Pediatric Edible Cannabis Exposures and Acute Toxicity: 2017–2021

Marit S. Tweet, MD,[a,b] Antonia Nemanich, MD,[b,c] Michael Wahl, MD[b,d]

abstract

OBJECTIVES: This study evaluates trends in pediatric cannabis edible ingestions in children younger than age 6 years with regard to toxicity, medical outcome, and health care utilization for the years 2017–2021.

METHODS: We performed retrospective analysis of the National Poison Data System data for pediatric exposures to edible cannabis products in children <6 years from 2017 to 2021. Data were analyzed quantitatively with a focus on incidence, common clinical effects, medical outcomes, health care utilization, and changes in acute toxicity between the pre-COVID years (2017–2019) to the COVID years (2020–2021).

RESULTS: There were 7043 exposures reported during 2017–2021. In 2017, there were 207 reported cases, and in 2021 there were 3054 cases, an increase of 1375.0%. Most exposures (97.7%) occurred in a residential setting. Seventy percent of cases followed to a known outcome were reported to have central nervous system depression. Of all reported cases, 22.7% of patients were admitted to the hospital. There was a significant increase in both ICU and non-ICU admissions, whereas the number of patients treated and released decreased when comparing the pre-COVID years (2017–2019) to the COVID years (2020–2021) ($P < .05$). Major and moderate effects also significantly increased during the prepandemic years compared with the 2 years during the pandemic ($P < .05$).

CONCLUSIONS: There has been a consistent increase in pediatric edible cannabis exposures over the past 5 years, with the potential for significant toxicity. It is important for providers to be aware of this in their practice and it presents an important opportunity for education and prevention.

[a]Department of Emergency Medicine, Southern Illinois University School of Medicine, Springfield, Illinois; [b]Illinois Poison Center, Chicago, Illinois; [c]Department of Emergency Medicine, Rush University Medical Center, Chicago, Illinois; and [d]Division of Emergency Medicine, NorthShore University HealthSystem, Evanston, Illinois

Dr Wahl conceptualized the study and obtained the data from the National Poison Data System and performed statistical analyses, contributed to the initial manuscript, and reviewed and revised the final manuscript. Dr Tweet abstracted the data and carried out the initial data analysis, contributed to the initial manuscript, and reviewed and revised the final manuscript. Dr Nemanich carried out additional data analysis, contributed to the initial manuscript, and reviewed and revised the final manuscript. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

DOI: https://doi.org/10.1542/peds.2022-057761

Accepted for publication Nov 8, 2022

Address correspondence to Marit S. Tweet, Department of Emergency Medicine, Southern Illinois University School of Medicine, 701 N First St, PO Box 19679, Springfield, IL 62794. E-mail: mtweet35@siumed.edu.

PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

WHAT'S KNOWN ON THIS SUBJECT: Previous published research studies focused on individual states after cannabis legalization have found increases in both calls to regional poison centers and visits to pediatric emergency departments for unintentional cannabis exposures.

WHAT THIS STUDY ADDS: This study provides a view of nationwide trends as opposed to regional trends in pediatric edible cannabis exposures and an update on increasing severity of clinical symptoms and admissions during the pandemic.

To cite: Tweet MS, Nemanich A, Wahl M. Pediatric Edible Cannabis Exposures and Acute Toxicity: 2017–2021. *Pediatrics.* 2023;151(2):e2022057761

Cannabis products have become increasingly available as more states have legalized medical and recreational cannabis. At the beginning of 2017, 30 states and Washington, DC, allowed medical cannabis use and 8 states and Washington, DC, allowed recreational use. By the end of May 2022, 39 states and Washington, DC, allowed medical use and 18 states and Washington, DC, allowed adult recreational use. The number of states allowing adult recreational use has more than doubled in the past 5 years.[1] The population of the United States with access to legal recreational cannabis increased from 68.9 million people in 2017 to 134.4 million people in 2021, a 95% increase according to state and US census data.[2] Multiple studies show increases in unintentional pediatric ingestions of cannabis edibles after legalization. In states with legalized cannabis, regional poison centers have seen an increase in calls regarding exposures[3–7] and in visits to pediatric emergency care centers.[5,6,8,9] Similar trends are reported in other countries, such as Canada, where studies have shown increased numbers of pediatric emergency department (ED) visits related to unintentional ingestions after cannabis legalization.[10,11]

A typical adult starting dose for edible cannabis ranges from 2.5 to 10 mg of Δ9-tetrahydrocannabinol (THC).[12] Edible preparations are particularly appealing to toddlers because they resemble common treats such as candies, chocolates, cookies, or other baked goods. These products often contain multiple doses in 1 package or treat. For example, 1 chocolate bar may contain multiple servings, each of which contains 10 mg of THC. A child would not recognize the need to stop after 1 bite/segment/piece.[13] Given the smaller weight of pediatric patients, a higher milligram/kilogram dose is ingested, which puts children at risk for increased toxicity from these exposures.

This study focuses on unintentional ingestions of edible cannabis products in children aged ≤5 years because they are at increased risk of such ingestions, accounting for 41.6% of all human poison exposures reported in 2020.[14] The purpose of this study is to analyze trends in unintentional pediatric exposures to edible cannabis preparations and the clinical outcomes as the availability of products increases around the country. The changes in clinical effects, health care utilization, and medical outcomes before and during the COVID-19 pandemic were also evaluated in the study.

METHODS

Data Source

This retrospective study analyzes aggregate data obtained from the National Poison Data System (NPDS) data portal. The NPDS is a structured data management and reporting system owned by the American Association of Poison Control Centers (AAPCC) used to track potentially toxic exposures reported to the 55 regional poison control centers (PCCs) that serve the United States and its territories.

Case Selection Criteria

The NPDS portal was queried for the generic code corresponding to edible cannabis cases involving children aged <6 years for the years 2017–2021. The data for these years were finalized and closed by the AAPCC, and although the data for 2021 are preliminary and may have minor changes when the database is finalized at the end of 2022, they are not expected to be material.

General Characteristics Data

The aggregate data for age, sex, clinical symptoms, medical outcomes, management site, caller site, and site of exposure were obtained. There were 7043 cases involving edibles in the 5-year study period for this age group and a general description of volume trends, demographics, and exposure site was performed. χ^2 statistics were performed on the volume of calls over the years to assess for significance of increase in cases, particularly when comparing prepandemic years to pandemic years.

Medical Outcome

The medical outcome categories defined in the NPDS database are no effect, minor effect, moderate effect, and major effect.[15] χ^2 analyses to determine the change in percentage of cases for each medical outcome over the 5-year study period were performed focusing on the difference from prepandemic years to pandemic years.

Disposition

Level of health care facility utilization is defined as admitted to critical care, admitted to noncritical care, treated and released, patient lost to follow-up/left against medical advice, and patient refused referral. Admission to critical care, noncritical care, and treated and released were analyzed quantitatively by year and then the χ^2 test was used to determine if there were significant changes between prepandemic and pandemic years.

Clinical Effects and Therapies

A total of 2216 cases were not followed to a known outcome (eg "lost to follow-up" or "not followed – toxic effects possible") and were excluded from the total of 7043 cases over the 5 years of the study, which left 4827 cases for the evaluation of clinical effects and therapies used. These cases were excluded because the data were incomplete and would not provide an accurate frequency of clinical effects seen after ingestion. For analysis of clinical symptoms, the top 30 clinical effects codes were gathered and presented as percentage of exposures followed to a known outcome. Clinical effects coded as "other-organ system" were removed from the top 30 effects because there is no uniform definition for what falls into these categories. Statistical analyses were performed on various clinical effects spread among the organ systems to determine if there was a difference seen in effects between 2017 and 2019 and 2020 and 2021. In 2019, the codes for decreased mental status (drowsiness/lethargy and coma) were replaced by degrees of central nervous system (CNS) depression (mild, moderate, major). The relevant clinical codes were combined into a single "CNS depression" category to standardize the analysis. Therapies used were analyzed, and the top 20 therapies as a percentage of exposures followed to a known outcome were provided.

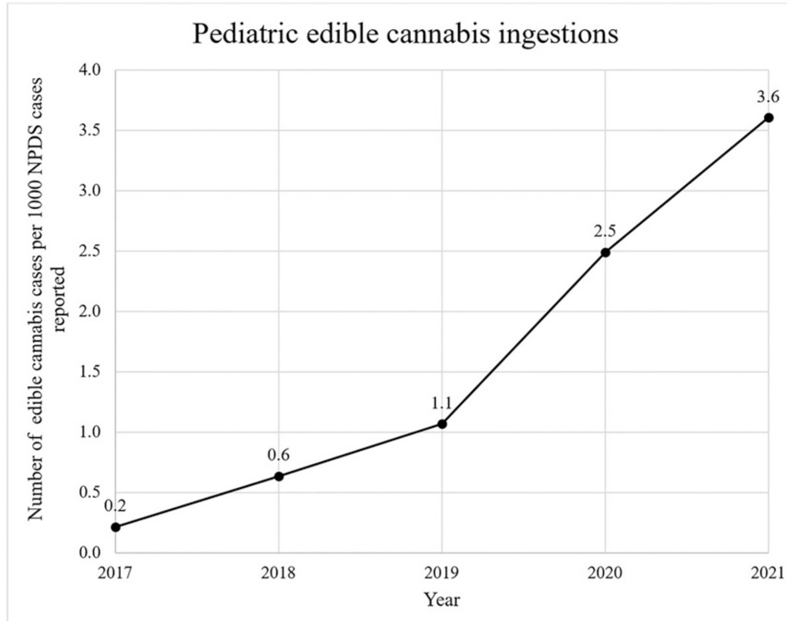

FIGURE 1
Pediatric edible cannabis product ingestions per 1000 pediatric calls to the National Poison Data System by year.

Ethical Considerations

The study was reviewed by our institutional review board and determined to be exempt from institutional review board approval because NPDS data are publicly available and deidentified. This study does not meet the definition of human subjects research.

RESULTS

General Characteristics

There were 7043 cases of pediatric edible cannabis exposures recorded in NPDS during the study period. The number of cases rose from 207 cases in 2017 to 3054 cases in 2021, an increase of 1375.0%. In 2017, pediatric edible cannabis cases accounted for 0.02% of all pediatric exposures, or 0.2 cases per 1000 pediatric NPDS cases, which increased to 0.36%, or 3.6 cases per 1000 pediatric NPDS cases in 2021 ($P < .05$) (Fig 1). Two-year-old patients accounted for the largest number of cases of all ages at 27.7%, followed closely by 3-year-old patients (24.6%). The median age for patients across all 5 years of the study was 3 years old (interquartile range, 2-4).

The most common site of exposure was a residential setting, 6842 cases (97.1%), with 6391 (90.7%) occurring in their own residence. A total 973 cases (13.8%) were managed onsite without referral to a health care facility; 3071 calls (43.6%) originated from a health care facility, whereas 3468 (49.2%) of calls originated from a residential setting. A total of 7.2% originated from other settings (Table 1).

Medical Outcome

There were 155 major effect cases (2.2%) and 1539 moderate effect cases (21.9%) in the 7043 cases. There was an increase in the severity of toxicity when comparing the prepandemic period (2017–2019) and the pandemic years (2020–2021). Major effect increased from 1.6% of cases to 2.4% of cases (50% increase) and moderate effect increased from 15.9% of cases to 23.8% of cases for the pre- to postpandemic periods ($P < .05$). No effect and minor effect accounted for 13.1% and 31.3% of cases, respectively, over the 5 years. When analyzing the pandemic period, minor effect decreased from 33.4% to 30.1% ($P < .05$) and no effect decreased from 17% to 11.8% of cases ($P < .05$). Confirmed nonexposures accounted for 74 cases (1.1%). Not followed, unable to follow, or unrelated effects accounted for a total of 2141 cases (30.4%).

Disposition

Five hundred and seventy-three patients (8.1%) were admitted to critical care units and 1027 (14.6%) were admitted to noncritical care units (Table 2). A total of 2550 patients (36.2%) over the 5 years were treated and released from the ED. Patients who were lost to follow-up, left against medical advice, or did not present to a health care facility against recommendations made up 25.6% of all cases. Other situations, such as managed on site outside of a health care facility, made up the remainder of the 15.4% of cases.

TABLE 1 General Characteristics of all Edible Cannabis Products Cases (2017–2021) (n = 7043)

Characteristics	Number of Cases (%)
Age, y	
<1	136 (1.9)
1-<2	1046 (14.9)
2-<3	1954 (27.7)
3-<4	1734 (24.6)
4-<5	1265 (18.0)
5-<6	891 (12.7)
Unknown but <6	17 (0.2)
Sex	
Female	3450 (49.0)
Male	3495 (49.6)
Unknown	98 (1.4)
Exposure site	
Own residence	6391 (90.7)
Other residence	451 (6.4)
Other/unknown	201 (2.9)
Management site/level of HCF	
Managed on site (non HCF)	973 (13.8)
Patient already in (or enroute to) HCF when PCC called	3405 (48.3)
Patient was referred by PCC to an HCF	2557 (36.3)
Other/unknown	108 (1.5)
Level of HCF	
Admitted to critical care unit	573 (8.1)
Admitted to noncritical care unit	1027 (14.6)
Treated/evaluated and released	2550 (36.2)
Patient refused referral/did not arrive at HCF	625 (8.9)
Lost to follow-up/other	2268 (32.2)
Medical outcome	
Major effect	155 (2.2)
Moderate effect	1539 (21.9)
Minor effect	2211 (31.4)
No effect	923 (13.1)
Confirmed nonexposure	74 (1.1)
Not followed to known outcome	2141 (30.4)
Number of cases per year	
2017	207 (2.9)
2018	590 (8.4)
2019	983 (14.0)
2020	2209 (31.4)
2021	3054 (43.4)

HCF, health care facility; PCC, poison control center.

The frequency of critical care admissions appeared unchanged over the 5-year period, accounting for 8.7% of all cases in 2017 and 9.0% of all cases in 2021. However, when comparing the prepandemic period to the pandemic years, critical care admissions increased from 6.6% to 8.6% for a 30% increase ($P < .05$). The number of cases admitted to a noncritical care unit increased 68.0%, from 9.7% in 2017 to 16.3% in 2021. When comparing prepandemic years to pandemic years, there was a 24% increase for noncritical care admissions from 12.7% to 15.7% of cases ($P < .05$). In 2017, 44.9% of patients were treated and released from the ED; this decreased to 35.9% in 2021. This was similar for the prepandemic and postpandemic evaluation, with 41.2% treated and released from the hospital in the first group versus 34.5% in the latter ($P < .05$).

TABLE 2 Percent of Cases by Disposition for Each Year (n = 7043)

	2017	2018	2019	2020	2021
Admitted to critical care unit	8.7	4.7	7.3	8.2	9.0
Admitted to noncritical care unit	9.7	10.5	12.0	14.9	16.3
Treated/evaluated and released	44.9	42.4	39.7	32.6	35.9
Patient refused referral/did not arrive at HCF	5.8	6.6	8.0	10.3	8.7
Patient lost to follow-up/left AMA	15.0	19.0	16.5	17.0	16.4
Other	15.9	16.8	16.5	17.0	13.7

AMA, against medical advice; HCF, health care facility.

Clinical Effects by Organ System

Neurologic Effects

CNS depression was the most reported clinical effect (Table 3). A total of 3381 cases (70.0%) followed to a known outcome (n = 4827) had some degree of CNS depression. There were 90 cases (1.9%) in which a patient developed more severe CNS effects, including major CNS depression or coma. There was an increase in CNS depression when comparing the pre-COVID years to the 2 pandemic years: 61.6% of cases vs 72.9% ($P < .05$). Multiple other clinical effects were recorded, including ataxia in 359 cases (7.4%), agitation in 342 cases (7.1%), confusion in 294 cases (6.1%), tremor in 98 cases (2.0%), and seizures in 79 cases (1.6%).

Cardiovascular Effects

Tachycardia was seen in 548 cases (11.4%), whereas bradycardia was seen in 68 cases (1.4%). Despite a large percentage of cases presenting with tachycardia, there was no significant change in rates of tachycardia seen from the pre-COVID years to the COVID years: 10.3% to 11.6% ($P > .05$). Hypotension, in 123 cases (2.5%), was more common than hypertension, 43 cases (0.9%).

Gastrointestinal Effects

Vomiting was seen in 458 (9.5%) of 4827 cases and increased significantly from the pre-COVID years to the COVID years, from 7.5% to 10.0% ($P < .05$). Nausea, in 75 cases (1.6%),

TABLE 3 Top 30 Clinical Effects for all Cases Followed to a Known Outcome (n = 4827)

Organ System	Clinical Effects	Number of Cases (%)
Neurologic		
	CNS depression	3381 (70.0)
	Ataxia	359 (7.4)
	Agitation	342 (7.1)
	Confusion	294 (6.1)
	Tremor	98 (2.0)
	Dizziness/vertigo	91 (1.9)
	Seizure (any amount)	79 (1.6)
	Hallucinations/delusions	47 (1.0)
	Slurred speech	45 (0.9)
	Headache	18 (0.4)
Cardiovascular		
	Tachycardia	548 (11.4)
	Hypotension	123 (2.5)
	Bradycardia	68 (1.4)
	Hypertension	43 (0.9)
Gastrointestinal		
	Vomiting	458 (9.5)
	Nausea	75 (1.6)
	Abdominal pain	49 (1.0)
Ocular		
	Mydriasis	284 (5.9)
	Red eye/conjunctivitis	111 (2.3)
	Nystagmus	51 (1.1)
	Miosis	24 (0.5)
Respiratory		
	Respiratory depression	148 (3.1)
	Hyperventilation/tachypnea	30 (0.6)
Other		
	Pallor	65 (1.3)
	Fever/hyperthermia	49 (1.0)
	Acidosis	39 (0.8)
	Muscle weakness	38 (0.8)
	Hypothermia	38 (0.8)
	Urinary retention	35 (0.7)
	Electrolyte abnormality	32 (0.7)

and abdominal pain, in 49 cases (1.0%), were seen less commonly.

Ocular Effects

Mydriasis was seen in 284 cases (5.9%), which was more frequently reported than miosis, which was only seen in 24 cases (0.5%). Conjunctivitis was seen in 111 cases (2.3%). Nystagmus was seen in 51 cases (1.1%).

Respiratory Effects

Respiratory depression was reported in 148 cases (3.1%). Incidence of respiratory depression did not significantly change when comparing prepandemic years with the pandemic years: 2.5% to 3.3% ($P > .05$). Hyperventilation/tachypnea was seen in 30 cases (0.6%).

No deaths were reported during the 5 years included in the study period.

Therapies

Similar to clinical effects, only cases that were followed to a known outcome were included (n = 4827). The most common therapies provided were intravenous fluids (20.7%), dilution/irrigation/washing (10.9%), and food/snack (10.3%). Oxygen therapy was noted in 193 cases (4.0%). Intubation was performed in 35 cases (0.7%), and noninvasive ventilation was rarely used, seen in only 4 cases (0.1%). Naloxone was administered in 68 cases (1.4%), and flumazenil was given to 7 patients (0.2%). Charcoal (single dose) was used in 100 cases (2.1%). The top 20 most used therapies are listed in Table 4. However, this includes 23 distinct therapies because 3 therapies were used an equal amount.

DISCUSSION

Using AAPCC NPDS data, we analyzed unintentional cannabis exposure trends in children aged ≤5 years and determined that these exposures increased substantially (1375%) from 2017 to 2021. This increase occurred in an environment in which overall case volume in the 0 to 5 years of age group to poison centers decreased from 956 871 to 846 296 during the 5-year study period. There has also been a significant increase in the severity of acute toxicity, as indicated by increasing critical care admissions, more patients admitted to noncritical care beds, and fewer patients being treated and released from the ED. Although the specific number of cases

TABLE 4 Top 20 Therapies Used in Cases Followed to a Known Outcome (n = 4827)

Therapies Used	Number of Cases (%)
Fluids, intravenous	997 (20.7)
Dilute/irrigate/wash	525 (10.9)
Food/snack	495 (10.3)
Oxygen	193 (4.0)
Benzodiazepines	107 (2.2)
Charcoal, single dose	100 (2.1)
Antiemetics	97 (2.0)
Other emetic	96 (2.0)
Naloxone	68 (1.4)
Potassium	51 (1.1)
Intubation	35 (0.7)
Ventilator	33 (0.7)
Antibiotics	26 (0.5)
Anticonvulsants	20 (0.4)
Sedation (other)	17 (0.4)
Glucose, >5%	14 (0.3)
Vasopressors	13 (0.3)
Flumazenil	7 (0.1)
Antihistamines	5 (0.1)
Neuromuscular blocker	5 (0.1)
Opioid analgesia	5 (0.1)
Ventilation, noninvasive (CPAP, BiPAP)	4 (0.1)

BiPAP, bilevel positive airway pressure; CPAP, continuous positive airway pressure.

attributed to each state could not be determined by this study, these increases are believed to be associated with more states allowing adult, recreational use of cannabis. This study adds to a growing body of literature highlighting the increasing frequency and potential for acute toxicity of pediatric cannabis ingestions associated with widespread legalization.[3–11]

From 2017 to 2021, the percent of noncritical care admissions increased, whereas the percent of patients treated and released from the ED decreased (Table 2). It is unknown why these changes occurred. Etiologies may include provider comfort with disposition, bed availability during the pandemic, severity of clinical effects, or other factors. It is possible that products contained more THC per package or a larger number of edible products was purchased in the pandemic years of the study. It is also possible that providers became more experienced managing these cases and more comfortable placing less severely symptomatic patients in non-ICU beds. Additionally, it is unclear if fewer patients being treated and released from the ED was due to provider discomfort with discharging these patient or to the increased severity of acute clinical effects seen, such as CNS depression. Multiple factors could be at play between provider preference, increase in acute clinical effects, and an increase in either THC concentrations in products or the amount of product consumed. The COVID-19 pandemic may also have played a role in bed availability and disposition.

Moderate and major effects increased significantly during the last 2 years of the study. The total number of children requiring intubation during the study period was 35, or approximately 1 in 140. Although this was a relatively rare occurrence, it is important for clinicians to be aware that life-threatening sequelae can develop and may necessitate invasive supportive care measures.

The COVID-19 pandemic also may have affected the epidemiology of these ingestions. In the prepandemic years, there were 1780 cases, and for the 2 years during the pandemic, there were 5263 cases, an increase of 295.7%. The biggest increase in cannabis exposures in children aged <6 years happened between 2019 and 2020, which increased from 983 to 2209 exposures (+124.7%). It is possible that COVID-related quarantines and school/daycare closures played a role, with young children having more opportunity for exposure while at home.

Two- and 3-year-old children were at highest risk for cannabis exposure in the <6-year-old age group. They are capable of opening containers and climbing to high spaces to access items of interest. Interestingly, 4- and 5-year-old children accounted for fewer exposures despite having reached more advanced developmental milestones. Children aged <1 year, who have the most limited mobility, made up the smallest portion (1.9%).

Although awareness of pediatric cannabis exposures is growing, much more can be done from a poison prevention standpoint. The American College of Medical Toxicology released a position statement in April 2019 outlining recommendations for changes in packaging as well as suggestions regarding home storage techniques and responsible habits for home cannabis use.[16] Our study shows a continued increase in pediatric cannabis exposures after these guidelines came out and highlights how important it is to increase efforts to educate the public about prevention strategies. Providers in various clinical settings have an important opportunity to educate parents regarding the dangers of such exposures as well as discuss risk mitigation strategies to implement at home.

Because most of these exposures occur in the child's home (90.7%), educating caregivers and other adults in the home on how to safely store their cannabis products could significantly reduce exposures in young children. Ideally, these products should be stored in a location unknown to the children and kept in a locked container. Using locations outside the kitchen, away from other food items, may help reduce the risk of a child viewing these products as normal food items. Adults should be cautioned against using cannabis edibles in front of children because they may be likely to imitate the adult and attempt to ingest these products. Primary care providers can help prevent exposures by incorporating screening questions about cannabis use in the home and counseling caregivers on these practices.[16]

Unlike with tobacco or alcohol products, there are no nationwide laws regarding how cannabis products are packaged. Products continue to be offered in brightly colored, enticing packaging that is identical in style to how candy and snack products are marketed. Not only should cannabis products be placed in child-resistant packaging, but they should be in opaque packages with simple labels. In addition, there should be clear warning labels on the product cautioning against excessive use, and the national poison center phone number should be included on the package. California was the first state to enact these practices into law.[17] Several states now have risk-reduction laws, such as limiting the amount of THC that can be contained within a single package and requiring cannabis products to be sold in opaque packaging. However, noncompliant products may be imported from other states and bypass these regulations.[13]

Our results should be considered in the context of several limitations. Data from the NPDS includes only exposures that were reported to US PCCs. The numbers in our study are an underestimation of the actual number of cannabis exposures in this age group. Also, it is unknown whether other factors such as increased reporting to poison centers or decreased stigma surrounding cannabis use over the course of the study period may have contributed to the observed increase in exposure rates. Finally, the NPDS is compiled of information shared from patients/families and health care personnel; it must then be appropriately coded by poison center staff. Limited information provided and patients lost to follow-up can result in missing data and an incomplete picture of exposures and affect our analysis on adverse events, clinical effects, and outcomes.

CONCLUSIONS

This study demonstrates that unintentional cannabis exposures in young children are increasing rapidly. These exposures can cause significant toxicity and are responsible for an increasing number of hospitalizations. Prioritizing prevention strategies such as changing product packaging and labeling, regulating the maximum allowable dose in a package, and increasing public education on mitigation of household risks are key in reducing these exposures.

ABBREVIATIONS

AAPCC: American Association of Poison Control Centers
AMA: against medical advice
CNS: central nervous system
ED: emergency department
NPDS: National Poison Data System
PCC: poison control center
THC: tetrahydrocannabinol

FUNDING: No external funding.

CONFLICT OF INTEREST DISCLOSURES: The authors have indicated they have no potential conflicts of interest to disclose.

REFERENCES

1. DISA Global Solutions. Map of marijuana legality by state. Available at: https://disa.com/map-of-marijuana-legality-by-state. Accessed November 16, 2022
2. United States Census Bureau. U.S. Census Bureau QuickFacts: United States. Available at: https://www.census.gov/quickfacts/fact/table/US/PST045221. Accessed November 16, 2022
3. Cao D, Srisuma S, Bronstein AC, Hoyte CO. Characterization of edible marijuana product exposures reported to United States poison centers. *Clin Toxicol (Phila)*. 2016;54(9):840–846
4. Thomas AA, Von Derau K, Bradford MC, Moser E, Garrard A, Mazor S. Unintentional pediatric marijuana exposures prior to and after legalization and commercial availability of recreational marijuana in Washington State. *J Emerg Med*. 2019;56(4):398–404
5. Wang GS, Le Lait MC, Deakyne SJ, Bronstein AC, Bajaj L, Roosevelt G. Unintentional pediatric exposures to marijuana in Colorado, 2009-2015. *JAMA Pediatr*. 2016;170(9):e160971
6. Wang GS, Hoyte C, Roosevelt G, Heard K. The continued impact of marijuana legalization on unintentional pediatric exposures in Colorado. *Clin Pediatr (Phila)*. 2019;58(1):114–116
7. Whitehill JM, Harrington C, Lang CJ, Chary M, Bhutta WA, Burns MM. Incidence of pediatric cannabis exposure among children and teenagers aged 0 to 19 years before and after medical marijuana legalization in Massachusetts. *JAMA Netw Open*. 2019;2(8):e199456
8. Wang GS, Davies SD, Halmo LS, Sass A, Mistry RD. Impact of marijuana legalization in Colorado on adolescent emergency and urgent care visits. *J Adolesc Health*. 2018;63(2):239–241
9. Kaczor EE, Mathews B, LaBarge K, Chapman BP, Carreiro S. Cannabis product ingestions in pediatric patients: ranges of exposure, effects, and outcomes. *J Med Toxicol*. 2021;17(4):386–396
10. Cohen N, Galvis Blanco L, Davis A, et al. Pediatric cannabis intoxication trends in the pre and post-legalization era. *Clin Toxicol (Phila)*. 2022;60(1):53–58
11. Yeung MEM, Weaver CG, Hartmann R, Haines-Saah R, Lang E. Emergency department pediatric visits in Alberta for cannabis after legalization. *Pediatrics*. 2021;148(4):e2020045922
12. Steigerwald S, Wong PO, Khorasani A, Keyhani S. The form and content of cannabis products in the United States. *J Gen Intern Med*. 2018;33(9):1426–1428
13. Ompad DC, Snyder KM, Sandh S, et al. Copycat and lookalike edible cannabis product packaging in the United States. *Drug Alcohol Depend*. 2022;235:109409
14. Gummin DD, Mowry JB, Beuhler MC, et al. 2020 Annual Report of the American Association of Poison Control Centers' National Poison Data System (NPDS): 38th Annual Report. *Clin Toxicol (Phila)*. 2021;59(12):1282–1501
15. *National Poison Data System (NPDS) coding users' manual. Version 4.1.* Arlington, VA: American Association of Poison Control Centers; 2019
16. Amirshahi MM, Moss MJ, Smith SW, Nelson LS, Stolbach AI. ACMT Position Statement: addressing pediatric cannabis exposure. *J Med Toxicol*. 2019;15(3):212–214
17. State of California. Department of Cannabis Control. Requirements for cannabis goods. Available at: https://cannabis.ca.gov/licensees/requirements-cannabis-goods/. Accessed November 16, 2022