ORIGINAL ARTICLE

Marijuana Use and Self-reported Quality of Eyesight

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ABSTRACT

Purpose. There is increasing use of marijuana among young adults and more states in the United States are legalizing medical marijuana use. A number of studies have revealed both the beneficial and harmful effects of marijuana to the human system. Despite some beneficial effects, studies have shown marijuana to have a lot of deleterious effects on the visual system, which subsequently reduces the quality of eyesight. The aim of this study was to investigate if heavy marijuana smoking is associated with a poor quality of eyesight compared with light/no use of marijuana.

Methods. The National Longitudinal Survey of Youths (NLSY79), a nationally representative sample of 12,686 young men and women surveyed in 1979 to 2010 was used for this study. The quality of eyesight of 1304 heavy marijuana users was compared with 1304 respondents with light or no marijuana use. The *t* test, multivariate and weighted logistic regression were used in the data analysis.

Results. There was no statistically significant difference in the self-reported quality of eyesight among heavy marijuana smokers compared with youths who never used marijuana or are light marijuana users. Among heavy marijuana smokers, males and high school graduates have decreased odds of reporting a poor quality of eyesight, whereas blacks have increased odds of reporting a poor quality of eyesight.

Conclusions. The self-reported quality of eyesight among marijuana users can aid clinicians and other health practitioners facilitate the development of sex-, racial/ethnic–, and educational level–informed prevention and early intervention programs and also help characterize public opinions regarding cannabis, which are particularly relevant given the ongoing debate concerning the medicalization and legalization of cannabis in the United States.

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Key Words: cannabis, medical marijuana, public health, quality of eyesight, visual function

Marijuana, which contains the mind-altering chemical delta-9-tetrahydrocannabinol, is the most widely used illegal drug in the United States. Marijuana is most commonly used among young adults who now increasingly believe that it is no longer risky.[1] Approximately 147 million people, 2.5% of the world population, consume cannabis (annual prevalence) compared with 0.2% consuming cocaine and 0.2% consuming opiates.[2] As of 2015, 23 states in the United States and the District of Columbia have legalized medical marijuana, with legislation pending in additional nine states.[3] Recreational use of marijuana has been on the increase in the United States, so has the medical use of marijuana. Those in favor of the legalization of marijuana view smoked cannabis as harmless and can improve the quality of life, even though increasing evidence shows that it could lead to addiction and psychosis.[4] State legalization of marijuana has been associated with some economic and social benefits such as tax revenue from marijuana sales, control of crime, decreased costs of the criminal justice system, and reduction in the disproportionate incarceration of minorities for possession of small quantities of marijuana.[5]

Medically, cannabis has been applied to reduce pain associated with multiple sclerosis, chronic noncancer, human immunodeficiency virus neuropathy, and cancer. Marijuana has been shown to be used in neurodegenerative disorders and as an anticonvulsant.[6] Reported consequences of marijuana use on the vision have ranged from distortions in color discrimination, changes in pupil size, reduction in range of accommodation, decreased Snellen acuity, increased sensitivity to light, decreased dark adaptation, and reductions in intraocular pressure.[7] These affected visual functions are essential to maintaining excellent eyesight quality.

This article evaluates whether youths with heavy marijuana use have worse self-reported eyesight at age 40 years than light/never users of marijuana, using the nationally representative sample

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from National Longitudinal Study of Youths. Majority of studies on the effect of marijuana on the eye have been mainly case series and experimental studies. To the best of the author's knowledge, this is the first study using a nationally representative study to ascertain the self-reported quality of eyesight among marijuana smokers.

Previous research by Dawson et al.[7] has shown that the effect of marijuana on the visual function after 10 years of use includes increased basal lacrimation, increased intraocular pressure, increased photosensitivity, decreased dark adaptation, decreased color-match limits, and decreased Snellen acuity. The reported decrease in Snellen visual acuity from marijuana use reported by Dawson et al.[7] was contrary to that of another study, which found no significant change in static visual acuity among participants exposed to two different doses of marijuana compared with the unexposed.[8] Contrary to the report by Dawson et al.[7] that marijuana use resulted in decreased dark adaptation, another study found that marijuana use resulted in an improvement in dark adaptation, therefore improving night vision.[9] Chronic marijuana use, twice a week for at least 2 years, on eye movement control was associated with a significantly prolonged mean sentence reading, mean fixation duration, and initial fixation and refixation duration.[10] Reports from a case series have reported the following visual disturbances to be associated with cannabis use while staring at stationary and moving objects: visual distortions, distorted perception of distance, illusions of movement of stationary and moving objects, color intensification of objects, dimmed color, dimensional distortion, and blending of patterns and objects.[11]

METHODS

Data

The National Longitudinal Survey of Youths (NLSY79) is a nationally representative sample of 12,686 young men and women who were 14 to 22 years old when they were first surveyed in 1979 to 2010. These individuals were interviewed annually through 1994 and are currently interviewed on a biennial basis. These data provide an opportunity to study a large sample that represents American men and women born in the 1950s and 1960s and living in the United States in 1979. The respondents were 47 to 56 years at the time of their 2012 interviews, 6403 males (50%) and 6283 females (50%) in the initial survey. Race/ethnicity (in initial survey) includes non-black/non-Hispanic (7510), black (3174), and Hispanic or Latino (2002). The survey includes detailed questions on child-care cost, welfare receipt, educational attainment, training investments, income and assets, health conditions, workplace injuries, insurance coverage, alcohol, and substance abuse, sexual activity, and marital and fertility histories.[12]

NLSY79 is a public data set, which has been deidentified and does not meet the criteria for human subject research; hence, no review by the institutional review board was required.

Participants

After excluding invalid and missing responses across the outcome, primary predictor, and covariates, the original NLSY79 data were left with a sample of 7726 respondents: heavy marijuana users (treated) representing 1304 respondents and light/no marijuana (control) users representing 6422 respondents. To reduce bias and

potential confounding, matching was performed to eliminate differences in characteristics between both groups. The matching method is described in the analysis section. The treatment group (n = 1304) was watched with the control on age, sex, race, highest education attained (high school graduate and college graduate), and alcohol use.

Measures

Marijuana Use

In 1984, respondents were asked, "In your lifetime, on how many occasions have you ever used marijuana or hashish?" The responses presented were 0 for never used, 1 for 1 to 9 occasions, 2 for 10 to 39 occasions, 3 for 40 to 99 occasions, 4 for 100 to 999 occasions, and 5 for 1000 or more occasions. The responses were coded into heavy marijuana smokers and no/light marijuana smokers. Heavy marijuana smokers were classified as those who reported having ever used marijuana 100 or more times, whereas never/light marijuana smokers as those who reported having used marijuana 0 to 99 times in their lifetime.

Quality of Eyesight

At 40 years of age, respondents were asked to rate the quality of their eyesight (with glasses or contact lenses) on a 5-point scale. The responses to choose from were 1 for excellent, 2 for very good, 3 for good, 4 for fair, and 5 for poor. The quality of eyesight was dichotomized into two groups: good eyesight and poor eyesight. Respondents whose responses were excellent, very good, and good were said to have good eyesight, whereas those whose responses were fair and poor were said to have poor eyesight.

Covariates

The main covariates were sex, age, race/ethnicity, highest grade, and alcohol use. Male was coded 1, and female 0. Age range was from 14 to 22 years. Hispanic was coded 1, black coded 2, and nonblack and non-Hispanic coded 3. Highest grade was broken down into high school graduates and college graduates. High school graduates were coded as those with highest grade greater than 12th grade and college graduates as those with highest grade greater than 16th grade. Alcohol use (had any alcohol in the last month?) was coded as yes for 1 and no for 0.

Statistical Methods

The t test was used to determine the association and statistical significance between the various covariates and the main predictor variable. Multivariate logistic regression was used to predict the predictor from the control variables. Nearest-neighbor matching on propensity score was used in matching the treatment group to the control. The treatment group was matched to the control on age, sex, race, highest education attained, and alcohol use. Matching was done without replacement (replace = F) with a 1:1 ratio (one treated to one control). Weighted logistic regression analyses were conducted to evaluate the association between selected predictors and the odds of reporting a poor quality of eyesight. The predictors selected for this study included marijuana use (heavy vs. light/no use), age, sex, race/ethnicity (black, Hispanic),

TABLE 1.

Characteristics of the respondents by marijuana use

	Before Matching				After Matching			
	Marijuana Use		P	Standardized Differences	Marijuana Use		P	Standardized Differences
Variables	Heavy (n = 1304), %	Light/Never (n = 6422), %			Heavy (n = 1304), %	Light/Never (n = 1304), %		
Mean propensity score	0.21	0.16		0.63	0.21	0.21		0.00
High school graduate	24.8	37.2	≤.0001	−0.29	25.0	25.0	.96	0.00
Alcohol use in past month	85.1	70.7	≤.0001	0.41	85.0	85.0	.96	0.00
Male	69.2	45.9	≤.0001	0.50	69.0	69.0	.93	0.00
Hispanic	15.5	19.7	≤.0001	−0.11	15.0	15.0	>.999	0.00
Age	17.8	17.6	≤.01	0.08	17.8	17.8	.99	0.00
College graduate	1.3	1.5		−0.02	1.0	1.0	.86	0.01
Black	27.4	30.0		−0.06	27.0	27.0	.93	0.00

The propensity score is estimated using a logit of treatment status on high school graduate, ever used alcohol, male, Hispanic, age, college graduate, black.

highest education (high school and college graduate), and alcohol use. The analyses in this study were performed using the R statistical package.[13] Significance level of .05 was used to test statistical significance.

RESULTS

Characteristics of Respondents

The characteristics of the 7726 respondents before and after they were matched are shown in Table 1. In the unmatched group, 1304 respondents (16.9%) were identified as heavy marijuana smokers, whereas 6422 (83.1%) were identified to be light/never marijuana users. Compared with those who are light (or never) marijuana smokers, the heavy marijuana group were more likely to be older, more likely to be males, more likely to be have used alcohol in the last month, and more likely to be nonblack and non-Hispanic. No significant difference was found between heavy marijuana and light/never marijuana users among college graduates and blacks. Of the 1304 heavy marijuana participants, 1304 (100%) were matched to similar light (or no) marijuana users based on the baseline characteristics. No significant difference was found in baseline characteristics between both groups after matching. Balance between the groups after matching can be seen in the standardized differences (Table 1).

Weighted Logistic Regression after Matching

A weighted logistic regression was done using the matched group to predict the outcome (quality of eyesight) from marijuana use (heavy users vs. light/no use) and association with the covariates. The results after matching show that there was no statistically significant difference in the self-reported quality of eyesight among heavy marijuana smokers compared with youths who never used marijuana or are light marijuana users. High school graduates have a 63% decreased odds of reporting a poor quality of eyesight compared with youths who did not graduate from high school (odds ratio, 0.37; 95% confidence interval, 0.24–0.55). Males have a 38% decreased odds of reporting a poor quality of eyesight compared with females (odds ratio, 0.62; 95% confidence interval, 0.47–0.82). Blacks have a 59% increased odds of reporting

a poor eyesight quality compared with nonblacks and non-Hispanic (odds ratio, 1.59; 95% confidence interval, 1.18–2.15). These results can be seen in Table 2, which shows regression results for factors associated with self-reporting of poor eyesight.

DISCUSSION

Results of this study did not show any significant difference in the odds of reporting a poor quality of eyesight among heavy marijuana users compared with light or no users of marijuana. This result was the same before and after matching. Regression results after matching also reveal that high school graduates, males, and blacks were significantly associated with reporting a poor quality of eyesight. From a public health perspective, the results are very vital, especially when targeting individuals at risk of intervention and prevention programs.

There have been conflicting reports in previous studies reporting quality of eyesight in terms of visual acuity among marijuana users. Studies have found decreased Snellen acuity[7] and no significant change in the static visual acuity[8] among marijuana smokers compared with placebo. Another study found an increase in visual acuity after smoking cannabis.[14] The presence of conflicting opinions and results from various studies give an insight into why conflicting voices and opinions exist on the legalization of medical marijuana.

TABLE 2.

Regression results for factors associated with self-reporting of poor eyesight

	After Matching		
	Odds Ratio	95% Confidence Interval	P
Variables			
Heavy marijuana use	1.12	0.86–1.46	
High school graduates	0.37	0.24–0.55	≤.001
Male	0.62	0.47–0.82	≤.001
Black	1.59	1.18–2.15	≤.01
Hispanic	1.43	0.97–2.06	

This study is consistent with another study that reported males to be heavy marijuana users compared with females.[15] This has been attributed to peer influence, marijuana availability, greater stigmatization, and legal consequence of the effect of heavy marijuana use on women.[15]

Results from this study reveal that among heavy marijuana users, high school graduates and males have lower odds of reporting poor eyesight compared with youths without a high school diploma and females, respectively. Blacks were found to have higher odds of reporting poor eyesight compared with nonblacks and non-Hispanics. This is partially corroborated and explained from results in the study that looked at the perceived great risk of regular cannabis use, which showed that participants with a high school education or greater and males had lower odds of reporting perceived great risk of regular use of marijuana compared with no high school diploma and females, respectively, whereas blacks have a higher odds of reporting perceived great risk of regular use of marijuana compared with whites.[16]

A limitation of this study is that quality of eyesight was self-reported, which may be biased because of stigma associated with marijuana use. Respondents are less likely to be open and honest to divulge information with respect to measures relating to drugs (marijuana) and its effect on their health, and this may lead to misreporting the data needed to make appropriate correlation. Nonetheless, a major strength of the present study is the use of a nationally representative sample, allowing for generalization of findings to the US population of men and women 14 to 22 years old. In an attempt to reduce bias and address residual confounding, matching technique was used to adjust for preexisting differences between the heavy marijuana users and light/no users of marijuana.

A possible reason for no significant difference in the self-reported quality of eyesight between heavy and light/no marijuana users could be attributed to the way the study was designed. Probably if the main exposure, marijuana use, was dichotomized into marijuana users and nonusers as opposed to heavy users and light/no users, the result might have been different. This is an area that can be further looked into. Also, the dose-response relationship between marijuana use and self-reported quality of eyesight is another interesting area for future research.

There is an increasing spread across the United States in the legalization of marijuana for recreational and medicinal use, and so more recent studies are encouraged as it pertains to not only the visual system but also every portion of the human system.

Findings regarding the self-reported quality of eyesight among marijuana users can help characterize public opinions regarding cannabis, given that there is a high positive perception about marijuana despite documented proof of its negative health effects, which are particularly relevant, given the ongoing debate concerning the medicalization and legalization of cannabis in the United States. The identified correlates of self-reported quality of eyesight will be helpful to clinicians and public health advocates when determining which groups should be targeted for prevention interventions. Findings from this study may help target populations at risk and also facilitate the development of sex-, racial/ethnic–, and educational level–informed prevention and early intervention programs for adult marijuana use in maintaining good vision quality and health.

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