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COVID-19 and Pediatric Ingestions

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Abbreviations: United States (US); American Association of Poison Control Centers (AAPCC); National Poison Data System (NPDS); Healthcare Facility (HCF); Poison Control Center (PCC); Intensive Care Unit (ICU).

Contributors Statement Page

Drs. Lelak and Sethuraman conceptualized and designed the study, analyzed and interpreted the data, drafted and revised the manuscript and tables for important intellectual content.

Dr. Vohra conceptualized and designed the study, coordinated and supervised data collection, analyzed and interpreted the data, and critically reviewed the manuscript for important intellectual content.

Drs. Neuman and Toce designed the study, analyzed and interpreted the data and revised the manuscript critically for important intellectual content.

Dr. Farooqi conducted data analyses and critically reviewed the manuscript.

All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

Introduction

On March 13, 2020, the United States (US) declared the coronavirus 2019 (COVID-19) outbreak a national emergency.¹ Consequently, the abrupt shift in the school and home dynamics, combined with ensuing psychosocial and economic household stressors, placed children at increased risk of harm.² In particular, early 2020 data indicated an increase in household cleaner and disinfectant exposures.³ However, the impact of the pandemic³ on overall pediatric ingestions is unclear. Our objective was to compare national trends in pediatric ingestions during the pandemic to a similar pre-pandemic period.

Methods

All closed cases of ingestions involving children ≤ 19 years reported to US poison control centers from March 13 - December 31, 2020 (pandemic) were compared to an identical period from 2017 – 2019 (pre-pandemic). A closed case is either one in which the regional poison center determined no further follow-up/recommendations were required or no further information on the case was available.⁴ All US poison control center operations and reporting were consistent across the study period. Aggregate national data was abstracted from the American Association of Poison Control Centers (AAPCC) National Poison Data System (NPDS).⁴ Information requests and animal calls were excluded. Abstracted data included age group, sex, substance ingested, reason, exposure and management site, disposition, and medical outcome. Clinically significant outcomes were defined as a moderate or major effect, or death.⁴ Descriptive statistics were used to describe the study cohorts and categorical variables were compared using the Chi-square test. The significance level was set to an alpha < 0.05 . The study was exempt from review by our Institutional Review Board.

Results

There were 861,626 pediatric ingestions during the pandemic, representing a 6.3% absolute decrease compared to the pre-pandemic years (Figure 1a). The pandemic period had an increase in proportion of teenagers and children ≤ 5 years compared to the pre-pandemic years (Table). There was a relative increase in intentional ingestions accounting for 10.8% of all ingestions during the pandemic period vs 10.3% during the pre-pandemic period (0.5% difference, 95% CI: 0.4%-0.6%, $p < 0.001$) (Table). Further, there was a relative increase in ingestions occurring at home during the pandemic period when compared to the pre-pandemic period (1.9% difference, 95% CI: 1.8%-2.0%, $p < 0.0001$).

Ingestions of hand sanitizers increased by 43% (18,099 vs 12,653, $p < 0.0001$) and melatonin by 70% (44,957 vs 26,431, $p < 0.0001$) during the pandemic period. Additionally, melatonin ingestions supplanted analgesics as the most frequently ingested substance during the pandemic period (Figure 1b). Clinically significant outcomes associated with ingestions increased during the pandemic period (4.2% vs 3.6%, $p < 0.001$). While overall ingestions managed at a healthcare facility decreased by 14.2% during the pandemic, there was an increase in the proportion of adolescents ($p < 0.001$), intentional ingestions ($p < 0.001$) and hospitalizations ($p < 0.001$) (Table).

Discussion

Ingestion-related calls to poison control centers and those subsequently managed at healthcare facilities decreased during the pandemic. The latter is consistent with a report of an overall decrease in pediatric emergency department visits.⁵ This decline may be secondary to a

combination of social restrictions, apprehensions in seeking care at a medical center, and increased parental supervision due to work-from-home advisories.^{5,6} The majority of ingestions occurred at the home, aligning with school and childcare closures during the pandemic.

The increase in clinically significant ingestions observed in our study could be a consequence of misperceptions of healthcare facility safety during the pandemic. This may have subsequently contributed to delays in presentations and potentially worse outcomes.⁶

The increase in the proportions of adolescent and intentional ingestions may reflect heightened social, emotional, and psychological stressors on this age group. Initiatives focusing on implementing support systems for this vulnerable population are warranted. The heightened hand sanitizer and melatonin ingestions parallels the ubiquitous rise in the sale and use of such products during the pandemic and ease of accessibility among children.^{3,7} This demands continued attention given reports of methanol-contaminated hand sanitizer ingestions with severe adverse outcomes.⁸

Limitations include voluntary reporting to poison control centers and reliance on second-hand narratives which may include partially incomplete information. Additionally, drug concentrations are rarely obtained to confirm ingestions. Finally, incomplete coding of the poison control center data may have also skewed ingestion frequencies.

Conclusion

Pediatric ingestion calls to poison control centers decreased during the pandemic. However, there were significant increases in intentional, hand sanitizer and melatonin ingestions and those with clinically significant outcomes. Further studies are required to determine the long-term impact of the pandemic on pediatric ingestions in order to institute appropriate preventive measures and resource allocation.

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Table. Comparison of Pediatric Ingestions During the Pandemic (2020) vs Pre-Pandemic Period (2017-2019)

Characteristic	Year		P value
All Ingestions			
	2017-2019 N =2,757,796 Three-year average N = 919,265 n (%)	2020 N = 861,626 n (%)	
Age, y			<0.001
≤5	712,708 (77.5%)	670,352 (77.8%)	
6 to 12	87,006 (9.5%)	76,403 (8.9%)	
13 to 19	119,551 (13.0%)	114,871 (13.3%)	
Sex			<0.001
Male	470,376 (51.2%)	435,982 (50.6%)	
Female	446,465 (48.6%)	422,762 (49.1%)	
Unknown	2,424 (0.3%)	2,882 (0.3%)	
Reason			<0.001
Unintentional	813,237 (88.5%)	758,422 (88.0%)	
Intentional	94,560 (10.3%)	92,918 (10.8%)	
Other	11,468 (1.2%)	10,286 (1.2%)	
Exposure Site			<0.001
Residence	882,457 (96.0%)	843,935 (97.9%)	
School	17,554 (1.9%)	3,475 (0.4%)	
Other	19,255 (2.1%)	14,216 (1.6%)	
Management Site			<0.001

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Managed on site (non-HCF ^a)	713,205 (77.6%)	687,181 (79.8%)	
Patient already in or en route to HCF when PCC ^b called	146,284 (15.9%)	125,478 (14.6%)	
Patient was referred by PCC to HCF	44,432 (4.8%)	43,642 (5.1%)	
Other	15,344 (1.7%)	5,325 (0.6%)	
Outcome^c			<0.001
No effect	208,499 (22.7%)	186,261 (21.6%)	
Minor effect	86,566 (9.4%)	84,283 (9.8%)	
Clinically Significant	33,187 (3.6%)	35,906 (4.2%)	
Death	69 (0.0%)	81 (0.23%)	
Other	591,013 (64.3%)	555,218 (64.4%)	
Ingestion Managed at a Healthcare Facility			
	2017-2019 N = 438,853	2020 N = 125,478	P value
	Three-year average N = 146,284		
	n (%)	n (%)	
Age, y			<0.001
≤5	62,619 (42.8%)	45,728 (36.4%)	
6 to 12	11,151 (7.6%)	9,980 (8.0%)	
13 to 19	72,515 (49.6%)	69,770 (55.6%)	
Sex			<0.001
Male	59,676 (40.8%)	47,192 (37.6%)	
Female	86,399 (59.1%)	78,106 (62.2%)	

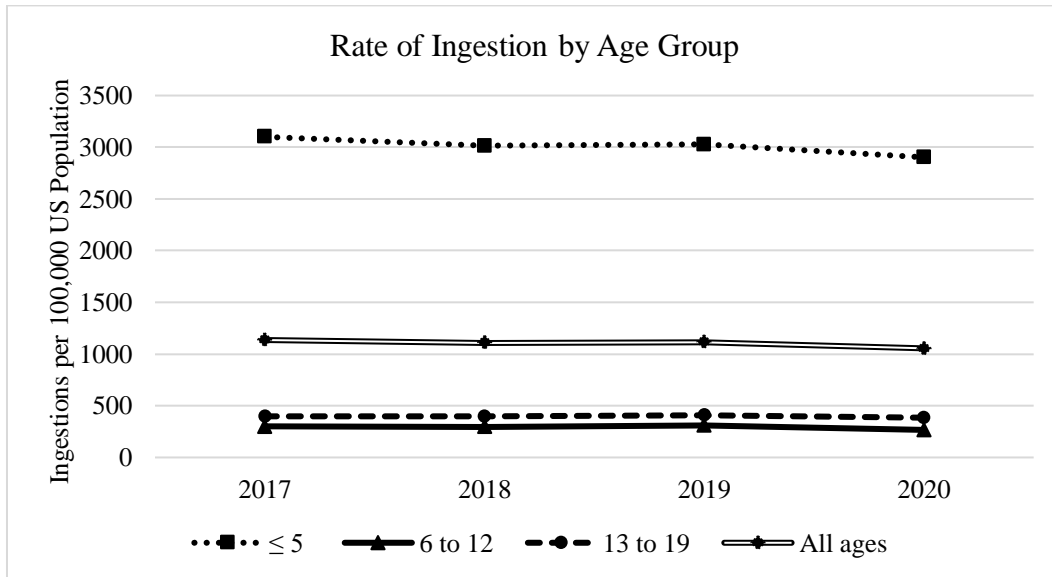
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Unknown	210 (0.1%)	180 (0.1%)	
Reason			<0.001
Unintentional	72,067 (49.3%)	52,714 (42.0%)	
Intentional	70,910 (48.5%)	69,838 (55.7%)	
Other	3,307 (2.3%)	2,926 (2.3%)	
Outcome^c			<0.001
No effect	50,487 (34.5%)	38,966 (31.1%)	
Minor effect	41,986 (28.7%)	38,382 (30.6%)	
Clinically Significant	28,679 (19.6%)	30,365 (24.2%)	
Death	61 (0.0%)	71 (0.23%)	
Other	25,132 (17.2%)	17,765 (14.2%)	
Disposition			<0.001
Hospitalized	54,983 (37.6%)	54,674 (43.6%)	
ICU ^d	15,842 (10.8%)	14,591 (26.7%)	
Treated and Released	85,921 (58.7%)	66,200 (52.8%)	
Other	5,380 (3.7%)	4,604 (3.7%)	

- a. Health care facility (HCF)
- b. Poison Control Center (PCC)
- c. No effect: no signs or symptoms⁴
 Minor effect: minimally bothersome symptoms; self-limited; resolved without intervention (i.e. self-limited gastrointestinal symptoms)⁴
 Clinically significant outcomes include moderate effect or major effect, or death.
 Moderate effect: systemic symptoms requiring intervention; not life-threatening (i.e. brief seizure readily resolved with treatment; high fever)⁴
 Major effect: life threatening symptoms (i.e. status epilepticus, respiratory failure requiring intubation)⁴
 Other: Cases that were not/unable to be followed to a known outcome but judged as likely non-toxic exposures, exposures with minimal clinical effects, or exposure deemed not responsible to the effect.⁴
- d. Intensive Care Unit (ICU)

Figure 1. Pediatric Ingestion Trends 2017-2020

A.



B.

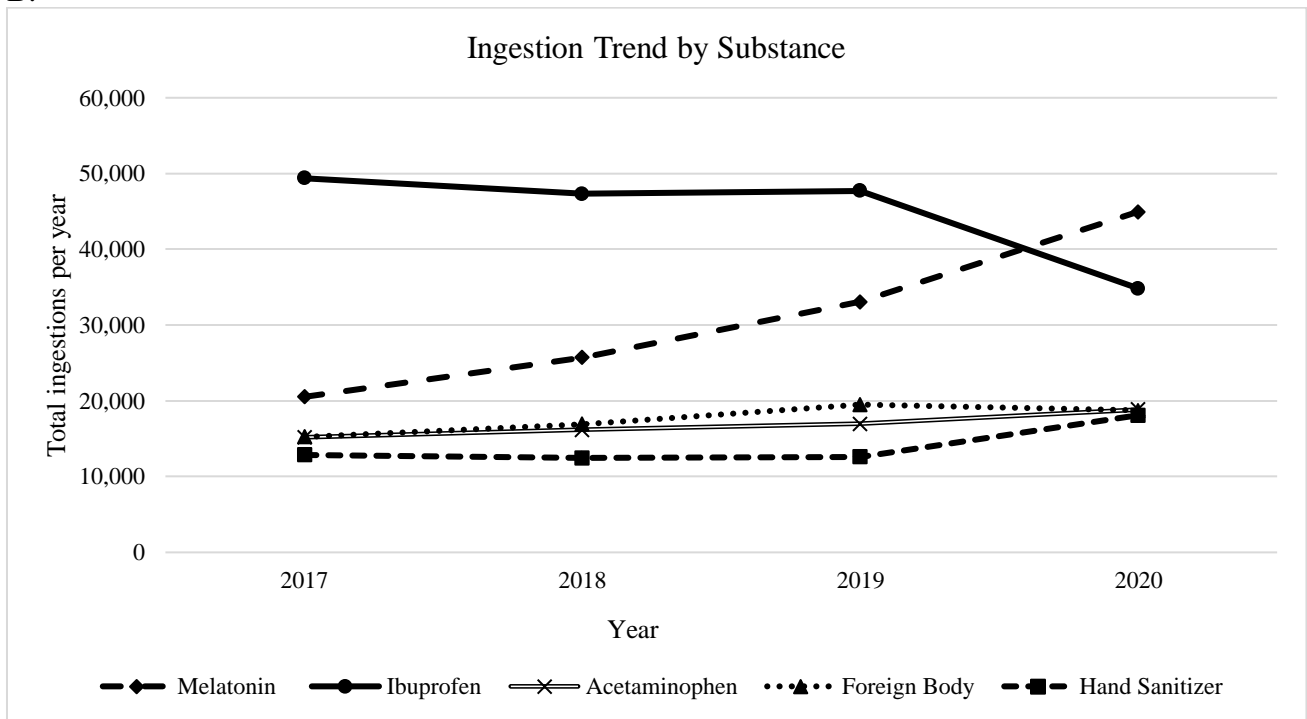


Figure 1. Pediatric Ingestion Trends 2017-2020

A. Rate of ingestion by age group (≤ 5 years, 6 to 12 years, and 13 to 19 years). Population estimates based on United States Census Bureau.
 B. Total yearly ingestions of the most common substances in 2020 (melatonin, ibuprofen, acetaminophen, foreign body, hand sanitizer) compared to three years prior.

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