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Retrospective Review of Unintentional Pediatric Cannabis Poisonings in Saskatchewan after Federal Legalization

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Abstract

Background: With the legalization of cannabis in Canada, safety concerns for children should be considered. Despite packaging and dose regulations for edibles and inhaled cannabis, unintentional poisonings are a clinical risk, and its impact on pediatric healthcare resources have not been clearly delineated.

Methods: This retrospective cross-sectional chart review evaluated all patients < 19 years presenting to Saskatchewan's only pediatric trauma center between January 1st, 2020 to June 30th, 2021 with unintentional poisoning. Cannabis and non-cannabis unintentional poisonings were compared using difference of squares and Fisher's exact test.

Results: There were fifty-two unintentional poisonings during the study period, with a mean age of 2.45 years (SD 2.11). Thirty one percent (n=16) were cannabis related, with edibles accounting for at least 63% (n=10) of those admissions. More than 40 percent were transferred from rural communities with an average transport distance of 160 kilometers. Over 18% (n=3) percent were admitted to PICU with no requirement for intubation or vasoactive medications.

Conclusions: Since legalization, one third of Saskatchewan's pediatric unintentional poisonings were due to cannabis, largely from edible ingestions. An increased public awareness and federal government initiatives may attenuate the risk of these ingestions.

Keywords: Cannabis; Children; Poisoning

Abbreviations: COVID-19 Coronavirus disease of 2019; CPR cardiopulmonary resuscitation; NACA National Advisory Committee for Aeronautics; PICU Pediatric Intensive Care Unit; SD standard deviation; THC: delta-9-tetrahydrocannabinol

Introduction

The World Health Organization reports that cannabis is one of the most widely used mind-altering substances [1]. In Canada, recreational cannabis use was legalized by the federal government on October 17th, 2018, and cannabis extracts were legalized for products such as vaping e-cigarettes and edibles on Oct. 17, 2019 [2,3]. To prevent serious poisonings, Canadian regulations require "child-resistant" packaging for edibles (not for plants or seeds), and limit the amount per package of edibles or per unit of inhaled use at 10mg THC (delta-9-tetrahydrocannabinol) [2-4].

A recent Canadian single center retrospective study found a significant difference between cannabis poisoning in the year post legalization and during the COVID-19 pandemic in 2020 [5]. In a cross-sectional study comparing pre and post-legalization, the proportion of hospitalizations after cannabis-related Emergency Department visits was significantly greater after the introduction of edibles [6]. Other reports have suggested that 3-13% of children seen in health care facilities for cannabis poisonings require admission to pediatric intensive care (PICU) [7-10] secondary to hypothermia, bradycardia, hypotension, seizures, respiratory depression, encephalopathy, and coma [10]. These children required intubation and CPR in almost 5% and 0.3% of cases, respectively [10].

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We hypothesized that unintentional cannabis-related poisonings would be prominent since legalization, with edibles being largely responsible.

Materials and Methods

Our retrospective cross-sectional chart review was approved by the University of Saskatchewan's Biomedical Ethics Review Board. It was not possible to involve patients in the design, conduct, reporting or dissemination plans of this research. Patients were identified by an institutional search that included International Classifications of Diseases (ICD-10) codes for unintentional poisonings (X40 to X49), age < 19 years, between January 1st, 2020 to June 30th, 2021, and admission to Saskatchewan's only pediatric trauma center. There were no specific exclusion criteria. After identification, patient demographics, pre-admission NACA (National Advisory Committee for Aeronautics) scores, transport data, hospital management, and outcomes including length of stay were recorded by a single reviewer. Rural was defined as > 20 km from a tertiary center. Quantitative data was summarized as means or proportions were appropriate. Cannabis and non-cannabis unintentional poisonings were compared using differences of squares and Fisher's exact test. Analyses was performed using SPSS Statistics 28 (IBM Corp., Armonk, NY).

Results

Between January 1st, 2020 to June 30th, 2021, fifty-two unintentional poisonings occurred. There were no missing data. The mean age was 2.45 years (SD 2.11), and 51.9% (n=27) were female. Forty six percent (n=24) of the poisonings were rural with a mean transport distance of 197.9 km (SD 126.3), involving private vehicles (n=7; 29.2%), ground ambulance (n=10; 41.7%), fixed wing (n=6; 25%) and helicopter (n=1; 4.2%). Patient's median initial GCS was 9 (IQ 8–11), and mean NACA scores were 4.04 (SD 0.39). Twelve patients required PICU, with a mean duration of 1.5 days (SD 0.65). Average admission duration was 1.42 days (SD 0.97). All were discharged home; there were no deaths.

Sixteen poisonings involved cannabis (30.8%), with edibles (pills, chocolates, cookies, gummies and butter) accounting for at least ten (63%) admissions. Over 40 percent were triaged from rural communities (Table 1), necessitating an average transport distance of 160 kilometres. Nearly twenty percent were admitted to PICU, but none required intubation or vasoactive medications. The non-cannabis poisonings were divided by ICD-10 classification as follows: X40 non-opioid analgesics and antipyretics (n=5; 9.6%), X41 anti-epileptics and sedative-hypnotics (n=10; 19.2%), X42 narcotics and psychedelics (n=7; 13.5%), X43 acting on autonomic nervous system (n=1; 1.9%), X44 unspecified drugs and biologic substances (n=9; 17.3%), X45 alcohol (n=1; 1.9%) and X49 unspecified chemicals and noxious substances (n=3; 5.8%). Differences between cannabis and non-cannabis unintentional poisonings are summarized in (Table 1). Non-cannabis poisonings required significantly longer hospital admissions.

Table 1: Comparison between cannabis and non-cannabis unintentional poisonings.

Variable	Cannabis (n=16)	Noncannabis (n = 36)	p-value
Age, yr[a]	2.72 (2.54)	2.33 (1.41)	0.48
Rural[b]	7 (43.8)	17 (47.2)	1
Distance of rural transport, km[a]	159.4 (164.9)	213.8 (108.8)	0.17
NACA score[a]	3.9 (0.2)	4.1 (0.4)	0.23
PICU Admission[b]	3 (18.8)	9 (25)	0.73
Intubated[b]	0	3 (8.3)	0.54
Vasoactive infusions[b]	0	1 (2.8)	1
Length of PICU admission, days[a]	1.0 (0)	1.7 (0.7)	0.21
Length of hospital admission, days[a]	1.1 (0.4)	1.6 (0.7)	0.005

[a]mean (standard deviation); [b]number (percentage)
NACA: National Advisory Committee for Aeronautics; PICU: pediatric intensive care unit

Discussion

In this retrospective cross-sectional study from admitted patients to a pediatric trauma center, cannabis caused over 30% percent of unintentional poisonings since legalization. Edibles were responsible for nearly two thirds of the poisonings. Although patient outcomes were very favorable and hospital admissions were short, 40% required transport assets and 20% required the PICU for monitoring and observation.

The high proportion of cannabis-related unintentional poisonings may be suggestive of the increased popularity and availability of various forms of edible THC. We likely underreported the incidence of edible cannabis poisonings, as cases were only considered if they were confirmed by caregivers. In four cases, both edibles and non-edibles were potentially accessible to the child, but caregivers were uncertain or unwilling to disclose the source. The remaining two, involved ingestion of hashish and second hand intoxication from cannabis aerosols. The latter case is of peculiar interest, as the legalization of THC extract in vaping products and e-cigarettes with subsequential exposure to secondhand aerosols, may increase unintentional poisonings [11].

Nineteen percent of our patients required a PICU admission, which is similar to previous findings in other pediatric studies [9,10]. However, the incidence of cannabis-related emergencies was lower than reported elsewhere [5-7,9,10], as airway instrumentation, vasoactive medications or CPR were not required. Perhaps these differences can be attributed to differences in THC dosing. For example, a recent French study found rates of PICU admission similar to our study, with the majority of their cases related to resin ingestion [9]. In North America, Canadian restrictions on THC content in edibles is higher than that in several American states. Interestingly, THC dose has not been shown to be related to an increase in severe pediatric cannabis-related poisonings [5,6,9]. However, dose related pediatric encephalopathy is likely a physiological response in children, and future research will be needed.

Despite our favorable patient outcomes and short hospital admissions, the healthcare system and family burden from unintentional cannabis poisonings was not inconsequential. A recent report through the Canadian Centre on Substance Use and Addiction found that inpatient hospitalizations and emer-

gency department visits related to cannabis accounted for over 80 million dollars in 2017 [12,13]. Forty percent of our patients presented to a regional hospital and required ground or fixed winged transport assets for a mean distance of 159 km. All required a short PICU or hospital admission.

Our findings are likely generalisable to other jurisdictions following cannabis legalization and similar legal safe guards. The federal *Cannabis Act* legislates a number of policies regarding the packaging and sale of cannabis products in Canada [2-4]. However, our study queries whether cannabis content restrictions could be made more effective. In Washington for example, each cannabis serving must be individually packaged in child-proof packaging [7]. This measure would help limit the risk of large doses of cannabis ingestions if children accessed a multi-dose package of cannabis-infused cookies or cake as was seen in our data set. Another consideration for cannabis packaging would be to display a large "Not For Kids" logo along with contact information for the local poison control centre on all marijuana products [7]. This type of visual warning is mandated on cannabis products in Washington, and although it may not deter all children from ingestion of cannabis products, it may delay their exploration and ingestion of cannabis products, allowing more time for caregivers to react and respond and prevent a cannabis ingestion from occurring. Other potential options to reduce the risk of child cannabis unintentional poisonings would be to require child-proof solid and opaque containers that would limit children from seeking interest in cannabis products. Mandating a robust visual representation of potential risks of cannabis to children, similar to the warning labels on tobacco packaging would act as a deterrent and support prevention of the risks of unintentional poisonings to children [11].

There are several limitations of our study other than its retrospective design, including the use of admissions data alone in determining cannabis-related unintentional poisonings, likely under-representing the total number of cases in Saskatchewan. Given our data was based solely on admissions to pediatric trauma centers, it likely under-represents the rate of all-comers to emergency departments throughout the province. The relatively small size of our data set was not powered to compare the incidence of cannabis intoxications in 2019, the first year after legalization of edibles, to later years. Future research using longer time periods and including emergency department visits would better capture the incidence of pediatric cannabis unintentional intoxications and frequency of related complications.

Conclusion

Our retrospective study found almost one third of pediatric unintentional poisonings between 2019 to July 2021 were related to cannabis, with most cases being related to edible ingestion. Our findings underline the importance of increased government-mandated safety measures related to the THC content and packaging of cannabis products. Furthermore, enhanced public awareness and government-funded prevention initiatives may stem the tide of unintentional pediatric cannabis poisonings and associated health care costs.

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