





ORIGINAL RESEARCH

Intentional paediatric poisoning presentations to emergency departments during the COVID-19 pandemic

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Abstract

Objective: To characterise paediatric poisoning presentations to EDs and determine if the advent of the COVID-19 pandemic was associated with increased intentional paediatric poisoning presentations.

Methods: We performed a retrospective analysis of paediatric poisoning presentations to three EDs (two regional and one metropolitan). Simple and multiple logistic regression analysis were performed to determine the association between

COVID-19 and intentional poisoning events. In addition, we calculated the frequency with which patients reported various psychosocial risk factors as being an implicating factor in engaging in an intentional poisoning event.

Results: A total of 860 poisoning events met inclusion criteria during the study period (January 2018–October 2021), with 501 being intentional, and 359 unintentional. There was an increased proportion of intentional poisoning presentations during the COVID-19 pandemic

Key findings

- Intentional poisoning presentations were more common among children who presented to the EDs studied.
- The proportion of intentional poisoning events increased during COVID-19.
- Intentional poisoning events were associated with the initial COVID-19 lockdown and posed a high burden on the ED.

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(261 intentional and 218 unintentional in the pre-COVID-19 period *vs* 241 intentional and 140 unintentional during the COVID-19 period). In addition, we found a statistically significant association between intentional poisoning presentations and an initial COVID-19 lockdown (adjusted odds ratio 26.32, $P < 0.05$). 'The COVID-19 lockdown' or 'COVID-19' was reported to be implicating factor for psychological stress in patients who presented with intentional poisonings during the COVID-19 pandemic.

Conclusions: Intentional paediatric poisoning presentations increased

during the COVID-19 pandemic in our study population. These results may support an emerging body of evidence that the psychological strain of COVID-19 disproportionately impacts adolescent females.

Key words: COVID-19, intentional, paediatric, pandemic, poisoning.

Introduction

Paediatric poisoning presentations to EDs are influenced by many social factors. These include healthcare access models that determine whether medical review is sought in an ED, those psychological factors that precipitate an intentional poisoning presentation and the social and environmental factors that determine exposure of the paediatric population to toxic substances. Freely accessible poisons information centres (PICs) have been operating in Australia since the 1960s.¹ Utilisation of PICs by the public contributes to a reduction in low acuity paediatric poisoning presentations to Australian EDs.^{1,2}

In the decade before the COVID-19 pandemic, there was a recognised upward trend of mental health presentations to Australian EDs. In New South Wales (NSW), between 2010 and 2014, presentations for suicidal ideation, self-harm or intentional poisoning for patients aged 10–19 years were increasing by 27% each year.³ Intentional poisonings in people aged 5–19 years increased by 98% from 2006 to 2016.⁴ From 2004 to 2017, paracetamol poisoning related hospital admissions in Australia increased from 282/year to 656/year in those aged 10–14 years and increased from 1842/year to 2972/year in those aged 15–19 years.⁵ The role of PICs in reducing low acuity unintentional poisoning presentations to EDs and the upward trend of intentional poisonings involving older children and adolescents are two factors that likely contributed to an Australian tertiary toxicology service reporting in 2019 that 66% of all calls from EDs regarding paediatric poisonings were regarding intentional poisonings.⁶

The COVID-19 pandemic is known to have been associated with an increase in presentations for paediatric

psychiatric conditions, including presentations for suicidal ideation, deliberate self-harm and eating disorders.^{7–10} In Australia, the early days of the COVID-19 pandemic were associated with increased levels of psychological distress across the population.¹¹ As the pandemic continued, levels of distress appeared to be returning to pre-pandemic levels in the broader population; however, they remained elevated in the Australian female adolescent population.¹¹

We sought to provide descriptive data comparing paediatric poisoning presentations that occurred prior to COVID-19 with those presentations that occurred following the advent of COVID-19. We hypothesised that we would observe an increase in intentional poisoning presentations in association with the COVID-19 pandemic and sought to determine if COVID-19 was statistically associated with increased intentional paediatric poisoning presentations. Additionally, we sought to determine what social risk factors patients identified as contributing to their intentional poisoning presentation.

The age group referred to by the term adolescent can vary between studies. For the present study, we defined paediatric as referring to patients aged 0–16 years and defined the adolescent cohort included within this population as those aged 13–16 years.

Methods

This was a retrospective clinical audit of patients aged 0–16 years presenting with poisonings to three EDs, one metropolitan and two regional. The three EDs are in NSW and are not attached to tertiary paediatric facilities. In 2018–2019, there were 103 434 presentations/year to these EDs, of which 19.4% were for patients aged 0–16 years. In 2020–2021, there were 97 698 presentations/year to these EDs, of which 16.6% were for patients aged 0–16 years.

Cases were extracted from the electronic medical record (eMR) if patients were age 0–16 years, and if either the presenting/triage problem or discharge diagnosis included

‘poisoning’, ‘ingestion’, ‘overdose’, ‘bite’, ‘envenomation’ or ‘inhalation’. Extracted data was entered into a preformatted Excel spreadsheet. Data variables included: date of presentation, age, sex, location of event, details of poisoning agent, whether the poisoning was intentional, ED length of stay (LOS), discharge disposition, whether the Poisons Hotline was contacted, triage category, mode of arrival, whether the patient had a prior mental health diagnosis, whether a Home, Education, Activities, Sexuality, Suicidality, Substances (HEADSS) assessment was performed, and the psychosocial risk factors identified on HEADSS assessment.

Data were collected from 1 January 2018 to 31 October 2021 and was divided into two periods: (i) the pre-COVID-19 era (1 January 2018 to 22 March 2020, 812 days) and (ii) the COVID-19 era (23 March 2020 to 31 October 2021, 588 days). The COVID-19 era encompasses the time Australia entered its initial COVID-19 lockdown on 23 March 2020, through to the end of the study period. When conducting regression analysis, we further divided our data within the COVID-19 era into four distinct periods: (i) the initial COVID-19 lockdown (23 March 2020 to 25 May 2020), (ii) the period between COVID-19 lockdowns (26 May 2020 to 25 June 2021), (iii) the second period of NSW COVID-19 lockdown (26 June 2021 to 10 October 2021) and (iv) the period after the second NSW lockdown (11 October 2021 to 31 October 2021).

In addition, we reviewed data from HEADSS assessments to identify social risk factors that were implicated in intentional paediatric poisoning presentations. HEADSS is an acronym for a commonly implemented bedside assessment tool used for the identification of psychosocial risk factors present in an adolescent's life.¹² Topics included in the assessment include home, education, eating, activities/employment, drug use, suicidality, safety and sexuality. Utilisation of this tool is common practice for psychological assessment of an adolescent presenting with an intentional poisoning.

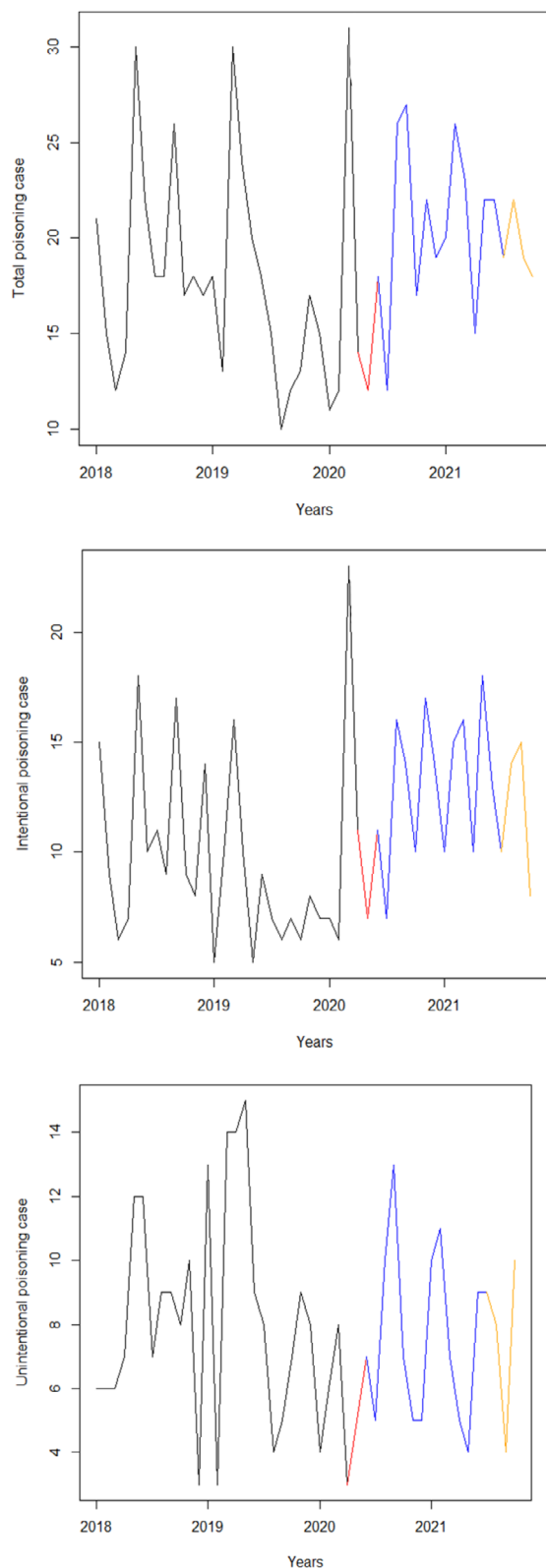


Figure 1. Graphical representation of the frequency with which paediatric poisoning presentations occurred over time. The time periods within the COVID-19 era are highlighted. (—), First lockdown; (—), in-between lockdowns; (—), second lockdown.

We collated those patient responses regarding psychosocial risk factors from HEADSS assessments that were performed by ED staff and documented within the eMR. We calculated the frequency with which each risk factor was reported and reported the top 10 most frequently reported risk factors for each time period.

Categorical data variables were reported as proportions, expressed as a percentage. Continuous data variables were reported as medians. The monthly frequency of poisoning presentations was calculated and presented in time series format. R version 4.1.0 was used for all statistical analyses. A *P*-value of less than 0.05 was considered statistically significant. Simple and multiple logistic regression was used to analyse the binary dependent variable (intentional and unintentional presentations). The multiple logistic regression was explored by stepwise removal of the least statistically significant independent variables to improve the model prediction by observing the Akaike information criterion. Data regarding presentations that occurred after 10 October 2021 were excluded from the logistic regression analysis.

The present study received ethics approval from the Nepean Blue Mountains Local Health District Human Research Ethics Committee (HREC: 2021/ETH00028). A waiver to consent from study participants was granted as part of the ethics approval.

Results

A total of 874 cases were identified in eMR. A total of 14 cases were excluded from the analysis as medical records regarding their presentations were incomplete. A total of 860 presentations met inclusion criteria. The median age of patients was 14 (interquartile range [IQR] 3–15). 501 (58.3%, 95% confidence interval [CI] 54.9–61.6) of the total presentations were for intentional poisoning presentations. A total of 479 presentations (0.59 presentations/day) occurred within the pre-COVID-19 era and 381 (0.65 presentations/day) occurred within the COVID-19 era. The frequency of both total poisoning presentations

TABLE 1. Comparisons between characteristics of paediatric poisoning presentations that occurred in the pre-COVID-19 era and those that occurred in each of the COVID-19 time periods

	Pre-COVID-19 era	Initial COVID-19 lockdown	Period between lockdowns	Second COVID-19 lockdown	Period after second lockdown	COVID-19 era	All presentations
Total presentations, <i>n</i> (%; 95% CI)	479 (55.7%; 52.3–59.1)	30 (3.49%; 2.37–4.94)	269 (31.3%; 28.2–34.5)	70 (8.14%; 6.4–10.2)	12 (1.4%; 0.7–2.4)	381 (44.3%; 41.0–47.7)	860
Age (years), median (IQR)	14 (3–15)	15	14	14	13	14 (4–15)	15 (3–15)
Age, <i>n</i> (%; 95% CI)							
Preschool age (0–4 years)	145 (30.3%; 26.2–34.6)	6 (20%; 7.7–38.6)	67 (24.9%; 19.9–30.5)	20 (28.6%; 18.4–40.6)	5 (41.7%; 15.2–72.3)	98 (25.7%; 21.4–30.4)	243 (28.3%; 25.3–31.4)
Primary school age (5–12 years)	61 (12.7%; 9.9–16.1)	3 (10.0%; 2.1–26.5)	36 (13.4%; 9.6–18.0)	9 (12.9%; 6.1–23.0)	1 (8.3%; 0.2–38.5)	49 (12.9%; 9.7–16.6)	110 (12.8%; 10.6–15.2)
Adolescent/high school age (13–16 years)	273 (57.0%; 52.4–61.5)	21 (70.0%; 50.6–85.3)	166 (61.7%; 55.6–67.6)	41 (58.6%; 46.2–70.2)	6 (50.0%; 21.1–78.9)	234 (61.4%; 56.3–66.3)	507 (59.0%; 55.6–62.3)
Sex (male:female)	1:1.56	1:1.63	1:2.13	1:2.03	1:1.38	1:2.03	1:1.75
Australasian Triage Scale (ATS) category, <i>n</i> (%; 95% CI)							
ATS 1	6 (1.3%; 0.5–2.7)	—	2 (0.7%; 0.1–2.7)	—	—	2 (0.5%; 0.1–1.9)	8 (0.9%; 0.4–1.8)
ATS 2	120 (25.1%; 21.2–29.2)	9 (30%; 14.7–49.4)	87 (32.3%; 26.8–38.3)	22 (31.4%; 20.9–43.6)	4 (33.3%; 9.9–65.1)	122 (32.0%; 27.4–37.0)	242 (28.1%; 25.2–31.3)
ATS 3	240 (50.1%; 45.5–54.7)	15 (50%; 31.3–68.7)	128 (47.6%; 41.5–53.7)	31 (44.3%; 32.4–56.7)	7 (58.3%; 27.7–84.8)	181 (47.5%; 42.4–52.7)	421 (49.0%; 45.6–52.4)
ATS 4	98 (20.5%; 16.9–24.4)	6 (20%; 7.7–38.6)	47 (17.5%; 13.1–22.6)	14 (20.0%; 11.4–31.3)	—	67 (17.6%; 13.9–21.8)	165 (19.1%; 16.6–22.0)
ATS 5	15 (3.1%; 1.8–5.1)	—	5 (1.9%; 0.6–4.3)	3 (4.3%; 0.9–12.0)	1 (8.3%; 0.2–38.5)	9 (2.4%; 1.1–4.4)	24 (2.8%; 1.8–4.1)
Involvement of external emergency services, <i>n</i> (%; 95% CI)							
Arrived by ambulance	176 (36.7%; 32.4–41.2)	13 (43.3%; 25.5–62.6)	106 (39.4%; 33.5–45.5)	26 (37.1%; 25.9–49.5)	6 (50.0%; 21.1–78.9)	151 (39.6%; 34.7–44.7)	327 (38.0%; 34.8–41.4)
Police involved	2 (0.4%; 0.1–1.5)	—	4 (1.5%; 0.4–3.8)	2 (2.9%; 0.3–9.9)	—	6 (1.6%; 0.6–3.4)	8 (0.9%; 0.4–1.8)
Location of poisoning, <i>n</i> (%; 95% CI)							
Home	321 (67.0%; 62.6–71.2)	23 (76.7%; 57.7–90.1)	192 (71.4%; 65.6–76.7)	58 (82.9%; 72.0–90.8)	7 (58.3%; 27.7–84.8)	280 (73.5%; 68.8–77.9)	601 (69.9%; 66.7–72.9)
Non-home residential	40 (8.4%; 6.0–11.2)	—	15 (5.6%; 3.2–9.0)	—	4 (33.3%; 9.9–65.1)	24 (6.3%; 4.1–9.2)	64 (7.4%; 5.8–9.4)
Outdoors	31 (6.5%; 4.4–9.1)	2 (6.7%; 0.8–22.1)	15 (5.6%; 3.2–9.0)	2 (2.9%; 0.4–9.9)	—	19 (5.0%; 3.0–7.7)	50 (5.8%; 4.4–7.6)
School/day-care	31 (6.5%; 4.4–9.1)	2 (6.7%; 0.8–22.1)	11 (4.1%; 2.1–7.2)	10 (14.3%; 7.1–24.7)	1 (8.3%; 0.2–38.5)	19 (5.0%; 3.0–7.7)	50 (5.8%; 4.4–7.6)
Other	4 (0.8%; 0.2–2.1)	—	8 (3.0%; 1.3–5.8)	—	—	8 (2.1%; 0.9–4.1)	12 (1.4%; 0.7–2.4)
Unknown	52 (10.9%; 8.2–14.0)	3 (10.0%; 2.1–26.5)	28 (10.4%; 7.0–14.7)	—	—	31 (8.1%; 5.6–11.4)	83 (9.7%; 7.8–11.8)
Type of poisoning, <i>n</i> (%; 95% CI)							
Ingestion	424 (88.5%; 85.3–91.2)	27 (90.0%; 73.5–97.9)	249 (92.6%; 88.8–95.4)	64 (91.4%; 82.3–96.8)	11 (91.7%; 61.5–99.8)	351 (92.1%; 89.0–94.6)	775 (90.1%; 87.9–92.0)
Pharmaceutical	308 (64.3%; 59.8–68.6)	21 (70.0%; 50.6–85.3)	186 (69.1%; 63.3–74.6)	42 (60.0%; 47.6–71.5)	7 (58.3%; 27.7–84.8)	256 (67.2%; 62.2–71.9)	564 (65.6%; 62.3–68.8)
Non-pharmaceutical	116 (24.2%; 20.5–28.3)	6 (20.0%; 7.7–38.6)	63 (23.4%; 18.5–29.0)	22 (31.4%; 20.9–43.6)	4 (33.3%; 9.9–65.1)	95 (24.9%; 20.7–29.6)	211 (24.5%; 21.7–27.6)

(Continues)

TABLE 1. Continued

	Pre-COVID-19 era	Initial COVID-19 lockdown	Period between lockdowns	Second COVID-19 lockdown	Period after second lockdown	COVID-19 era	All presentations
Inhalation	13 (2.7%; 1.5–4.6)	1 (3.3%; 0.1–17.2)	7 (2.6%; 1.1–5.3)	5 (7.1%; 2.4–15.9)	1 (8.3%; 0.2–38.5)	14 (3.7%; 2.0–6.1)	27 (3.1%; 2.1–4.5)
Envenomation	39 (8.1%; 5.9–11.0)	2 (6.7%; 0.8–22.1)	10 (3.7%; 1.8–6.7)	1 (1.4%; 0.1–7.7)	—	13 (3.4%; 1.8–5.8)	52 (6.1%; 4.6–7.9)
Other (eg. topical or injection)	3 (0.6%; 0.1–1.8)	—	3 (1.1%; 0.2–3.2)	—	—	3 (0.8%; 0.2–2.3)	6 (0.7%; 0.3–1.5)
Top three most ingested agents	Polypharmacy (22.5%)	Polypharmacy (30%)	Analgesic (20.4%)	Analgesic (25.7%)	Other medication (33.3%)	Analgesic (20.7%)	Polypharmacy (20.1%)
	Analgesic (15.5%)	Recreational substance (20%)	Polypharmacy (18.2%)	Household substance (18.6%)	Recreational substance (25%)	Polypharmacy (17.1%)	Analgesic (18.5%)
	Household substance (14.8%)	Analgesic (16.7%)	Recreational substance (14.9%)	Other medication (15.7%)	Anipsychotic (16.7%)	Recreational substance (15.5%)	Household substance (13.5%)
Intentional poisonings, <i>n</i> (%; 95% CI)	260 (54.3%; 49.7–58.8)	22 (73.3%; 54.1–87.7)	170 (63.2%; 57.1–69.0)	43 (61.4%; 49.0–72.8)	6 (50%; 21.1–78.9)	241 (63.3%; 58.2–68.1)	501 (58.3%; 54.9–61.6)
Pre-existing mental health diagnosis, <i>n</i> (%; 95% CI)							
All patients	146 (30.5%; 26.4–34.8)	13 (43.3%; 25.5–62.6)	104 (38.7%; 32.8–44.8)	24 (34.3%; 23.4–46.6)	3 (25.0%; 5.5–57.2)	144 (37.8%; 32.9–42.9)	290 (33.7%; 30.6–37.0)
Intentional poisoning	142 (54.6%; 48.4–60.8)	13 (59.1%; 36.4–79.3)	99 (58.2%; 50.4–65.7)	23 (53.5%; 37.7–68.8)	3 (50.0%; 11.8–88.2)	139 (57.8%; 51.2–64.0)	281 (56.1%; 51.6–60.5)
Duration of stay in ED							
Duration of stay (min), median (IQR)	221 (130.5–370.5)	280 (43–1580)	238 (23–9936)	338 (936–2714)	238 (44–448)	257 (144.25–441.75)	231 (138–405.8)
Departed within 4 h of presentation	54.8%	45.2%	50.7%	44.3%	58.3%	48.6%	52.3%
Duration of stay by discharge destination, min (IQR)							
Discharged home	222 (126–357)	313 (161–574)	219 (135–399)	251 (153–466)	238 (157–349)	232 (138–407)	226 (129–391)
Did not wait for treatment	128 (57–221)	—	211 (87–277)	331 (187–475)	322 (322–322)	219 (84–294)	167 (73–248)
Admitted							
Inpatient ward	198 (164–309)	189 (187–192)	220 (120–364)	332 (332–332)	—	207 (127–334)	198 (152–334)
ICU	164 (129–324)	—	188 (134–304)	486 (423–549)	—	296 (167–482)	190 (131–406)
ED short stay	310 (207–495)	264 (214–273)	291 (189–464)	549 (309–650)	44 (44–44)	269 (192–485)	288 (203–490)
Mental health facility	539 (368–728)	—	585 (402–1065)	1513 (1235–2413)	—	759 (425–1240)	649 (382–1191)
Transferred							
PICU	207 (184–228)	—	338 (338–338)	—	—	338 (338–338)	212 (202–274)
Other	148 (121–185)	—	830 (486–899)	—	—	830 (486–899)	185 (144–678)

TABLE 1. Continued

	Pre-COVID-19 era	Initial COVID-19 lockdown	Period between lockdowns	Second COVID-19 lockdown	Period after second lockdown	COVID-19 era	All presentations
Admission/discharge status, n (%; 95% CI)							
Discharged home	335 (69.9%; 65.6–74.0)	23 (76.7%; 57.7–90.1)	180 (66.9%; 60.9–72.5)	57 (81.4%; 70.3–89.7)	10 (83.3%; 51.6–97.9)	270 (70.9%; 66.0–75.4)	605 (70.3%; 67.2–73.4)
Did not wait for treatment	25 (5.2%; 3.4–7.6)	2 (6.7%; 0.8–22.1)	19 (7.1%; 4.3–10.8)	2 (2.9%; 0.4–9.9)	1 (8.3%; 0.2–38.5)	22 (5.8%; 3.7–8.6)	47 (5.5%; 4.0–7.2)
Admitted							
Inpatient ward	44 (9.2%; 6.8–12.1)	—	19 (7.1%; 4.3–10.8)	1 (1.4%; 0.1–7.7)	—	22 (5.8%; 3.7–8.6)	66 (7.7%; 6.0–9.7)
ICU	10 (2.1%; 1.0–3.8)	—	4 (1.5%; 0.4–3.8)	2 (2.9%; 0.4–9.9)	—	6 (1.6%; 0.6–3.4)	16 (1.9%; 1.1–3.0)
ED short stay	40 (8.4%; 6.0–11.2)	5 (16.7%; 5.6–34.7)	27 (10.0%; 6.7–14.3)	3 (4.3%; 0.9–12.0)	1 (8.3%; 0.2–38.5)	36 (9.4%; 6.7–12.8)	76 (8.8%; 7.0–10.9)
Mental health facility	18 (3.8%; 2.2–5.9)	—	16 (5.9%; 3.4–9.5)	5 (7.1%; 2.4–15.9)	—	21 (5.5%; 3.4–8.3)	39 (4.5%; 3.2–6.2)
Transferred							
PICU	4 (0.8%; 0.2–2.1)	—	1 (0.4%; 0.1–2.1)	—	—	1 (0.3%; 0.1–1.5)	5 (0.6%; 0.2–1.4)
Other	3 (0.6%; 0.1–1.8)	—	3 (1.1%; 0.2–3.2)	—	—	3 (0.8%; 0.2–2.3)	6 (0.7%; 0.3–1.5)
Poisons Information line accessed, n (%; 95% CI)	172 (35.9%; 31.6–40.4)	9 (30.0%; 14.7–49.4)	96 (35.7%; 30.0–41.7)	28 (40.0%; 28.5–52.4)	2 (16.7%; 2.1–48.4)	135 (35.4%; 30.6–40.5)	307 (35.7%; 32.5–39.0)

CI, confidence interval; IQR, interquartile range; PICU, paediatric intensive care unit.

and intentional poisoning presentations was at its lowest in the last 6 months of 2019, before trending upwards from early 2020 onwards (Fig. 1). The mortality rate throughout the study period was 0%.

The median LOS in the ED was longer during the COVID-19 era (257 min, IQR 144–442) than during the pre-COVID-19 era (221 min, IQR 131–371).

During the COVID-19 era there was an increase in the proportion of intentional poisoning events (63.3%, 95% CI 58.2–68.1 vs 54.3%, 95% CI 49.7–58.8) (Table 1). There were also increases in presentations that were triaged as Australasian Triage Scale (ATS) 3 or higher (80%, 95% CI 75.7–84.0 vs 76.4%, 95% CI 72.4–80.1), presentations that arrived by ambulance (39.6%, 95% CI 34.7–44.7 vs 36.7%, 95% CI 32.4–41.2) and presentations that were brought to the ED by police (1.6%, 95% CI 0.6–3.4 vs 0.4%, 95% CI 0.1–1.5). Admissions to the ED short stay unit or to a mental health facility also increased.

During the COVID-19 era, there was an increased proportion of intentional poisoning presentations in which the patient involved in the intentional poisoning had a previous mental health diagnosis (57.9%, 95% CI 51.2–64.0 vs 54.6%, 95% CI 48.4–60.8). This increase was most pronounced during the initial COVID-19 lockdown (59.1%, 95% CI 36.4–79.3) and remained during the period between COVID-19 lockdowns (58.2%, 95% CI 50.4–65.7) but was not present during the second COVID-19 lockdown (53.5%, 95% CI 37.7–68.8).

Regression analysis demonstrated statistically significant associations between intentional poisoning presentations and increased age, female sex and having a previous mental health diagnosis (Table 2). We found a statistically significant association between intentional poisoning presentations and the initial COVID-19 lockdown (AOR 26.316, $P = 0.01363$, 95% CI 1.87–333.3) (Table 2).

The ‘current COVID-19 lockdown’ was among the top three most frequently reported social risk factors

TABLE 2. Characteristics of intentional and unintentional poisoning presentations†

Characteristics	Intentional, n (%)	Unintentional, n (%)	Unadjusted			Adjusted		
			P-value	OR	95% CI	P-value	AOR	95% CI
Total study participants	501	359						
COVID-19 time period								
Pre-COVID-19	261 (52.1)	218 (60.7)	Ref			Ref		
Initial COVID-19 lockdown	22 (4.4)	8 (2.2)	<0.05	1.18	1.17–6.17	<0.05	26.32	1.87–333.3
Period between lockdowns	170 (33.9)	99 (27.6)	<0.05	1.45	1.07–1.97	0.14	2.00	0.81–5.29
Second COVID-19 lockdown	43 (8.6)	27 (7.5)	0.18	1.41	0.85–2.38	0.27	2.56	0.55–15.39
Period after lockdowns	6 (1.2)	6 (1.7)	NA	NA	NA	NA	NA	NA
Age								
Increased age			<0.001	1.96	1.75–2.17	<0.001	1.78	1.59–2.06
Sex								
Male	122 (24.4)	189 (52.6)	Ref			Ref		
Female	379 (75.6)	170 (47.4)	<0.01	3.39	2.74–4.55	<0.05	2.73	1.21–6.37
Agent involved in poisoning								
Analgesic	121 (24.2)	38 (10.6)	Ref			Ref		
Alpha-agonist	9 (1.8)	18 (5.0)	<0.001	0.16	0.06–0.37	<0.05	0.09	0.01–0.56
Antipsychotic	13 (2.6)	6 (1.7)	0.63	0.76	0.26–2.51	0.90	1.32	0.04–66.67
Stimulant	4 (0.8)	5 (1.4)	<0.05	0.25	0.06–1.00	0.41	0.36	0.29–3.76
Sedative (including benzodiazepines)	13 (2.6)	4 (1.1)	0.96	1.03	0.34–3.82	0.59	2.21	0.16–50.0
Serotonergic	40 (8.0)	5 (1.4)	0.07	2.53	1.01–7.74	0.43	2.65	0.29–32.26
Polypharmacy	148 (29.5)	25 (7.0)	<0.05	1.87	1.08–3.31	0.71	1.30	0.33–5.44
Tricyclic	3 (0.6)	2 (0.6)	0.42	0.48	0.08–1.00	0.42	0.28	0.17–6.71
Other medications	37 (7.4)	73 (20.3)	<0.001	0.16	0.09–0.28	0.37	0.53	0.14–2.11
Household substances	18 (3.6)	98 (27.3)	<0.001	0.06	0.03–0.12	0.15	0.33	0.07–1.49
Recreational	91 (18.2)	14 (3.9)	<0.05	2.01	1.05–4.05	0.99	0.99	0.25–3.89
Smoke inhalation	0 (0)	11 (3.1)	0.99	<0.01	NA	0.99	<0.001	<0.001–>1000
Spider	0 (0)	39 (10.9)	0.98	<0.01	<0.01– < 0.01	0.99	<0.001	<0.001–>1000
Snake	0 (0)	11 (3.1)	0.98	<0.01	NA	0.99	<0.001	<0.001–>1000
Mushroom	4 (0.8)	5 (1.4)	<0.05	0.25	0.06–1.00	0.67	2.01	0.10–50.0
Fauna	0 (0)	5 (1.4)	0.99	<0.01	NA	1.00	<0.001	<0.001–>1000
Pre-existing mental health diagnosis								
Yes	280 (55.9)	10 (2.8)	Ref			Ref		
No	221 (44.1)	349 (97.2)	<0.01	0.02	0.01–0.04	<0.05	0.23	0.06–0.66
HEADSS assessment performed								
Yes	322 (64.3)	63 (17.5)	Ref			Ref		
No	179 (35.7)	296 (82.5)	<0.01	0.12	0.08–0.16	<0.01	0.26	0.12–0.61

†Results from simple and multiple logistic regression analysis are displayed to demonstrate associations between intentional poisonings and each of the listed independent variables. The first variable listed in each category was used as the reference variable when calculating statistical associations. Age was a continuous variable and therefore no categorical data is displayed. AOR, adjusted odds ratio; CI, confidence interval; HEADSS, Home, Education, Activities, Sexuality, Suicidality, Substances – acronym used in bedside assessment screening for psychosocial risk factors; OR, odds ratio.

on HEADSS assessments performed during both COVID-19 lockdown periods (Fig. 2). Other commonly reported social risk factors during the COVID-19 era included substance use, relationship issues, residence in foster care or a group home, parental separation, academic/school issues and exposure to abuse, assault, bullying or other trauma.

The ED LOS was substantially longer for presentations that were eventually admitted to a mental health facility, with a median LOS of 539 min (IQR 368–728) for patients being admitted to a mental health facility during the pre-COVID-19 era and 759 min (IQR 425–1240) for patients being admitted to a mental health facility during the COVID-19 era.

Discussion

We found a statistically significant association between the initial COVID-19 lockdown and intentional poisoning presentations. We also

found associations between intentional poisoning presentations and female sex and increasing age. There is a growing body of evidence that demonstrates that the pandemic has had a disproportionate adverse psychological impact upon adolescent females. Australian adolescent females were found to have more persistent psychological distress levels over the first year of the pandemic.¹¹ Pandemic associated increases in ED presentations have been reported for conditions commonly associated with the psychological health of adolescent females. One Australian study reported a 63% increase in presentations for adolescents with eating disorders.¹⁰ Another Australian study reported a pandemic-associated accelerated increase in mental health presentations for self-harm or suicidal ideation for those aged 10–24 years.⁹ The accelerated growth in presentations was attributed to increased presentations in females aged 13–17 years, for whom presentations

increased by 47.1% per annum from 2020 to 2021. Development of strategies to mitigate this psychological distress is imperative and needs further investment. Intentional self-poisoning is the leading method of suicide attempt in late childhood and adolescence and an initial self-poisoning event is a risk factor for subsequent suicide completion and premature death.¹³

The recognised upward trend of intentional paediatric poisoning presentations in Australia in the decade before the COVID-19 pandemic is a confounding factor to consider when interpreting the increase in intentional poisonings that we identified during the COVID-19 era. We did observe a reduction in the frequency of intentional poisoning presentations during the latter part of 2019; however, it is uncertain if this trend would have been sustained throughout 2020 if the pandemic had not occurred. Recognition that the observed increase in intentional poisonings may not be attributable solely to the COVID-19 pandemic and may continue beyond the eventual end of the pandemic increases impetus to identify and address any additional factors implicated in these presentations.

The implicating social risk factors identified from HEADSS assessments gives insight into the resources that may be required to reduce the frequency of intentional paediatric poisonings. Strategies to address substance use, reduce familial relationship breakdowns and actions to enhance the safety of young people living in foster care or group home environments may result in a reduction in intentional poisonings. There may also be a role for increased provision of child and adolescent-specific trauma-informed psychology services.

Participants in HEADSS assessments frequently reported a ‘current COVID-19 lockdown’ as a factor. While lockdowns may fulfil a role in reducing the spread of infectious disease, respondents identified the adverse impact that lockdowns had upon their level of psychological distress. Therefore, it is imperative when introducing a lockdown to recognise and seek to mitigate the broader health implications of its introduction.

Social Risk Factors Identified on HEADSS Assessments in cases of intentional poisoning events		
• Top 10 most frequently reported factors for each time period		
ALL EVENTS	PRE-COVID-19 ERA	COVID-19 ERA
<ul style="list-style-type: none"> Substance use Relationship issues Parental separation Academic/school issues Lives out of home (e.g. foster care or group home) Bullying Previous sexual abuse or assault Previous exposure to abuse or trauma (excluding sexual abuse or assault) Homelessness or accommodation difficulties Grief and loss 	<ul style="list-style-type: none"> Substance use Relationship issues Parental separation Bullying Academic/School issues Lives out of home (e.g. foster care or group home) Previous exposure to abuse or trauma (excluding sexual abuse or assault) Grief and loss Homelessness or accommodation difficulties 	<ul style="list-style-type: none"> Substance use Relationship issues Lives out of home (e.g. foster care or group home) Parental separation Academic/School issues Previous sexual abuse or assault COVID-19 Lockdown Bullying Homelessness or accommodation difficulties Previous exposure to abuse or trauma (excluding sexual abuse or assault)
INITIAL COVID-19 LOCKDOWN	PERIOD BETWEEN LOCKDOWNS	SECOND COVID-19 LOCKDOWN
<ul style="list-style-type: none"> COVID-19 Lockdown Substance use Lives out of home (e.g. foster care or group home) Relationship issues Academic/School issues Previous exposure to abuse or trauma (excluding sexual abuse or assault) Involvement in criminal behaviour Illness in a family member Eating disorder Homosexuality or gender identity concerns 	<ul style="list-style-type: none"> Substance use Relationship issues Lives out of home (e.g. foster care or group home) Academic/School issues Parental separation Bullying Previous sexual abuse or assault Previous exposure to abuse or trauma (excluding sexual abuse or assault) Illness in a family member Grief and loss 	<ul style="list-style-type: none"> Relationship issues Substance use COVID-19 Lockdown Homelessness or accommodation difficulties Parental separation Previous sexual abuse or assault Lives out of home (e.g. foster care or group home) Previous exposure to abuse or trauma (excluding sexual abuse or assault) Academic/School issues Bullying

Figure 2. Social risk factors reported by respondents to Home, Education, Activities, Sexuality, Suicidality, Substances (HEADSS) assessments performed following intentional poisoning presentations. The top 10 most frequently reported factors are reported for each time period.

The median ED LOS for presentations that were subsequently admitted to a mental health facility was excessive. Most of these patients remained in the ED beyond 8 h in both the pre-COVID-19 era and the COVID-19 era. The median LOS increased by 41% during the COVID-19 era. This is consistent with other recent studies. A total of 8.9% of all paediatric patients presenting with mental health concerns to a tertiary paediatric ED in Victoria spent greater than 8 h in the ED, with eventual inpatient admission and a diagnosis of drug overdose identified as factors that were associated with more prolonged LOS.¹⁴ A paediatric ED in Brisbane reported that the percentage of mental health presentations meeting the National Emergency Access Target criteria for ED LOS fell from 63% in 2013 to 39% in 2017.¹⁵ Further work is required to identify and address the causative factors for prolonged ED LOS for these presentations.

Although the total number of poisoning presentations was smaller during the COVID-19 era, the incidence increased from 0.59 presentations/day in the pre-COVID-19 era to 0.65 presentations/day in the COVID-19 era. Our data suggest that the poisoning presentations during the COVID-19 era were associated with increased severity and psychosocial complexity. Specifically, the increased proportion of presentations with a higher ATS category and the increased proportion of cases for which ambulance and police were involved are evidence of presentations that were more medically urgent and had a greater degree of social complexity.

We found an association between unintentional poisoning presentations and ingestion of alpha agonists, household products and fauna. It is well recognised that unintentional poisonings often involve the ingestion of household products and accidental exposure to therapeutic drugs.¹⁶ Adherence to safe prescribing practices for patients who reside with younger children may prove beneficial in further reducing the prevalence of unintentional paediatric poisonings.

Limitations

Due to the retrospective design, many confounders exist that cannot be explained. These would likely be reduced with a prospective design. Many of the associations identified were not found to be statistically significant. This may be due to our relatively small sample size. Their significance may be confirmed if a similar study were performed in a larger population. Our review of findings from HEADSS assessments was insufficient to determine whether there are causative associations between intentional poisonings and the identified social risk factors.

Conclusions

We found more intentional than unintentional paediatric poisoning presentations to the three EDs. The proportion of intentional poisoning events increased with the advent of COVID-19. We found a statistically significant association between intentional poisoning events and the initial COVID-19 lockdown. Poisoning presentations during COVID-19 were found to pose a high burden upon the ED, as evidenced by triage scores, police and ambulance involvement and ED LOS.

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Competing interests

None declared.

Data availability statement

Research data are not shared.

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