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## **Marijuana Use and Mental Health among Emergency Department Patients**

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Marijuana Use and Mental Health among Emergency Department Patients

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Clinical Science and Research

Scholarship in Medicine Final Report

**By checking this box, I indicate that my mentor has read and reviewed my draft proposal prior to submission**

**Abstract**

Background: According to the Centers for Disease Control and Prevention (CDC), marijuana is the most commonly used illicit drug in the U.S. with an increasing number of users in recent years.

Objective: This study was undertaken to identify common reasons for marijuana use and any relationship between its use and mental health among Emergency Department (ED) patients.

Methods: A total of 303 ED patients participated from the Miami Valley Hospital Emergency Department. Eligible participants included those with any marijuana use. Subjects were administered a survey which identified age of first use, reasons for use, and presence of anxiety and depression (in the present and past).

Results: 303 patients consented to participate (86% response rate). The majority of participants reported a perception that marijuana use improved their mental health (N=158; 52%) and did not worsen it (N=222; 73%). A minority reported marijuana use worsened their mental health (N = 32; 11%) or had a neutral/no effect on it (16%). The most common reasons cited for marijuana use included recreation (N=211; 70%), anxiety (N=89; 29%), pain (N=74; 24%), depression (N=50; 17%), and sleep (N=24; 8%). The age of first marijuana use varied (range age 6 to 65; mean=18). The frequency of marijuana use also varied among participants. The majority of patients reported no marijuana use in the last 30 days (60%), while 18% reported 1-9 days of use, 10% reported 10-20 days of use, and 11% reported daily use.

Conclusions: Marijuana use is common among ED patients. The age of first use varied from age 6 to 65. Marijuana users most commonly use it for recreation, followed by treatment of anxiety, pain, depression, and sleep disturbances. Participants report variable effects of marijuana use on mental health.

Key Words: marijuana, mental health, emergency department, marijuana users

## Introduction/Literature Review

According to the National Institute on Drug Abuse (reported by the CDC) marijuana is the most commonly used illicit drug in the United States, and its use has increased over recent years. In 2007, there were 14.5 million people using marijuana in the U.S., while in 2013, there were 19.8 million users. Often, illicit drug users begin with marijuana and may subsequently use other illicit substances. Marijuana has the second highest rate of dependence or abuse among all drugs (after alcohol).<sup>1</sup>

Some of the most common mental health conditions in the United States are anxiety and depression. The National Institute of Mental Health reports that from 2001 to 2003, the prevalence of anxiety disorders among adults in the U.S. was about 19.1% annually, and 31.1% experienced an anxiety disorder at some point in their lives. Between 2001 and 2004, 31.9% of adolescents had an anxiety disorder. Overall, in both the adult and adolescent categories, anxiety is more prevalent among women, compared to men.<sup>2</sup> Depression is also common in the U.S. Over 17 million adults (7.1% of all U.S. adults) had at least one major depressive episode in 2017. For adolescents between ages 12 and 17, 3.2 million (13.3% of this population) reported at least one major depressive episode. Similar to anxiety, the prevalence of major depressive episodes was higher among females than males in both adults and adolescents.<sup>3</sup> The CDC reports that daily or near daily use of high doses of marijuana may be associated with anxiety, paranoia, and disorientation. Users are also more likely to develop temporary psychosis, long term mental disorders like schizophrenia, and experience depression and anxiety.<sup>4</sup> Turner et al. addresses the prevalence of self-medication with alcohol or drugs in mood and anxiety disorders in the general population (n=22). In this meta-analysis, 21.9% to 24.1% of respondents admitted to self-

medication. Their data also supports a temporal onset of the mental health conditions prior to a respondent's substance use disorder history.<sup>5</sup>

A study by Orr MF et al. focused on the chronic pain patient population in whom they researched anxiety, depression and suicidal ideation. Their results concluded the presence of a significant indirect relationship between cannabis use problems and these three mental health conditions.<sup>6</sup> Another study by Poli P. et al. also researched chronic pain patients; however, in contrast to Orr MF, Rogers AH et al., this study treated 338 patients with Cannabis Flos 19% (strain made from whole dried female flowers). Results concluded that cannabis therapy in adjunct to analgesic therapy was effective in managing the chronic pain and alleviating some of the psychiatric effects.<sup>7</sup> Bartoli F et al. reviewed the bipolar disorder patient population from various databases (a total of eleven studies) and concluded a weak association between using marijuana and suicidal attempts in this population.<sup>8</sup> A weak association requires more analysis on other aspects of mental health such as suicidal thoughts/attempts and the timeline between recognition of mental health conditions and marijuana use, as mentioned in Turner et al. A recent ED study identified an association between marijuana use and depression and suicidal thoughts.<sup>9</sup> As there are varying results between studies, more research is needed to understand the use of marijuana and its effects on both physical and mental health. The relationship between marijuana and mental health is an important public health issue.

Knowledge of this relationship and dissemination of information may have important effects on marijuana use among those with mental health conditions or among those who may develop them. A better understanding of this relationship will provide more accurate information for counseling regarding marijuana use, making personal choices about marijuana use, and early treatment interventions for substance use and mental health conditions. This prospective study

was undertaken to identify temporal and causal relationships between marijuana use and mental health among Emergency Department patients.

### **Hypothesis/Specific Aims/Research Questions**

The research hypothesis is that marijuana use is associated with mental health conditions in the Emergency Department patient population.

### **Methods**

#### *Context/Protocol*

Eligible subjects were selected from the Miami Valley Hospital Emergency Department and included patients who had used marijuana at any time in their lives. Patients with no marijuana use were excluded from this study. Subjects were identified by the ED EPIC Tracking Board and were approached with the survey while in the ED treatment area. Subject participation did not interfere with medical care or interrupt its delivery. Protected health information was not recorded.

#### *Data Collection*

The study design and survey instrument were developed by a panel of Emergency physicians. An expert panel composed of members of Wright State University Department of Emergency Medicine Research Committee modified the instrument accordingly. The survey instrument was piloted among eligible ED patients and modified for clarity and readability. Data was collected by trained research assistants. Survey questions included the following: When did you first use marijuana? What are the reasons you use marijuana for? How many times have you been treated for any psychiatric or mental health condition (inpatient and outpatient)? Does marijuana use

improve your mental health? Does marijuana use worsen your mental health? A Likert scale was used to assess, “Does marijuana help you with this reason for use?” on a scale of 1-5 with 1 being “No help” and 5 being “Great deal of help”. Participants were invited to speak with an ED Social Worker regarding treatment for addiction or mental health.

### *Data Analysis*

To examine relationships between marijuana use and mental health, Spearman correlation coefficients were used. Differences between remote and current marijuana users were tested with Mann Whitney Wilcoxon tests. Differences among mental health by frequency of marijuana use were tested with Kruskal Wallis tests. P-values less than 0.05 were considered statistically significant. Research questions include marijuana use in last 30 days, age of first use, most recent use to time of survey, reasons for use, effectiveness on reasons for use, previous history of psychiatric care, the presence of anxiety, depression and suicidal thoughts, and whether marijuana use improves or worsens a subject’s mental health. Reasons for marijuana use (% of respondents who select each of the reasons) is the primary outcome measure. We assume the percentage of participants with a specific reason is 50%. In order for a 95% confidence interval to have a  $\pm 10\%$  (e.g., 40% to 60%), a sample size of 96 is needed.

### **Results**

A total of 303 individuals consented to participate out of 352 eligible patients in the Miami Valley ED (86% participation rate). The mean age of participants was 45 years (range 18 to 88). Of these participants, 145 (48%) were males, 158 (52%) were females, 55% were white, and 42% were African American. Age of first marijuana ranged from 6-65 with a median age of 16. Years of serious depression ( $r = -0.08$ ,  $P = 0.16$ ,  $n = 301$ ) and thoughts of suicide ( $r = -0.03$ ,  $P =$

0.65,  $n = 296$ ) were not significantly associated with age of first use, while years of serious anxiety or tension ( $r = -0.11$ ,  $P = 0.05$ ,  $n = 301$ ) was negatively correlated to age of first use. Days of depression in the last 30 days had no correlation to age of first use.

The number of days of marijuana use and the total number of times marijuana was used in the last 30 was variable among participants, with the majority 183 (60.8%) reporting no marijuana use in this time frame. In the last 30 days from the time of the interview, 41 (13.6%) patients used marijuana 1-5 days, 36 (12.0%) used it 6-19 days and 41 (13.6%) used it 20-30 days (the latter including the 32 patients reporting everyday use of marijuana). The majority of participants reported the route of use of marijuana as smoking (98%;  $n = 297$ ), followed by edibles (17%;  $n = 51$ ), and other (2%;  $n = 7$ ). Recreational use (70%;  $n = 211$ ), treating anxiety (30%;  $n = 89$ ), pain (25%;  $n = 74$ ), and depression (17%;  $n = 51$ ) were the most common reasons for marijuana use. Table 1 displays the perceived effectiveness of marijuana on each reason of use.

**Table 1** Perceived efficacy of marijuana

“Does marijuana help you with this reason?”	1: no help (%)	2: little help (%)	3: moderate (%)	4: helps a lot (%)	5: great deal of help (%)
Recreational ( $n = 212$ )	52 (24.5)	11 (5.2)	34 (16.0)	31 (14.6)	84 (39.6)
To treat pain ( $n = 73$ )	3 (4.1)	2 (2.8)	4 (5.5)	18 (24.7)	46 (63.0)
To treat depression ( $n = 53$ )	1 (1.9)	2 (3.8)	2 (3.8)	12 (22.6)	36 (67.9)
To treat anxiety ( $n = 90$ )	1 (1.1)	6 (6.7)	7 (7.8)	14 (15.6)	62 (68.9)
To treat sleep disorder ( $n = 32$ )	1 (3.1)	0 (0)	2 (6.3)	2 (6.3)	27 (84.4)
Other ( $n = 64$ )	1 (1.6)	2 (3.1)	6 (9.4)	8 (12.5)	47 (73.4)



Many participants reported suffering from mental health conditions in the last 30 days, including anxiety (59%; n = 176) in the last 30 days, followed by depression (46%; n = 137), and suicidal thoughts (9%; n = 29). Those who reported more days of anxiety in the last 30 days frequently also reported more marijuana use (median 15.5, compared to 1; P = 0.001). Most participants reported using marijuana prior to the onset of mental health conditions (77%; n = 167) and an earlier age of starting marijuana use was correlated to a greater number of years of anxiety or tension in a lifetime ( $r = -0.11$ ,  $P = 0.05$ ,  $n = 301$ ). Table 2 below displays the comparison of timing of first use with estimated onset of mental health conditions.

**Table 2** Comparison of timing of first marijuana use with estimated onset of mental health condition

	Mental Health Condition		
Comparison of age of first use of marijuana with estimated age mental health issue began	Depression (%)	Anxiety (%)	Suicidal Thoughts (%)
No. of patients with mental health condition (years in lifetime > 0)	216 (71)	218 (72)	124 (41)
Marijuana use started before mental health condition	167 (77.3)	159 (72.9)	113 (91.1)
Mental health condition started before marijuana use	43 (19.9)	52 (23.9)	8 (6.5)
Marijuana use started same year as mental health condition	6 (2.8)	7 (3.2)	3 (2.4)

Participants reported varying perceived effects of their marijuana use. Most reported that marijuana use improved their mental health (62%; n = 163) and a minority reporting their mental health was not improved with marijuana use (37%; n = 98). Table 3 below summarizes free text responses from participants on their perceived effects of marijuana use.

**Table 3** Responses to the question: “Is there a relationship between marijuana use and the way you feel? This may include depression or anxiety. Explain.”

Perceived positive effects of marijuana	n	% <sup>a</sup>	Perceived negative effects of marijuana	n	% <sup>a</sup>
Relaxes/calms me/reduce stress	65	21	Worsens focus/cannot think	11	4
Happiness/feels good	36	12	Worsen anxiety	9	3
Improve anxiety	24	8	Worsen paranoia	4	1
Improve depression	17	6	Worsen depression	3	1
Escape from problems/reality	17	6	Worsen guilt	1	<1

Improves performance/helps me think/focus	11	4			
Increase hunger	9	3			
Get high/intoxication	8	3			
Improve pain	8	3			
Improve sleep	8	3			
Improves sociability	5	2			
No effect	116	38			

Social Services for drug treatment were provided at the end of each survey. Few participants accepted the offer (8%; n = 25).

## Discussion

Marijuana use has increased significantly in the United States due to increased access from medical and recreational legalization.<sup>13</sup> However, it remains poorly understood what consequences accompany increased exposure to the psychoactive compounds found in marijuana. The two highly studied psychoactive components of marijuana are cannabidiol and  $\Delta$ -THC which interact with the endocannabinoid system to elicit these effects.<sup>14</sup> Many studies have addressed marijuana's effect on cognitive function and conclude that its use diminishes verbal learning and memory, impaired attention, and psychomotor function in both acutely and

chronically. More severe deficits appear to be associated with higher frequency and increased THC potency, and it remains uncertain whether an extended period of marijuana use abstinence will recover some or all functions. In one particular study, a 6-point decrease in IQ was observed in those exposed to THC from childhood through midlife as compared to non-marijuana users.<sup>15</sup>

An increased frequency of psychosis and associated behaviors have also been associated with marijuana use. In a large European study, 12% of first case psychosis events across Europe were associated with daily use of high potency marijuana use. Even more so, a 30% and 50% incidence of heavy marijuana-associated psychosis was seen in specific populations of London and Amsterdam. Additionally, a doubling risk of developing psychosis was observed in those who begin using high potency marijuana by 15 years of age.<sup>16</sup>

This study demonstrated a young age of first marijuana use (median age 16, range 6-65) which is of concern as many studies have described marijuana's cognitive and emotional effects in children and adolescents. In a recent meta-analysis study, young adult users of marijuana were found to have increasing rates of major depression and suicidal ideation.<sup>17</sup> Addictions to cocaine and alcohol have also been linked to adolescent marijuana use in many other studies.<sup>18</sup>

Recreational use followed by treatment for anxiety, pain, and depression were the most commonly cited reasons for marijuana use in this study and many participants reported perceived benefit of treatment for these conditions. The physiologic benefit of marijuana use in treating mental health conditions like depression and anxiety has not been extensively studied and there is limited published data on this topic. However, in addition to the physiologic effect, patients may report perceived benefit from marijuana due to its anxiolytic effect, cognitive effect or placebo effect as well.<sup>19-21</sup>

Among participant with mental health conditions, most reported marijuana use began prior to the onset of mental health conditions. In addition, a high incidence of self-reported serious anxiety or tension in the last 30 days (59%) and serious depression (45%) were identified in this study. Another recently published study, likewise, reported that generalized anxiety disorder criteria was met for about 55% of the ED patients.<sup>22</sup> Our study also identified a positive correlation between self-reported days of serious anxiety or tension and days of marijuana use in the last 30 days. Similarly, heavy marijuana users were found to have a higher risk for anxiety disorders in a literature review by Shalit and Lev-Ran.<sup>23</sup> An association between high THC content marijuana use and psychosis, mania and suicide were also identified in a previous study conducted by Sideli et al.<sup>24</sup>

Exacerbations of mental health conditions like schizophrenia, personality, mood, and anxiety disorders due to marijuana use have also been identified in various studies. According to a meta-analysis, individuals with heavy marijuana use and early use were found to have a dose response association with the highest odds of developing a psychotic disorder.<sup>25</sup> However, it remains unclear how exactly marijuana use influences rates of mental health conditions even though associations between high doses of  $\Delta$ 9-THC and anxiety attacks or panic disorders have been reported.

## **Conclusion**

Results may not be generalizable to other setting as this study was conducted at a single institution. The accuracy of the data in this study is dependent on the accuracy of participant self-reports and with this it is possible that participants did not accurately diagnose the onset of mental health conditions. Also, with this study we cannot infer a causal relationship between marijuana use and mental health (with use usually preceding onset of conditions) although we

identified a temporal relationship between the two. Lastly, the relationship of marijuana with incidence of anxiety is unknown even though many patients self-reported anxiety.

In conclusion, marijuana use is prevalent among ED patients. Anxiety, depression and suicidal thoughts are also common in this population. Many participants began using marijuana at an age under 18, and marijuana use frequently preceded the onset of mental health conditions. Parents, children, and adolescents should be educated on the effects marijuana can have on brain development. Future research should aim to better elucidate physiologic mechanism of marijuana and its effects on mental health conditions.

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Marijuana Use and Mental Health among Emergency Department Patients  
Survey Instrument

Good morning/afternoon/evening.

My name is \_\_\_\_\_. I am a research assistant.

We are doing a brief research study about marijuana use and mental health.

We would like to ask you some brief questions to help us understand your history and point of view. Your participation is voluntary, and your health information will be kept confidential. There will be no legal consequences of participating. Participating will not affect your medical care at all. We expect that the study will take about 5 minutes of your time. Are you willing to participate?

Thank you in advance for your time.

**STUDY ID \_\_\_\_\_ (Research assistant initials and consecutive numbers; NO PHI)**

Day of the week:

\_\_\_(1) Sun    \_\_\_(2) Mon

\_\_\_(3) Tues    \_\_\_(4) Wed

\_\_\_(5) Thurs    \_\_\_(6) Fri

\_\_\_(7) Sat

Patient age (years) \_\_\_\_\_ (if 90 or older, enter "90")

Patient gender

\_\_\_(1) Male

\_\_\_(2) Female

Patient ethnicity

\_\_\_(1) African American

\_\_\_(2) Asian

- (3) White
- (4) Hispanic
- (5) Multiracial
- (6) Other \_\_\_\_\_

Mode of Arrival in ED

- (1) Walk-In
- (2) Ambulance

ED Chief Complaint \_\_\_\_\_ (enter free text)

Triage level            1                    2                    3                    4                    5

Patient Survey

1. Have you ever used marijuana? Y N
2. In the last 30 days, how many days have you used marijuana?  
 In the last 30 days, how many times have you used marijuana?
3. In your lifetime, how many years (or fraction of years) have you used marijuana?
4. When did you first use marijuana? (Age)\_\_\_\_\_
5. When was your most recent use of marijuana?  
 (T) Today  
 (Y)Yesterday  
 (W)Within the past week  
 (M)Within the past month  
 (A)1-12 months ago  
 \_\_\_years ago
6. What route do you use marijuana?  
 \_\_\_(S)Smoke  
 \_\_\_(E)Edible (includes food, tea, etc.)  
 \_\_\_ Other\_\_\_\_\_
6. What are the reasons you use marijuana? (select all that apply)  
 \_\_\_(R)recreational  
 \_\_\_(P)to treat pain  
 \_\_\_(D)to treat depression  
 \_\_\_(A)to treat anxiety  
 \_\_\_(S)to treat sleep disorder  
 \_\_\_ other\_\_\_\_\_
7. Does marijuana help you with this reason for use?  
 Please rate on a scale of 1 to 5  
 1                    2                    3                    4                    5  
 No help            Little help           moderate            helps a lot           Great deal of help

recreational

to treat pain

to treat depression

to treat anxiety

to treat sleep disorder

other \_\_\_\_\_

8. Have you used any other street drugs in the past 30 days?

(O) opiates

(C) cocaine

(M) methamphetamine

(B) benzodiazepine

(O) other \_\_\_\_\_

9. How often do you drink alcohol?

(D) daily

(S) socially

(N) never

10. How many times have you been treated for any psychiatric or mental health condition?

\_\_\_ Inpatient

\_\_\_ Outpatient

11. In the last 30 days, how many days have you experienced serious depression?

12. In your lifetime, how many years (or fraction of years) have you experienced serious depression?

13. In the last 30 days, how many days have you experienced serious anxiety or tension?

14. In your lifetime, how many years (or fraction of years) have you experienced serious anxiety or tension?

15. In the last 30 days, how many days have you experienced serious thoughts of suicide?

16. In your lifetime, how many years (or fraction of years) have you experienced serious thoughts of suicide?

Additional questions for patients who use marijuana AND experienced any mental health conditions:

We would like to better understand marijuana use and mental health.

1. Is there a relationship between marijuana use and the way you feel? This may include depression or anxiety. Explain.
  
2. Does marijuana use improve your mental health? (the way you feel)
  
3. Does marijuana use worsen your mental health? (the way you feel)
  
3. Does your mental health cause you to increase or decrease your marijuana use?

ED Diagnosis \_\_\_\_\_

ED Disposition        \_\_\_\_\_    (D)Discharge to home  
   \_\_\_\_\_    (H)Hospital admission  
   \_\_\_\_\_    (P)Admission to psychiatric facility

Do you wish to talk with the ED Social Worker today about treatment for addiction or mental health?

\_\_\_ Yes                    \_\_\_ No

(If yes, please communicate this to the physician caring for the patient)

