

Sex Differences in the Association Between Cannabis Use and Suicidal Ideation and Attempts, Depression, and Psychological Distress Among Canadians

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Différences entre les sexes dans l'association entre l'utilisation du cannabis et la détresse psychologique, la dépression et les comportements suicidaires chez les Canadiens

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Abstract

Background: Depression, anxiety, and substance use disorders are leading causes of morbidity worldwide. The most commonly used illicit substance is cannabis and there is some evidence that the association between cannabis use and poor mental health is more pronounced among females compared with males. This analysis examines sex differences in the association between cannabis use and major depressive episode (MDE), suicidal thoughts and attempts, and psychological distress.

Methods: This study uses data from the 2002 and 2012 Canadian Community Health Survey's Mental Health Component, repeated cross-sectional surveys of nationally representative samples of Canadians 15 years of age and older ($n = 43,466$). Linear and binary logistic regressions were performed, applying weighting and bootstrapping.

Results: There were significant sex differences in the strength of the association between cannabis use and suicidal thoughts and attempts and psychological distress, but not MDE. Females who reported using cannabis occasionally (defined as 1 to 4 times a week) reported higher levels of psychological distress than their male counterparts. Females who reported using regularly (defined as more than once per week) reported higher levels of psychological distress and were more likely to report suicidal thoughts and attempts.

Conclusions: Future research is needed to further our understanding of the nature of these sex differences. Public health messaging should incorporate being female as a potential risk factor for the co-occurrence of cannabis use and emotional problems, particularly at higher frequencies of use. Clinicians should also be aware of this association to better inform integrated mental health and substance use screening, discussions, and care, particularly for female patients.

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Contexte : La dépression, l'anxiété, et les troubles d'utilisation de substances sont les principales causes de la morbidité dans le monde entier. La substance illicite la plus communément utilisée est le cannabis et des données probantes laissent croire que l'association entre l'utilisation du cannabis et une mauvaise santé mentale est plus prononcée chez les femmes comparativement aux hommes. Cette analyse examine les différences entre les sexes dans l'association entre l'utilisation du cannabis et l'épisode dépressif majeur (EDM), les pensées et les tentatives de suicide, et la détresse psychologique.

Méthodes : Cette étude utilise des données de l'Enquête sur la santé dans les collectivités canadiennes – Santé mentale de 2002 et 2012, des enquêtes transversales répétées menées auprès d'échantillons représentatifs à l'échelle nationale de Canadiens âgés de 15 ans et plus ($n = 43\,466$). Des régressions logistiques linéaires et binaires ont été exécutées à l'aide de la pondération et de la méthode du bootstrap.

Résultats : Il y avait des différences significatives entre les sexes dans la force de l'association entre l'utilisation du cannabis et les pensées et tentatives de suicide, et la détresse psychologique, mais pas l'EDM. Les femmes qui déclaraient utiliser du cannabis occasionnellement (défini comme étant de 1 à 4 fois par semaine) mentionnaient des degrés plus élevés de détresse psychologique que leurs homologues masculins. Les femmes qui déclaraient utiliser du cannabis régulièrement (défini comme étant plus d'une fois par semaine) mentionnaient des degrés plus élevés de détresse psychologique et étaient plus susceptibles de déclarer des pensées et tentatives de suicide.

Conclusions : Une recherche future est nécessaire pour mieux comprendre la nature de ces différences entre les sexes. Les messages de la santé publique devraient faire état que le sexe féminin est un facteur de risque potentiel de la cooccurrence de l'utilisation du cannabis et des problèmes émotionnels, particulièrement à des fréquences d'utilisation plus élevées. Les cliniciens devraient également être conscients de cette association afin de mieux éclairer le dépistage intégré de la santé mentale et de l'utilisation de substance, les discussions, et les soins, en particulier pour les patientes.

Keywords

cannabis, depression, suicide, psychological distress, sex, gender

Background

The likelihood of experiencing a substance use disorder is doubled among those who experience another mental illness,¹ and weekly cannabis use, or a cannabis use disorder, is almost 10 times as likely in people with v. those without a mental illness.² The imminent changes to recreational cannabis legalization in Canada³ lend importance to examining the current associations between use and symptoms of depression and anxiety in the general population.

A recent study using the 2015 Canadian Tobacco, Alcohol and Drugs Survey (CTADS) and the 2014 General Social Survey (GSS) on Victimization reported much higher rates of mental health disability among females reporting v. not reporting frequent cannabis use (43.0% v. 7.0%) compared with males (11.0% v. 4.0%).⁴ Previous research has consistently demonstrated elevated risk among females for a variety of adverse mental health-related effects associated with regular cannabis use as compared with males.⁵⁻¹³

Cannabis is a plant composed of over 500 different compounds including a class of chemicals called cannabinoids.¹⁴ These cannabinoids act on the body's endocannabinoid system (ECS).¹⁵ The ECS is hypothesized to function differently in males and females^{16,17} and there may be biological differences in the dopamine system (i.e., the number of neurons, density of terminals, and responsiveness of the dopamine system to drugs), which may produce differential biological effects of cannabis use in females as compared with males.¹⁸⁻²⁰ These differential effects are hypothesized to be

due in part to differences in the expression and impact of sex hormones,^{16,21-24} particularly estrogen, on the ECS.¹⁸⁻²⁰

General population studies clearly demonstrate sex differences in the prevalence of substance use disorders and other mental health disorders. Males are more likely to use any substance and have a substance use disorder whereas females experience higher rates of depression and anxiety.²⁵ Females also appear to develop a physiological dependence on substances more quickly,⁵ which is accompanied by higher degrees of subjective craving,²⁶⁻²⁹ greater severity of withdrawal symptoms,³⁰ and are more likely to experience relapse.^{31,32}

Using the 2002 and 2012 Canadian Community Health Survey's Mental Health Components (CCHS-MH), the objectives of this study were to examine the association between recreational cannabis use and past 12-month: i) suicidal thoughts and attempts; ii) major depressive episode (MDE); and iii) psychological distress, and the extent to which these associations were stronger for females compared with males.

Methods

Data

This is a secondary analysis of Statistics Canada data from the 2002 and 2012 CCHS-MH, which are repeated cross-sectional surveys from nationally representative samples of Canadians aged 15 years and older.^{33,34}

Table 1. Results From Stratified Multivariable Regression Analyses Determining the Association Between Frequency of Cannabis Use and Emotional Problems.

Effect	Suicidal thoughts or attempts		MDE		Distress	
	OR (95% CI)		OR (95% CI)		Beta (95% CI)	
	Male	Female	Male	Female	Male	Female
Year (2012 vs. 2002)	0.84 (0.68, 1.04)	0.67* (0.55, 0.81)	1.02 (0.83, 1.24)	0.97 (0.82, 1.15)	-0.24* (-0.45, -0.03)	0.14 (-0.11, 0.39)
Emerging Adulthood (15-24 vs. 25-60)	0.91 (0.70, 1.17)	1.00 (0.82, 1.23)	1.01 (0.79, 1.30)	1.15 (0.97, 1.37)	0.74* (0.50, 0.98)	1.00 (0.71, 1.29)
Rare Cannabis Use	0.79 (0.50, 1.24)	0.70 (0.47, 1.06)	0.77 (0.49, 1.22)	0.80 (0.54, 1.19)	-0.44 (-1.01, 0.14)	-0.86* (-1.70, -0.01)
Occasional Cannabis Use	2.08* (1.39, 3.12)	2.87* (2.08, 3.96)	2.37* (1.64, 3.43)	2.45* (1.79, 3.36)	1.57* (1.14, 2.01)	2.84* (2.15, 3.53)
Regular Cannabis Use	3.04* (2.29, 4.04)	5.00* (3.41, 7.33)	4.16* (3.15, 5.50)	3.67* (2.63, 5.12)	3.22* (2.71, 3.73)	4.65* (3.74, 5.56)

*Significant at $p < 0.05$.

Bold effects represent significant sex differences in the full model with sex-by-cannabis-use interactions at $p < 0.05$.

Variables

Past-year cannabis frequency. Self-reported frequency of past year recreational cannabis use was categorized as: never (reference), rare (less than once a month), occasional (1 to 4 times per month), and regular (more than once a week or every day). Medical use of cannabis was not captured.

Past 12-month MDE. Past 12-month MDE was determined using the World Health Organization World Mental Health Composite International Diagnostic Interview,³⁵ a fully structured, diagnostic interview to assess mental illnesses based on International Classification of Diseases and the Diagnostic and Statistical Manual IV criteria.³⁶ MDE was captured as 0 for “never or not in the past 12 months”, or 1 for “in the past 12 months.”

Psychological distress. The Kessler-10 (K10) is a 10-item self-report questionnaire that measures past-month psychological distress on a Likert scale of 0 for “none of the time” to 4 for “all of the time” for individual items. Scores are summed (0 to 40), with higher scores reflective of greater distress.

Suicidal thoughts and attempts. Suicidal thoughts and attempts were measured using a self-reported questionnaire, which included: Have you thought about committing suicide or taking your own life, and, if so (i.e., second question was conditional on saying yes to the first question), have you attempted suicide or tried to take your own life?¹ Responses were collapsed into 0 for “never or not in the past 12 months” and 1 for “in the past 12 months”.

Biological sex. Biological sex was ascertained by the interviewer and, if necessary, the interviewer asked the participant if they were male or female. Sex was coded as male (0) or female (1).

Age. Self-reported age was grouped into 2 developmental periods: emerging adults (15 to 24 y), and young and middle-aged adults (25 to 60 y), reflecting age discontinuities in the frequency of cannabis use and the biological effects of cannabis use on the brain before the age of 25.³⁷⁻⁴⁰

Analytical Techniques

Data from 2002 and 2012 were pooled for the analysis, with the year of data collection accounted for as a covariate. Individuals over 60 y were excluded because of their infrequent use of cannabis. Among the eligible sample (15 to 60 y), 97.5% had no missing information and became the sample for analysis (observed $n = 43,466$). The mean age was 37.9 y (SD, 0.05 y), with 20% of the cohort classified as emerging adults, 50.1% were female, 5.4% met the criteria for MDE, and 4.3% reported suicidal thoughts or attempts. Among the total sample, 6.0%, 4.1%, and 4.2% endorsed using cannabis rarely, occasionally, and regularly, respectively.

All data analyses were performed at the McMaster Research Data Centre (RDC) using SAS software Version [9.4] (SAS Institute Inc., Cary, NC, USA). Multivariable binary logistic regression analyses were used for suicidal thoughts or attempts and MDE; and linear regression, for psychological distress. The analyses included sampling weights to produce unbiased population effects and statistical bootstrapping to obtain correct standard errors. All analyses were adjusted for survey year and developmental age. Initial analyses were conducted in the full sample to determine the extent to which associations were significantly different for females v. males through the inclusion of interaction terms between biological sex and cannabis frequency. The sample was then stratified by biological sex to produce sex-specific effect estimates. This paper only

presents the results from the stratified models (the results using the full sample are available upon request).

In logistic models, a clinically meaningful result was interpreted as a beta-coefficient of at least ~ 0.37 ($P < 0.05$), which is equivalent to a small effect size, according to Cohen of ~ 0.2 .⁴¹ This translates to an OR of ~ 1.5 and corresponds to a clinically meaningful effect from previous meta-analyses of cannabis use and mental health outcomes.^{42,43} In the absence of a pre-established minimal clinically important difference on the K10 (linear model), we used a 2.5-point change (half a category) in psychological distress when interpreting beta-coefficients.⁴⁴

Results

Table 1 demonstrates a consistent association between occasional and regular cannabis use and all 3 outcomes for males and females. Sex differences were identified in the association between regular cannabis use and suicidal thoughts and attempts and psychological distress. Occasional cannabis use had a stronger association with psychological distress for females compared with males. For MDE, both occasional and regular cannabis use were associated with an increased OR compared to never use; however, there was no evidence of sex differences. Effect estimates associated with regular cannabis use and suicidal thoughts and attempts, MDE, and psychological distress were clinically meaningful at both ends of the CI for both males and females (the results did not differ when age was treated continuously). Estimates for occasional cannabis use were also clinically meaningful for MDE among both males and females, but only among females for suicidal thoughts and attempts.

Conclusions

Associations between cannabis use and suicidal thoughts and attempts and psychological distress were stronger for females as compared with males. There was no evidence of a sex difference in the strength of the association between cannabis use and MDE. These findings are generally consistent with previous Canadian evidence arising from general population surveys also demonstrating a more pronounced association between regular cannabis use and mental health problems among females as compared with males,⁴ and reflects larger effect sizes than previous studies.^{6,7,10} As data are cross-sectional, we are unable to infer causality or directionality. Nevertheless, it is important to acknowledge the clinically relevant associations between cannabis use and suicidal thoughts and behaviors, MDE and distress across both sexes, and the higher likelihood of co-occurrence among females.

Previous studies have also documented an increased susceptibility for alcohol dependence among females with a mental disorder, compared to their male counterpart.⁴⁵ As a result, the authors suggested increased alcohol screening, prevention, and intervention for females presenting with

mental disorders. Our findings suggest these recommendations should be extended to cannabis use. Public health messaging, including the Canadian Lower Risk Cannabis Use Guidelines,⁴⁶ should incorporate being female as a potential risk factor for the co-occurrence of cannabis use and emotional problems, particularly at higher frequencies of use. Some evidence also suggests that reduction in cannabis use is associated with concurrent improvement in symptoms.⁴⁷⁻⁴⁹ A recent systematic review of longitudinal studies of adults with mood or anxiety disorders found cannabis use was associated, in a dose-response fashion, with greater severity and number of symptoms and a lower likelihood of remission at follow-up. This demonstrates that cannabis use may contribute to the clinical course and treatment outcomes for individuals with mood and anxiety disorders.⁵⁰ Best Practice Guidelines suggest mental health and substance use should be assessed, monitored, and treated concurrently and, although research is limited, cognitive behavioural therapy is recommended for the treatment of depression, anxiety, and cannabis-related problems.⁵¹⁻⁵³ Overall, clinicians should also be aware of this association to better inform integrated mental health and substance use screening, discussions, and care, particularly for female patients.

Data Access

Microdata was obtained through the McMaster Research Data Centre. To apply for data access, follow this link: <https://www.statcan.gc.ca/eng/rdc/process>.


Declaration of Conflicting Interests

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Note

- i. These questions were worded slightly differently if the respondent entered the depression module. Statistics Canada collapsed multiple items to create variables for past 12-month suicidal thoughts and a second variable for past 12-month suicide attempts. In 2002, there was an error in the skip pattern and not all respondents were asked suicide-related questions and an imputation strategy was derived to assign values for 12-month thoughts and attempts by Statistics Canada. The Statistics Canada-derived and imputed variables were used in this study.

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