**	**CI**	**P-value**
Male	7,542,757 (42.7)	7,376,673 (42.4)	166,084 (61.8)	Ref		
Female	10,132,242 (57.3)	10,029,400 (57.6)	102,842 (38.2)	0.46	0.45-0.47	<.001
Race						
	Total Population	**Non – CUD**	**CUD**	**OR**	**CI**	**P-value**
White	12,639,262 (71.5)	12,473,345 (71.7)	165,918 (61.7)	Ref		
Black	1,671,700 (9.5)	1,622,769 (9.3)	48,931 (18.2)	2.27	2.18-2.36	<.001
Hispanic	980,554 (5.5)	963,688 (5.5)	16,866 (6.3)	1.32	1.24-1.40	<.001
Asian or Pacific Islander, Native American, Other	625,441 (3.5)	616,643 (3.5)	8,798 (3.3)	1.07	0.98-1.18	0.142
Associated Disease incidence in CUD *vs.* non-CUD groups						
	Total Population	**Non – CUD**	**CUD**	**OR**	**CI**	**P-value**
Deficiency anemia's	3,093,927 (17.5)	3,065,009 (17.6)	28,918 (10.8)	0.56	0.54-0.58	<.001
Valvular disease	649,795 (3.7)	646,197 (3.7)	3,598 (1.3)	0.35	0.33-0.38	<.001
Peripheral vascular disorders	1,071,380 (6.0)	1,064,946 (6.1)	6,434 (2.4)	0.38	0.35-0.40	<.001
Hypertension	9,950,610 (56.3)	9,853,749 (56.6)	96,862 (36.0)	0.43	0.42-0.44	<.001
Diabetes mellitus, uncomplicated	3,411,930 (19.3)	3,386,153 (19.5)	25,777 (9.6)	0.44	0.42-0.45	<.001
Diabetes with complications	875,586 (5.0)	867,955 (5.0)	7,631 (2.8)	0.56	0.52-0.59	<.001
Hypothyroidism	2,358,423 (13.3)	2,344,670 (13.5)	13,753 (5.1)	0.35	0.33-0.36	<.001
Liver disease	620,458 (3.5)	604,039 (3.5)	16,419 (6.1)	1.81	1.73-1.89	<.001
Lymphoma	150,034 (0.8)	149,090 (0.9)	943.4 (0.4)	0.41	0.35-0.48	<.001
Metastatic cancer	556,506 (3.1)	553,364 (3.2)	3142 (1.2)	0.36	0.33-0.4	<.001
Obesity	2,632,529 (14.9)	2,603,285 (15.0)	29,245 (10.9)	0.69	0.67-0.72	<.001

Congestive heart failure	1,339,831 (7.6)	1,332,437 (7.7)	7,394 (2.7)	0.34	0.32-0.36	<.001
Renal failure	1,649,843 (9.3)	1,640,100 (9.4)	9,743 (3.6)	0.36	0.34-0.38	<.001
Solid tumor /No metastasis	304,876 (1.7)	302,757 (1.7)	2,119 (0.8)	0.45	0.40-0.50	<.001
Rheumatoid arthritis	731,410 (4.1)	726,366 (4.2)	5044 (1.9)	0.44	0.41-0.47	<.001
Depression	3,366,322 (19.0)	3,319,960 (19.1)	46,362 (17.2)	0.88	0.86-0.91	<.001
Alcohol abuse	851,472 (4.8)	785,117 (4.5)	66,355 (24.7)	6.93	6.74-7.13	<.001
Drug abuse	1,366,946 (7.7)	1,124,583 (6.5)	242,363 (90.1)	132.09	121.46-143.65	<.001
Chronic pulmonary disease	4,215,131 (23.8)	4,150,057 (23.8)	65,074 (24.2)	1.02	0.10-1.05	0.118
Anxiety disorder	2,704,184 (15.3)	2,631,885 (15.1)	72,300 (26.9)	2.06	2.01-2.13	<.001
Schizophrenia/ psychotic disorders	452,313 (2.6)	423,781 (2.4)	28,532 (10.6)	4.76	4.57-4.95	<.001
Personality disorders	235,975 (1.3)	209,298 (1.2)	26,677 (9.9)	9.05	8.65-9.48	<.001
United States Geographic Region of Hospital						
	Total Population	**Non - CUD**	**CUD**	**OR**	**CI**	**P-value**
Northeast (1)	2,835,892 (16.0)	2,792,029 (16.0)	43,863 (16.3)	Ref		
Midwest (2)	4,214,990 (23.8)	4,140,296 (23.8)	74,694 (27.8)	1.15	1.04-1.27	0.006
South (3)	7,025,473 (39.7)	6,934,368 (39.8)	91,106 (33.9)	0.84	0.76-0.92	0.002
West (4)	3,598,645 (20.4)	3,539,380 (20.3)	59,264 (22.0)	1.07	0.97-1.18	0.198
Bed Size of hospital						
	Total Population	**Non - CUD**	**CUD**	**OR**	**CI**	**P-value**
Small (1)	2,525,457 (14.3)	2,492,168 (14.3)	33,289 (12.4)	Ref.		
Medium (2)	4,457,431 (25.2)	4,390,104 (25.2)	67,327 (25.0)	1.15	1.05-1.26	0.003
Large (3)	10,597,734 (60.0)	10,430,958 (59.9)	166,775 (62.0)	1.2	1.10-1.30	<.001
Location/Teaching Status of Hospital						
	Total Population	**Non - CUD**	**CUD**	**OR**	**CI**	**P-value**
Rural (1)	2,239,643 (12.7)	2,209,201 (12.7)	30,442 (11.3)	Ref.		
Urban nonteaching (2)	7,338,479 (41.5)	7,236,568 (41.6)	101,911 (37.9)	1.02	0.94-1.12	0.626
Urban teaching (3)	8,002,501 (45.3)	7,867,462 (45.2)	135,039 (50.2)	1.25	1.15-1.35	<.001

Trends in hospital admissions, hospital size, locations

Table 1 shows trends in hospital admissions, hospital size, and geographic locations in the study groups. Comparisons were made between Group 1-CUD patients *vs.* Group 2- Non- CUD patients, and our data shows that the median Length of Stay (LOS) for the CUD patients was 3.19 days compared to the 2.83 days (Odds Ratio 1.01; $p<0.001$) for the Non CUD patients. A slightly higher percentage (27.8%, $p<0.006$) of CUD patients were being admitted in the Midwest region hospitals of the United States as compared to the Non-CUD patients with pain conditions (23.8%), whereas a lower percentage (33.9%, $p<0.002$) of CUD patients were being admitted in the Southern region hospitals of the United States as compared to the Non-CUD patients with pain conditions (39.8%). No significant differences between the two groups were observed in the hospital locations in the Northeast and the Western regions of the United States. The Northeast region hospitals were used as a reference group in the analysis. The hospitals that had larger number of beds had more admissions (62% CUD *vs.* 59% Non- CUD) as compared to hospitals with medium (25% CUD *vs.* 25.2% Non- CUD) to smaller (12.4% CUD *vs.* 14.3% non- CUD) numbers of beds; this is also reflected in Urban teaching hospitals where increased number of CUD patients (50.2%; $p<0.001$) were evaluated as compared to 45.2% Non- CUD patients.

Changes in medical conditions associated with cannabis use

Table 1 shows a comparative assessment of additional medical conditions in patients with pain disorders CUD *vs.* Non-CUD patients. A comparative analysis between the two study group showed CBD use resulted in a significantly better disease outcome in CUD patients for the following medical conditions as compared to the Non- CUD group. The incidence of association with the following disease conditions was examined and the following associations were noted. Iron Deficiency anemia's (CUD 10.8% *vs.* non-CUD 17.6%; $p<0.001$); valvular disease (CUD1.3% *vs.* non-CUD3.7%; $p<0.001$); peripheral vascular disorders (CUD2.4% *vs.* non-CUD6.1%; $p<0.001$); hypertension (CUD36.0% *vs.* non-CUD56.6%; $p<0.001$); Diabetes Mellitus uncomplicated (CUD 9.6% *vs.* non-CUD19.5%; $p<0.001$); Diabetes Mellitus complications (CUD2.8% *vs.* non-CUD5.0%; $p<0.001$); hypothyroidism (CUD5.1% *vs.* non-CUD13.5%; $p<0.001$); lymphoma (CUD0.4% *vs.* non-CUD 0.9%; $p<0.001$); metastatic cancer (CUD 1.2% *vs.* non-CUD3.2%; $p<0.001$); obesity (CUD 10.9% *vs.* non-CUD15%; $p<0.001$); congestive heart failure (CUD 2.7% *vs.* non-CUD 7.7%; $p<0.001$); renal failure(CUD 3.6% *vs.* non-CUD 9.4%; $p<0.001$); solid tumor without metastasis (CUD 0.8% *vs.* non-CUD 1.7%; $p<0.001$); Rheumatoid Arthritis (CUD 1.9% *vs.* non-CUD 4.2%; $p<0.001$); and depression (CUD 17.2% *vs.* non-CUD19.1%; $p<0.001$).As outlined, the incidence of these diseases was less in the CUD patient group as compared to the non- CUD patient group.

A significantly higher incidence of Alcohol abuse (CUD24.7% *vs.* non-CUD4.5%; $p<0.001$); multiple drug abuse (CUD 90.1% *vs.* non- CUD 6.5%; $p<0.001$); anxiety disorder (CUD 26.9% *vs.* non-CUD 15.1%; $p<0.001$); schizophrenia/psychotic disorders (CUD 10.6% *vs.* non-CUD 2.4%; $p<0.001$); and personality disorders (CUD 9.9% *vs.* non-CUD 1.2%; $p<0.001$) was observed in the CUD patient group as compared to the non- CUD patient group.

Table 2 shows multivariate analyses of cannabis utilization for pain disorders by age, gender, race, and medical conditions. Analysis shows that there are significant differences for gender and race of patients between the two study groups of CUD *vs.* non CUD; however, no significant difference between the two groups was observed with respect to the following medical conditions: hypertension, liver disease, metastatic cancer, solid tumors without

metastasis, and lymphomas. There were significant differences between CUD *vs.* non CUD groups with respect to disease conditions like deficiency anemia's, rheumatoid arthritis, congestive heart failure, depression, diabetes both uncomplicated and with complication, hypothyroidism, obesity, peripheral vascular disorders, renal failure, valvular disease, alcohol abuse, drug abuse, schizophrenia/psychotic disorders, personality disorders and anxiety disorders.

Table 2: Factors Associated with Cannabis use in Various Diseases with an underlying Pain condition.

	Point Estimate	**95% Confidence Limits**		**P value**
Age	0.96	0.96	0.96	<.001
Sex				
Male	Ref.			
Female	0.6	0.58	0.61	<.001
Race				
White	Ref.			
Black	1.78	1.72	1.85	<.001
Hispanic	1.12	1.06	1.18	<.001
Asian or Pacific Islander, Native American, Other	1.24	1.14	1.36	<.001
Medical Conditions positively influenced by marijuana use	**Point Estimate**	**95% Confidence Limits**		**P value**
Deficiency Anemia's	0.71	0.68	0.73	<.001
Rheumatoid arthritis	0.75	0.69	0.81	<.001
Congestive heart failure	0.84	0.79	0.89	<.001
Depression	0.95	0.92	0.98	0.001
Diabetes uncomplicated	0.82	0.79	0.85	<.001
Diabetes with complications	0.83	0.78	0.89	<.001
Hypertension	0.99	0.97	1.02	0.554
Hypothyroidism	0.82	0.79	0.86	<.001
Liver disease	0.94	0.9	0.99	0.021
Lymphoma	0.86	0.73	1.02	0.076
Metastatic cancer	1.01	0.92	1.1	0.898
Obesity	0.88	0.85	0.91	<.001
Peripheral vascular disorders	1.09	1.02	1.17	0.008
Renal failure	0.8	0.75	0.84	<.001
Solid tumor without metastasis	1.06	0.95	1.18	0.326
Valvular disease	0.83	0.76	0.9	<.001
Medical Conditions negatively influenced by marijuana use	**Point Estimate**	**95% Confidence Limits**		**P value**
Alcohol abuse	1.42	1.38	1.47	<.001
Drug abuse	76.93	70.4	84.1	<.00001
Schizophrenia/Psychotic disorders	1.34	1.29	1.4	<.001
Personality disorder	1.24	1.18	1.32	<.001
Anxiety disorder	1.11	1.07	1.14	<.001

Pain conditions most associated with cannabis use

Figure 1 shows the various pain conditions for which patients used cannabis. Our data shows that 84.8% of CUD patients used it to treat back pain disorders followed by use for chronic pain syndrome at 10.09%, neoplasm pain 3.25%, reflex sympathetic dystrophy syndrome 0.59%, traumatic pain 0.5%, neuritis 0.4% and post-operative pain 0.28%.

Figure 2 showed the age distribution of the cannabis users in the various pain condition categories. Cannabis treatment for traumatic pain (Figure 2B) was largely evident in the 18-40 years age group; however, for all other pain conditions, namely post-operative pain (Figure 2A), back disorders (Figure 2C), neoplasm pain (Figure 2D), chronic pain syndrome (Figure 2E), central pain syndrome (Figure 2F), reflex sympathetic dystrophy syndrome (Figure 2G), and the pain associated with neuritis (Figure 2H), was mostly in predominantly the 41- 60 years age group.

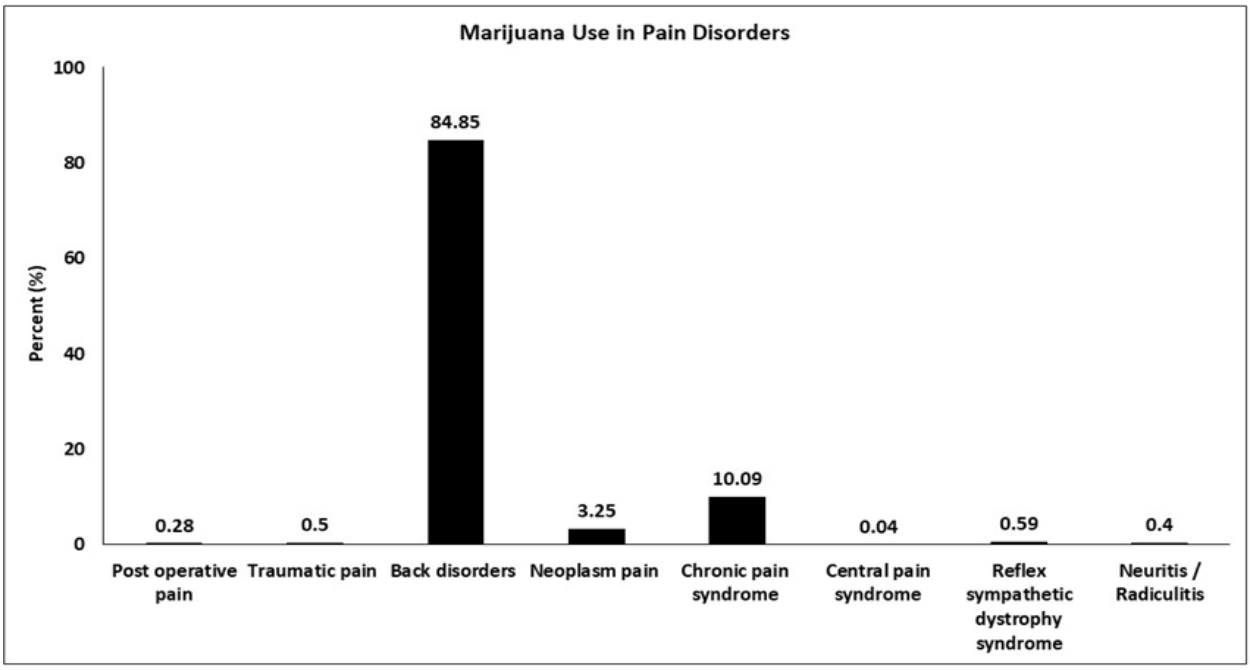

Figure 1: Cannabis utilization for various pain disorders.

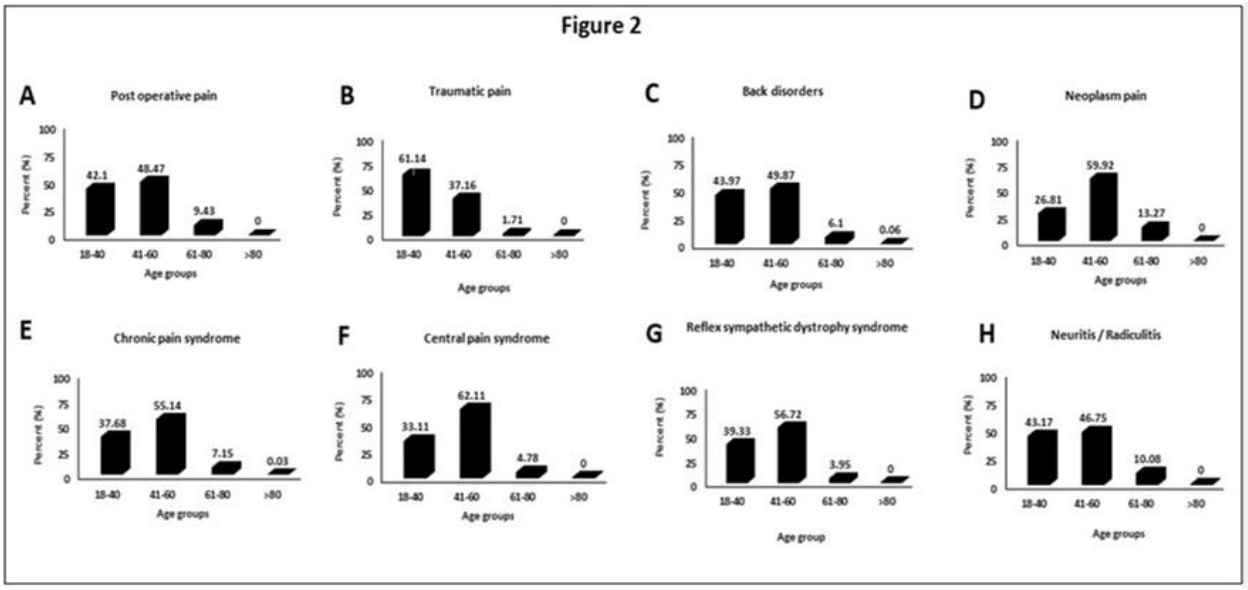

Figure 2: Age distribution of cannabis use for various pain disorders.

DISCUSSION

The most common use for medical marijuana (cannabis) in the United States is for pain control. Medical marijuana (cannabis) is an increasingly popular alternative to traditional pain-relieving medications, including opioids. Cannabis may ease certain types of chronic pain, including pain resulting from nerve damage and inflammation. Although cannabis is not very effective for severe pain like post-surgical pain or a broken bone, it is very effective for chronic pain. Cannabis is perceived as a safe alternate to opiates and can be used instead of NSAIDs, which are not recommended for patients with kidney disease. While several studies have examined the effects of cannabis use on general health conditions, none have focused on examining the relationships between cannabis use and various types of pain disorders and potential health outcomes among hospitalized patients, who used or did not use cannabis to treat pain disorders. Many studies have documented increased risks of cardiovascular and cerebrovascular events associated with cannabis use, while some others did not observe any adverse health outcomes associated with cannabis use [8,9,13-16]. Marijuana is believed to be most effective for chronic pain. Table 1 shows that cannabis use can have both positive and negative impact of various health conditions, and these differences can be attributed to major differences in study population such as age/gender-associated effects, underlying health status, source of data on cannabis use (e.g., self- reported vs. clinical data), reason for cannabis use (medical vs. recreational). Our study suggests that cannabis use is predominant in older adults between the age group of 41-60 and specifically associated with pain conditions such as post-operative pain, chronic back pain, neoplasm pain, chronic pain syndrome, central pain syndrome, reflex sympathetic dystrophy syndrome, and neuritis (Figure 2 A-H). Pain management of these medical conditions in this middle age to aging population group is often the main reason for medical cannabis use [10,17]. And this is not surprising since this age group is the active work force group where work-related stress may be a contributing factor to these chronic pain conditions. However, in spite of the use of cannabis for clinical diagnosis of pain in this group, we do not have any reliable method to identify chronic pain using administrative databases that are available to us, and therefore, we are cognizant of the fact that the results obtained in this study have limited direct relevance. We evaluated the relationships between cannabis use with clinical outcomes using the NIS database between 2005 and 2014, and these NIS databases are based on the ICD-9-CM coding system, which has been used in the US since 1979.Therefore, we must be cognizant that much of that data is prior to legalization of cannabis in many US states. The major strength of our study is the determination of the incidence of medical cannabis use for various pain conditions as compared to non-users, based on the NIS database. Our study provides evidence regarding the association between cannabis use in pain condition and its effect on other health outcomes in various adult age groups in the US, and these associations between cannabis use and health outcomes were assessed using clinical claims data in a nationally representative dataset, with adjustment for multiple confounders. As the use of both medical and recreational cannabis becomes increasingly prevalent for pain management, awareness among health care professionals is essential to educate patients about the appropriate use of cannabis.

Limitations of the study:

- Our study had limitations where the type, quantity and mode of cannabis use is not coded in the database, and therefore, these variables cannot be adjusted for in our multivariate analysis.

- Over-reporting or under-reporting the estimated population is possible in this study because ICD-9 coding errors in an administrative database such as NIS are possible.
- Further, this data set does not control for errors during the entry of the data.
- Our analyses are based on a database of inpatient hospitalizations, and therefore, only health outcomes that were captured during inpatient admissions were included in this study. Our definition of cannabis use is based on ICD- 9- CM codes documented in the NIS databases. As with any administrative claims database, there is a chance of misclassification and under-classification of drug use using secondary ICD-9-CM codes as it is often self- reported [18-20].
- Our database categorizes participants solely on the basis of dependency status, and the extent to which cannabis use represents medical or recreational use is unknown. No formal coding exists to specify the specific indication, dose, or timing of use. Therefore, we are unable to directly assess causality or dose–response mechanisms in this analysis.
- Patient specific clinical information was not obtained which limits the demographic data presented in the study.
- The factors that contribute to prevalence of medical cannabis use are limited due to the variability in doses, combinations of THC and CBD ratios which are variable at dispensaries, uniform availability across the various states in which cannabis is legalized and association with co-morbidities, socioeconomic factors, require further investigation.

CONCLUSION

Our study sheds light on the trends and associations related to the utilization of cannabis for various pain disorders using the National Inpatient Sample (NIS) database from 2008 to 2014. Our findings reveal a demographic distribution among cannabis users for pain, particularly in age group of 41-60 and predominant usage for conditions such as chronic back pain, neoplasm pain, and post-operative pain. The analysis further highlights differences in hospital admissions, length of stay, and regional patterns between cannabis users and non-users with pain disorders. While CBD usage demonstrated positive associations with certain health conditions, such as lower rates of iron deficiency anemia's and valvular disease, it also indicated higher incidences of alcohol abuse, multiple drug abuse, anxiety disorders, schizophrenia/psychotic disorders, and personality disorders. As the landscape of cannabis regulations evolves, healthcare professionals must be attuned to the implications of cannabis use, considering both potential benefits and risks, particularly in the context of managing chronic pain.

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