Brief Report

Marijuana Use Among Young Adults (18–44 Years of Age) and Risk of Stroke
A Behavioral Risk Factor Surveillance System Survey Analysis

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Background and Purpose—Amidst legalization of therapeutic and recreational use of marijuana/cannabis in the United States, cerebrovascular effects of marijuana use remain largely unknown, especially among young adults. We aimed to examine the association between marijuana use (18–44 years) among young adults and stroke events.

Methods—The study analyzed pooled data from the Behavioral Risk Factor Surveillance System (2016–2017)—a nationally representative cross-sectional survey collected by the Centers for Disease Control and Prevention. Weighted logistic regression models were used to examine an association of recent marijuana use (within the last 30 days) and stroke in young adults (18–44 years) adjusting for patient demographics, risk behavior, and relevant comorbidities.

Results—Overall, 13.6% of participants (n=43 860; weighted 35.5 million; 49.9% men) reported using marijuana recently (in the last month), with 63.3% of them being men. Compared with nonusers, marijuana users were often younger (18–34 years; 73.8% versus 61%), non-Hispanic white or black, and with some college education. Marijuana users were often physically active (81.8% versus 77.5%), heavy drinkers (16.8% versus 4.9%), current combustible cigarette users (37.9% versus 15%) and had lower prevalence of hypertension, diabetes mellitus, and hyperlipidemia as compared with nonusers ($P<0.01$). Young adults with recent marijuana use showed 1.82× higher odds (adjusted odds ratio, 1.82 [95% CI, 1.08–3.10]) of stroke compared with nonusers, which further increased to 2.45× higher (adjusted odds ratio, 2.45 [95% CI, 1.31–4.60]) among frequent marijuana users (>10 days/month). Compared with nonusers, stroke odds were even higher among frequent marijuana users with concomitant combustible cigarette use (adjusted odds ratio, 3.12 [95% CI, 1.40–6.97]) and e-cigarette use (adjusted odds ratio, 2.63 [95% CI, 1.07–6.46]), respectively.

Conclusions—There may be a significantly higher odds of stroke in young marijuana users (18–44 years) as compared with nonusers with even greater odds among frequent users (>10 days/month). (*Stroke*. 2020;51:308-310. DOI: 10.1161/STROKEAHA.119.027828.)

Key Words: cannabis ■ cerebrovascular disorders ■ hypertension ■ stroke ■ young adult

The legalization and decriminalization of marijuana/cannabis use in the United States and the rising popularity of its use among young adults culminate the need to understand the benefits and risk of using marijuana at a younger age.[1] Despite the fact that marijuana is the most widely used illicit drug with fewer adverse effects, recent evidence has suggested an association of marijuana use with cardiovascular and cerebrovascular events.[2–4] It is believed that tetrahydrocannabinol—a principal active ingredient of marijuana—has a dose-dependent effect through its direct interactions with cannabinoid receptors.[5] Considering a paucity of data on the stroke prevalence among young marijuana users, we evaluated the odds of having stroke using a national sample of young (18–44 years) marijuana users controlling relevant risk behaviors.

Methods

We conducted a retrospective analysis using the publicly available Behavioral Risk Factor Surveillance System datasets (2016–2017) to investigate the prevalence of marijuana use and associated stroke prevalence in young adults (18–44 years). Behavioral Risk Factor Surveillance System data are collected using a nationwide cross-sectional survey by the Centers for Disease Control and Prevention, all US states, and participating territories.[6] Data can be accessed at https://www.cdc.gov/brfss/index.html. The study was exempted from the Institutional Review Board approval because it used deidentified secondary data. Study population, selected variables, and definitions are described in Methods in the online-only Data Supplement.

Baseline characteristics were compared across marijuana users (no/yes) using weighted data as recommended by Centers for Disease Control and Prevention (online-only Data Supplement). χ^2 analysis was performed to assess statistically significant correlation among characteristics of marijuana users. Association of marijuana use and frequency of use with stroke were assessed using logistics regressions, adjusted for demographics and comorbid risk factors. Further, marijuana users were stratified by current combustible cigarette and e-cigarette use to assess the additive risk of frequent marijuana use for stroke among young adults. We also performed sensitivity analysis restricting to 2017 data for hypertension and hypercholesterolemia. Data were analyzed using STATA-v16 (StataCorp).

Results

In our study, 13.6% of total young adults (unweighted total n=43 860; 49.9% men) reported past-month use of marijuana. As shown in Table 1, the weighted prevalence of marijuana use was significantly higher among 18 to 24 years old (34.5% versus 25%), male (63.3% versus 47.8%), white (54.5% versus 50.4%), and black (14.6% versus 12.3%) participants compared with nonusers. Marijuana users were more often current combustible cigarette users (37.9% versus 15%), current e-cigarette users (15.5% versus 4.9%), and heavy alcohol drinkers (16.8% versus 4.9%) when compared with nonusers. However, diabetes mellitus, hypertension, and hypercholesterolemia were less frequently observed among marijuana users.

Compared with nonusers, recent marijuana users (within the last 30 days) showed 82% higher odds of stroke (adjusted odds ratio [aOR], 1.82 [95% CI, 1.08–3.10]), which further increased ≤145% (aOR, 2.45 [95% CI, 1.31–4.60]) with frequent recent use of marijuana (>10 days/month). When controlled for hypertension and cholesterol, stroke odds were 3× higher with recent marijuana use (aOR, 3.11 [95% CI, 1.23–7.79]) and 4× higher (aOR, 4.10 [95% CI, 1.22–13.69]) with frequent recent use (>10 days/month; Table 2).

On further risk stratification, frequent marijuana use (>10 days/month) with current combustible cigarette use (aOR, 3.12 [95% CI, 1.40–6.97]) and current e-cigarette use (aOR, 2.63 [95% CI, 1.07–6.46]) showed even higher odds of stroke in young users compared with nonusers (Table I in the online-only Data Supplement). We performed a multicollinearity test to confirm the stability of regression coefficients (Table II in the online-only Data Supplement).

Discussion

Stroke has been reported as a common neurovascular adverse event in young marijuana users.[3,7] However, current literature remains divisive on the stroke risk in young marijuana users.[2,3,8,9] Consistent to findings by Rumalla et al,[3] we found that young marijuana users had higher odds of stroke even after adjusting for concomitant substance use, which is in contrast to other studies showing no association when adjusted for cigarette and alcohol use.[8,9] Our poststratified result showed greater odds of stroke in frequent marijuana use with current combustible cigarette and e-cigarette use. Earlier studies were based on hospital discharge records or inclusive of men-only participants,[3,7,9] whereas our study presented findings from a recent national survey with larger sample size and sampling weights that allow us to approximate the young marijuana users on a national level.

Frequent marijuana users (>10 days/month) in this study had significantly higher odds of stroke. Recent studies reported that heavy and chronic marijuana use can lead to multifocal intracerebral vasospasm, multifocal intracranial stenosis, cardiac embolization, systemic hypotension, altered vasomotor function, and other cerebrovascular dysfunctions, which can increase the stroke risk.[10,11] Increasing marijuana potency by higher tetrahydrocannabinol concentration poses a greater risk of neurological complications, mainly stroke due to its procoagulant effects on platelets.[10,11]

Table 1. Baseline Characteristics in Young Adults (18–44 Years of Age) With Versus Without Marijuana Use

	No (Unweighted, n=39 144)	Yes (Unweighted, n=4716)	
	Weighted ≈30.7 Million (86.4%)	Weighted ≈4.8 Million (13.6%)	*P* Value
Age group, y			<0.01
18–24	25.0 (25.1–26.0)	34.5 (32.0–37.2)	
25–34	36.0 (35.0–36.9)	39.3 (36.7–41.9)	
35–44	39.0 (38.0–39.9)	26.2 (23.7–28.9)	
Men	47.8 (46.8–48.7)	63.3 (60.6–65.9)	<0.01
Race			<0.01
White, non-Hispanic	50.4 (49.4–51.4)	54.4 (51.5–57.1)	
Black, non-Hispanic	12.3 (11.7–12.9)	14.6 (12.8–16.6)	
Hispanic	27.1 (26.1–28.0)	22.0 (19.5–24.7)	
Education			<0.01
Less than high school	13.8 (13.0–14.7)	12.8 (10.7–15.2)	
High school graduate	28.3 (27.4–29.2)	30.3 (27.9–32.9)	
Some college	32.2 (31.3–33.2)	40.5 (37.8–43.3)	
College graduate	25.6 (24.9–26.4)	16.4 (14.8–18.1)	
Income			0.50
<$15k	12.2 (11.5–13.0)	13.1 (11.3–15.2)	
≥$50k	45.9 (44.8–47.0)	44.6 (41.8–47.5)	
Insured	83.1 (82.4–83.8)	81.4 (79.4–83.2)	0.08
BMI			<0.01
Underweight	2.54 (2.15–2.98)	2.77 (2.04–3.74)	
Normal weight	36.0 (35.0–37.0)	47.3 (44.5–50.1)	
Overweight	33.7 (32.7–34.7)	29.7 (27.3–32.3)	
Obese	27.8 (26.9–28.7)	20.2 (18.1–22.5)	
Combustible cigarette use			<0.01
Never	70.6 (69.7–71.4)	43.2 (40.5–46.0)	
Former	14.4 (13.8–15.0)	18.8 (17.0–20.8)	
Current	15.0 (14.4–15.7)	37.9 (35.3–40.6)	
E-cigarette use			<0.01
Never	75.4 (74.6–76.3)	35.0 (32.4–37.7)	
Former	19.7 (18.9–20.5)	49.5 (46.7–52.2)	
Current	4.9 (4.5–5.2)	15.5 (13.6–17.4)	
Have physical activity*	77.5 (76.6–78.3)	81.8 (79.6–83.9)	<0.01
Heavy drink†	4.9 (4.5–5.4)	16.8 (14.7–19.3)	<0.01
Diabetes mellitus	4.9 (4.4–5.4)	2.0 (1.5–2.7)	<0.01
Hypertension (2017)	13.9 (12.9–14.9)	14.3 (11.8–17.3)	0.77
Cholesterol (2017)	16.6 (15.2–17.9)	13.5 (10.6–16.4)	0.07
Stroke	0.8 (0.6–0.9)	1.2 (0.8–1.9)	0.05

Significant *P*<0.05. BMI indicates body mass index.

*Physically active: participated in any physical activity/exercise other than regular job in last month.

†Heavy drinker: men having >14 drinks and women having >7 drinks per wk.

Table 2.   Unadjusted and Adjusted Association Between Marijuana Use and Stroke in Young Adults (18–44 Years of Age)

Marijuana Use	Unadjusted OR (95% CI) n, ≈35.5 Million	aOR* (95% CI), 2016–2017 n, ≈31.3 Million	aOR† (95% CI), 2017 n, ≈13.4 Million
Never users	Referent (1.00)	Referent (1.00)	Referent (1.00)
Current users	1.59 (0.99–2.56)	1.82 (1.08–3.10)‡	3.11 (1.23–7.79)‡
Less frequent§	1.08 (0.51–2.31)	1.08 (0.44–2.66)	1.95 (0.51–7.49)
Frequent‖	2.01 (1.14–3.55)‡	2.45 (1.31–4.60)‡	4.10 (1.22–13.69)‡

aOR indicates adjusted odds ratio; BMI, body mass index; BRFSS, Behavioral Risk Factor Surveillance System; and OR, odds ratio.

*Adjusted model with age, sex, race, education, marital status, BMI, physical activity, combustible cigarette use, e-cigarette use, heavy drinking, and diabetes mellitus.

†Model with BRFSS-2017 data additionally adjusted with hypertension and cholesterol.

‡Significant *P*<0.05.

§Less frequent: ≤10 d/mo.

‖Frequent use: >10 d/mo.

Potential limitations of this study include its cross-sectional nature and retrospective review of the database. Stroke episodes and marijuana use are self-reported, so may include self-reporting bias, and cross-sectional design may limit the causality between marijuana use and stroke. Although usage frequency is available in our study, there may be modulation by strength and type of marijuana, genetic susceptibility or social desirability bias, and polysubstance use along with reported marijuana use. Although information regarding the purpose of marijuana use was limited, we assume that it would have a negligible effect on results with over 86% overlap reported between medicinal and recreational use in the United States.[12] Despite these limitations, Behavioral Risk Factor Surveillance System data offer larger sample size, improved questionnaire design, and interviewing, data collection, and processing methods for the national representation.

Conclusions

There may be a significantly higher odds of stroke in young marijuana users as compared to nonusers with even greater odds among frequent users (>10 days/month). Given the popularity of marijuana use in young adults, strategies to bring issues to light about potential cerebrovascular effects of marijuana and preventive strides to educate the youth for the same are warranted.

Disclosures

None.

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