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ORIGINAL ARTICLE

Three decades of pediatric drug intoxication trends in Taiwan (1985-2020)

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Abstract

Background: Pediatric drug intoxication is a significant public health issue worldwide. The present study aimed to delineate the epidemiology, exposure-related conditions, and outcome severity of pediatric drug intoxication cases in Taiwan for over a 36-year period.

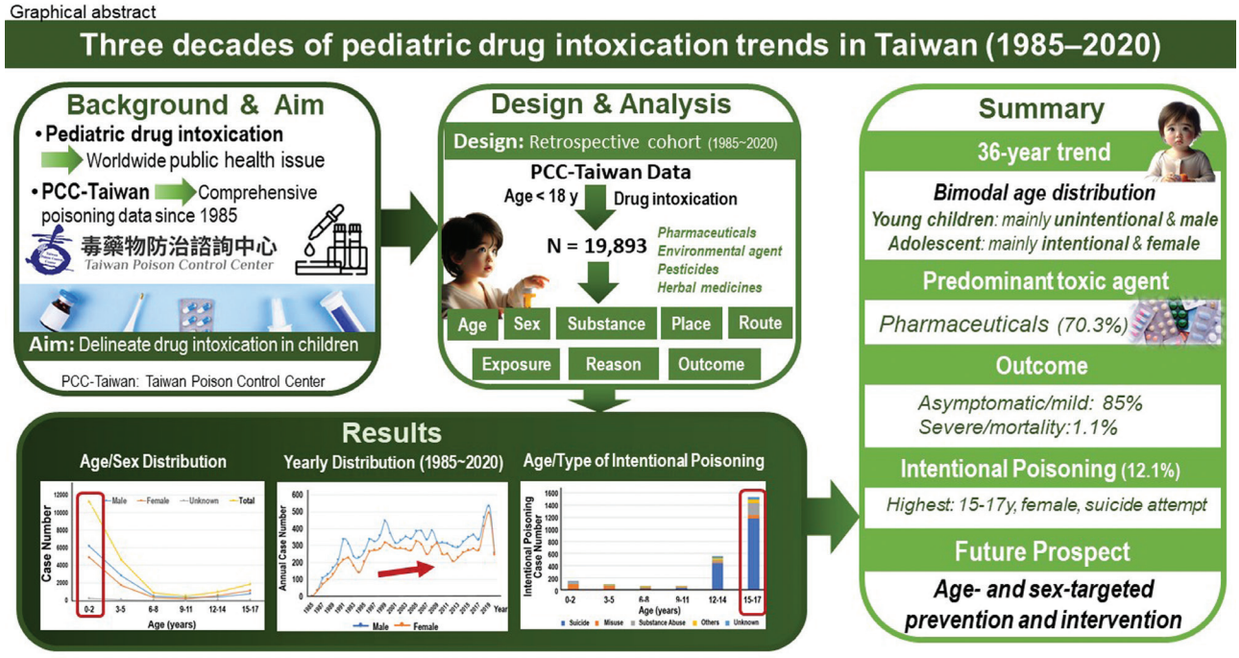
Methods: This retrospective cohort study analyzed pediatric drug intoxication cases registered in Taiwan Poison Control Center (PCC-Taiwan) database between 1985 and 2020. Data on patient demographics, toxic substances, exposure-related conditions, and outcome severity were extracted and analyzed. Descriptive statistics were used to summarize the findings.

Results: Altogether, 19 893 pediatric drug intoxication cases were reported. The majority of cases involved boys (54.7%), and the highest percentage of cases occurred in children aged 0 to 2 years (56.4%), but there is a second, relatively lower peak in adolescents, where female cases outnumbered the male cases. Pharmaceuticals were the predominant toxic substances (70.3%), with most drug intoxication cases being acute (97.2%) and occurring at home (88.8%). Witnesses were present in 62.8% of the cases. The outcomes were mostly asymptomatic (51.0%) or involved mild discomfort (34.1%), with severe complications and mortality occurring in 0.76% and 0.37% of the cases, respectively. Unintentional poisoning accounted for 85.4% of the cases, whereas intentional poisoning was noted in 12.1% of the cases, with the highest rate seen in adolescents aged 15 to 17 years. Intentional cases mainly involved suicide attempts (68.4%) and predominantly occurred in girls (70.7%).

Conclusion: This analysis of data obtained from PCC-Taiwan database for over 36 years reveals bimodal trends in pediatric drug intoxication, showing high rates in young children due to unintentional exposures and peaks in intentional poisoning among adolescent girls. Pharmaceuticals were the predominant toxic agents. Future efforts should focus on age- and sex-targeted preventions, public education on medication safety, and age-specific interventions.

Keywords: Children; Drug; Poison control center; Suicide

Graphical abstract



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1. INTRODUCTION

Pediatric intoxication remains a serious public health concern, frequently leading to emergency department (ED) visits and hospitalizations worldwide. Young children are inherently curious and often explore their environments, which can result in unintentional exposure to toxic substances.[1–6] Adolescents, experiencing physiological and emotional dysregulation, sometimes engage in inappropriate drug use or even attempt suicide.[7,8]

Globally, pediatric intoxications burden the healthcare systems.[5,9–14] Mintegi et al's[10] analyzed pediatric acute poisoning cases from 105 EDs across 20 countries, revealing an average incidence rate of 0.47%. Among the pediatric poisoning cases analyzed, most poisonings occurred at home, with significant regional variations. Unintentional exposures were the most common cases, and intentional self-poisoning was more frequent in specific regions, with therapeutic pharmaceuticals being the most common agents.[10] A study conducted in Italy using data from the pediatric poison control center (PCC) registry over a 3-year period reported that preschool children were most frequently intoxicated, with unintentional exposure to pharmaceuticals being a common cause. Intentional exposure was common among adolescents.[13] A previous systematic review revealed that pharmaceutical poisoning is a significant public health concern among low- and lower-middle-income countries, occurring in 12.4% to 72.4% of cases. The key risk factors of pharmaceutical poisoning include unsafe medication storage, inadequate caregiver knowledge, and delayed access to care.[11] Therefore, epidemiological evaluations of different regions are crucial for the effective local prevention of childhood poisoning.

Few comprehensive studies have examined intoxication cases in Taiwan. A retrospective analysis from 1985 to 1993 revealed that children accounted for 24.8% of the 23 436 poisoning cases, with unintentional exposures being more common in children, while intentional poisoning predominated in adults.[15] In their analysis by toxic substance category, drugs were the most prevalent toxic substance (32.4% of the total cohort) in children.[15] Jeng et al[1] reviewed 266 cases of pediatric nontraumatic injuries of one medical center reported from 1990 to 1993 and found that most injuries occurred at home, with boys aged 1 to 3 years being most affected. Household materials (39.1%) and pharmaceuticals (37.6%) were the leading causes.[1] From 2011 to 2015, Lee et al[3] reported that most pediatric poisoning cases involved young children ingesting drugs (41.4%) or pesticides (9.5%) at home unintentionally at another medical center. They also mentioned that female adolescents were more likely to engage in intentional poisoning.[3] These studies highlight the importance of prevention through parent and child education to reduce the risk of pediatric drug intoxication in Taiwan.

Given the persistent risk of pediatric poisoning, prevention remains paramount. Because most data were derived from regional or single-institution studies, comprehensive national studies on pediatric drug intoxication will be highly valuable for improving pediatric care in Taiwan.

Therefore, the present study aimed to investigate the epidemiology of and trends in drug intoxication in children aged <18 years for over three decades in Taiwan by conducting a comprehensive epidemiological analysis of data obtained from Taiwan Poison Control Center (PCC-Taiwan) database from 1985 to 2020.[16–18]

2. METHODS

The present study is a retrospective cohort analysis utilizing data from the Taiwan PCC, which was established in July 1985 at Taipei Veterans General Hospital.[16] The PCC-Taiwan serves as a critical resource for poisoning prevention, diagnosis, and management across Taiwan. Established with the mission to provide timely and accurate information on toxic exposures, the PCC-Taiwan offers 24-hour emergency consultation services to healthcare professionals and the general public.[15–20] These services are staffed by a rotation of health experts. Information, such as critical details on patient demographics (sex, age), toxic substance, type of exposure (acute or chronic), place, witness, reason for exposure (unintentional, intentional, or adverse reaction), and route of exposure, was meticulously collected during telephone consultations. Upon the closure of each case, additional data regarding the outcome of intoxication and specialized treatments administered were systematically recorded.[15,19,20] The intoxication outcomes were categorized into the following six severity levels: asymptomatic (no effect), mild (minor effect), moderate, severe (major effect), death, and unknown. Mild cases involved minor signs or symptoms that minimally affected the patient and resolved quickly without lasting disabilities. Moderate cases presented with more pronounced and prolonged symptoms requiring treatment, but these were not life-threatening and remained reversible. Severe cases featured life-threatening symptoms or significant disability/disfigurement, including status epilepticus, respiratory failure, or shock. Death was defined as death resulting directly from the exposure of the toxic substance or its complications.[9,15]

The study population comprised children aged <18 years who had drug intoxication caused by pharmaceuticals (human drugs or substances with pharmaceutical effects to be prescribed or used for therapeutic, nutritional, or other purposes),[11] environmental agents (drugs or substances for environmental use, such as household insecticide, insect attractant, fungicide, rodenticide, and herbicide), pesticides, and herbal medicines, from 1985 to 2020. All relevant data were extracted from the PCC-Taiwan database.

The enrolled cases were categorized by sex, age, toxic substances, exposure type, route, and place, presence of a witness during the intoxication, and severity of clinical outcomes. The study population was categorized into the following six distinct age groups: 0 to 2, 3 to 5, 6 to 8, 9 to 11, 12 to 14, and 15 to 17-year-old age groups. Within each age group, the cases were further stratified by sex (male, female). The annual case numbers over time by sex were plotted to observe the temporal trends.

The reasons for exposure were classified as unintentional, intentional, adverse reaction, and unknown.[15] The intentional poisoning cases were further classified into the following subcategories: suicide, misuse (intentional improper or incorrect use of a substance for reasons other than the pursuit of a psychotropic effect), substance abuse (intentional improper or incorrect use of a substance in which the victim was likely attempting to achieve a euphoric or psychotropic effect), and others, with a separate category for unknown causes.[15] Each subcategory was analyzed

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within the predefined age groups, and the data were presented using a bar chart. The annual number of suicide cases throughout the study period was presented using a line graph.

The study was conducted following the ethical guidelines. Data were anonymized before analysis to ensure confidentiality and protect the identities of the individuals involved. The study protocol received approval from the Institutional Review Board of Taipei Veterans General Hospital (approval number: 2021-06-008BC).

Descriptive statistics were utilized to summarize the data.

3. RESULTS

3.1. Age and sex distributions

The data of 19 893 cases of drug intoxication in children aged <18 years old registered in the PCC-Taiwan database between 1985 and 2020 were analyzed. The case numbers categorized by age and sex are shown in Table 1 and Fig. 1A. The distribution of cases by sex showed a higher prevalence in boys (54.7%) than in girls (43.8%). The age distribution indicated that the largest proportion of drug intoxication cases occurred in children aged 0 to 2 years (56.4%), followed by those aged 3 to 5 years (23.0%). Fig. 1A reveals the trends in age distribution. There is a discernible decline in the number of cases with increasing age, with the 9 to 11-year-old age group showing the minimum number of cases (n = 490 [2.5%]). The incidence rate increased in adolescence (n = 927 [4.7%] for children aged 12-14 years; n = 1830 [9.2%] for those aged 15-17 years). In terms of sex, boys had a higher incidence rate than girls up to 11 years of age, but, after this period, girls showed a higher number of cases than boys (Fig. 1A).

3.2. Annual changes

Fig. 1B illustrates the annual number of pediatric patients with drug intoxication for both sexes over the 36-year study period. Throughout this period, the rate of drug intoxication was higher in boys than in girls. This rate showed marked annual fluctuations in both sexes. In general, the number of patients increased from 1985, peaking around the mid-to-late 1990s, followed by a decline and relative stabilization before another sharp increase in the late 2010s. Between 1985 and 2020, a consistent annual difference between the number of male and female patients was noted. On average, the number of cases was approximately 100 to 200 cases higher compared to female patients each year.

3.3. Intoxication circumstances

Table 1 displays the toxic substances, nature of exposure, location, witnesses, and routes of intoxication. For the toxic substances, pharmaceuticals were the most common agents, accounting for 70.3% of cases, followed by environmental agents (20.9%).

Regarding the nature of the drug intoxication, the majority of the cases were acute exposures (97.2%) (Table 1). The majority of intoxication cases occurred at home, accounting for 17 669 (88.8%) cases, followed by outdoors with 1684 (8.5%) cases. In 12 489 (62.8%) cases, a witness was present at the time of ingestion. The data on the route of toxic exposures revealed that oral ingestion was the predominant route, accounting for 93.5% of the incidents.

3.4. Outcome severity

In the analysis of outcome severities, although most cases were asymptomatic (n = 10 134, 51.0%) or had only mild discomfort (n = 6783, 34.1%), 228 (1.1%) children experienced severe complications (n = 153, 0.76%) or died (n = 75, 0.37%) (Table 1).

Table 1

Demographic characteristics, intoxication circumstances, and outcome severity of pediatric drug intoxication children (1985-2020)

Parameters	Number of cases	(% of total cases)
Total	19 893	100
Gender		
Male	10 876	54.7
Female	8724	43.8
Unknown	293	1.5
Age, y		
0-2	11 228	56.4
3-5	4578	23.0
6-8	840	4.2
9-11	490	2.5
12-14	927	4.7
15-17	1830	9.2
Toxic substances		
Pharmaceuticals	13 980	70.3
Environmental agent	4158	20.9
Pesticides	1118	5.6
Herbal medicines	637	3.2
Types of exposure		
Acute	19 335	97.2
Chronic	436	2.2
Unknown	122	0.6
Place of exposure		
Home	17 669	88.8
Outdoor	1684	8.5
School	540	2.7
Witness at exposure		
Yes	12 489	62.8
Route of exposure[a]		
Ingestion	18 606	93.5
Inhalation/nasal	604	3.0
Dermal	489	2,5
Parenteral	146	0.7
Ocular	91	0.5
Others	105	0.5
Unknown	226	1.1
Severity of clinical outcomes		
Asymptomatic (no effect)	10 134	51.0
Mild (minor effect)	6783	34.1
Moderate	1253	6.3
Severe (major effect)	153	0.8
Death	75	0.4
Unknown or unrelated	1495	7.5
Reason for exposure		
Unintentional	16 981	85.4
Intentional	2404	12.1
Adverse reaction	345	1.8
Unknown	163	0.8

[a]Some of the exposures had multiple routes.

Table 2 further presents the detailed distribution of the cases with severe adverse complications or mortality cases stratified by age. Among the different age groups, the 15 to 17-year-old age group (n = 69, 3.8%) had the highest percentage of severe complications or mortality, followed by the 12 to 14-year-old age group (n = 32, 3.5%). Among the toxic substances, pharmaceuticals were the leading cause of drug intoxications causing severe complications or mortality, accounting for 52.6% (n = 122) of such cases and notably predominant in the 0 to 2-year-old age group (62.3%, n = 48). Pesticides were the second most common toxic agent, which was responsible for 37.7% (n = 86)

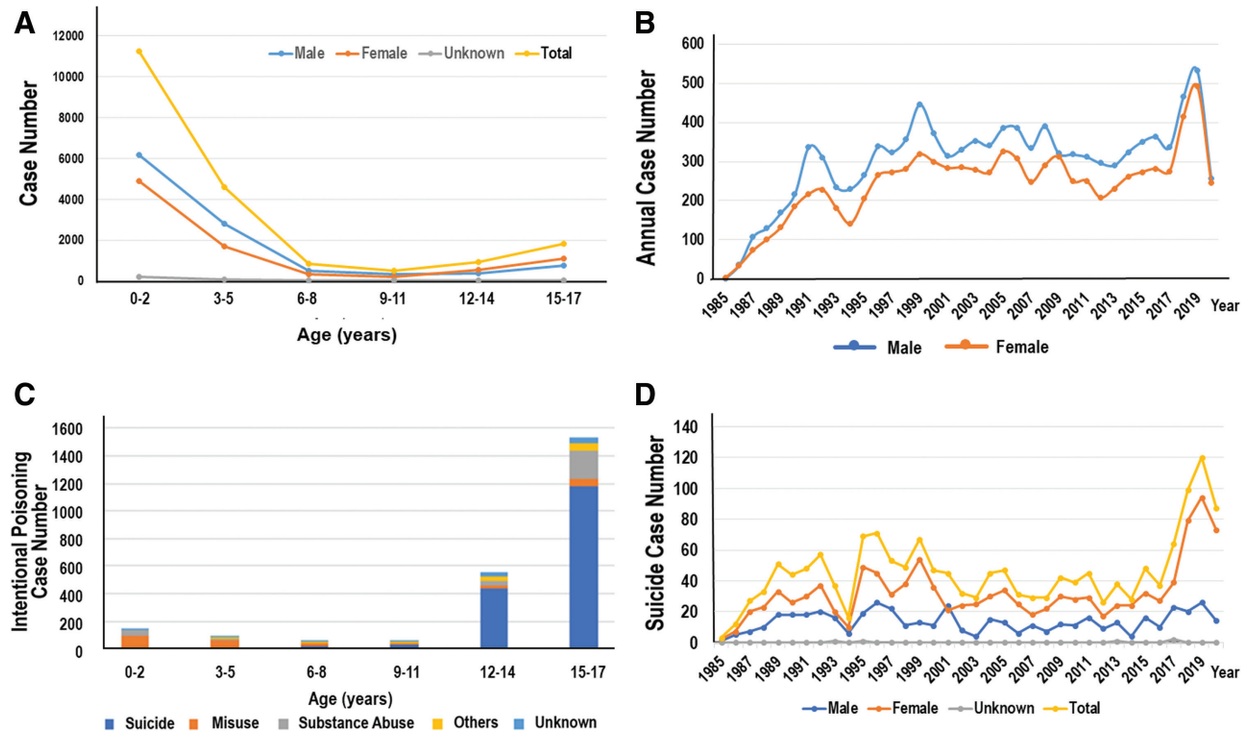

Fig. 1 Demographics and trends in pediatric drug intoxication in Taiwan (1985-2020). A, Age and sex distributions. The 0 to 2-year-old age group had the highest incidence of drug intoxication, which declines with age until adolescence, but then increases post-teenage years. B, Annual number of cases by sex. During the study period, the number of male pediatric cases numbers was higher than that of female pediatric cases. C, Distribution by age and reason for intentional poisoning. The intentional poisoning categories include suicide, misuse, substance abuse, others, and unknown. Marked increases in the number of cases are noted in the 12 to 14- and 15 to 17-year-old age groups, with "suicide" being the most frequent reason for exposure in children aged ≥12 years. D, The annual number of suicide cases. The number of suicide cases in girls consistently outnumbered that of boys throughout the study period. A significant increase in the total number of suicide cases, mainly in girls, was observed after the year 2016, peaking in 2019.

Table 2

Distribution of pediatric drug intoxication children with severe adverse complications or mortality by age groups

			Toxic substances			
Age, y	Total case n	Severe/mortality n (%)[a]	Pharmaceuticals n (%)[b]	Pesticides n (%)[b]	Herbal medicines n (%)[b]	Environmental agent n (%)[b]
0-2	11 228	77 (0.7)	48 (62.3)	18 (23.4)	7 (9.1)	4 (5.2)
3-5	4578	28 (0.6)	14 (50.0)	12 (42.9)	2 (7.1)	0 (0.0)
6-8	840	16 (1.9)	9 (56.3)	5 (31.3)	2 (12.5)	0 (0.0)
9-11	490	6 (1.2)	2 (33.3)	4 (66.7)	0 (0.0)	0 (0.0)
12-14	927	32 (3.5)	15 (46.9)	14 (43.8)	2 (6.3)	1 (3.1)
15-17	1830	69 (3.8)	34 (46.4)	33 (47.8)	1 (1.4)	1 (1.4)
Total	19 893	228 (1.1)	122 (52.6)	86 (37.7)	14 (6.1)	6 (2.6)

[a]Percentage of total cases number of the same age group.
[b]Percentage of all severe or mortality cases number of the same age group.

of severe cases, with the 9 to 11-year-old age group exhibiting the highest incidence (66.7%, n = 4). Herbal medicines were involved in 6.1% (n = 14) of severe intoxication cases, with the highest proportion of cases seen in the 6 to 8-year-old group (12.5%, n = 2) (Table 2).

3.5. Reason for exposure

When examining the causes of intoxication, unintentional poisoning was the predominant factor, accounting for the majority of cases (n = 16 981, 85.4%), whereas intentional poisoning ranked as the second highest (n = 2404, 12.1%) (Table 1). Fig. 1C shows the distribution of intentional poisoning cases stratified by age and reason for exposure. The 15 to 17-year-old age group had the highest number of intentional poisoning cases. The small peak at age 0 to 2 years group declined with increasing age, reaching the lowest incidence in the 9 to 11 years group. A noticeable increase in the number of cases occurred in children aged ≥12 years, particularly in the 15 to 17-year age group.

Table 3 illustrates the detailed distribution of the data of the 2404 pediatric cases of intentional intoxication, which constitute 12.1% of all pediatric poisoning cases. Across all age groups, suicide was the most common type of intentional

Table 3

Age distribution and types of intentional drug intoxication of 2404 pediatric cases (1985-2020)

Age, y	Total case n	Intentional intoxication cases n (%)[a]	Types of intentional intoxication				
			Suicide n (%)[b]	Substance abuse n (%)[b]	Misuse n (%)[b]	Others n (%)[b]	Unknown n (%)[b]
0-2	11 228	145 (12.9)	8 (5.5)	46 (31.7)	78 (53.8)	5 (3.4)	8 (5.5)
3-5	4578	82 (17.9)	2 (2.4)	3 (3.7)	59 (72.0)	15 (18.3)	3 (3.7)
6-8	840	46 (5.5)	13 (28.3)	0 (0.0)	24 (52.2)	5 (10.9)	4 (8.7)
9-11	490	53 (10.8)	20 (37.7)	4 (7.5)	14 (26.4)	8 (15.1)	7 (13.2)
12-14	927	547 (59.0)	428 (78.2)	35 (6.4)	27 (4.9)	30 (5.5)	27 (4.9)
15-17	1830	1531 (84.7)	1173 (76.6)	209 (13.7)	52 (3.4)	48 (3.1)	49 (3.2)
Total	19 893	2404 (12.1)	1644 (68.4)	297 (12.4)	254 (10.6)	111 (4.6)	98 (4.1)

[a]Percentage of total cases number of the same age group.

[b]Percentage of all intentional intoxication case number of the same age group.

intoxication (1644 cases, 68.4%), followed by substance abuse (297 cases, 12.4%) and intentional misuse (254 cases, 10.6%). Together, suicide and substance abuse cases accounted for 9.8% (1941 out of 19 893) of all pediatric drug intoxication cases.

In the 0 to 2-, 3 to 5-, and 6 to 8-year age groups, the number of intentional intoxication cases was 145 (12.9%), 82 (17.9%), and 46 (5.5%), respectively. In each age group, the most common type of intentional poisoning was intentional misuse (53.8%, 72.0%, and 52.2%, respectively). Among the children aged 9 to 11 years, 54 had intentional intoxication (10.8%), predominantly involving suicide (37.7%) and intentional misuse (26.4%) (Table 3).

In the 12 to 14-year and 15 to 17-year age groups, the number of intentional intoxication cases was 547 (59.0%) and 1531 (84.7%), respectively. The most common type of intentional intoxication was suicide (78.2 and 76.6%, respectively). Substance abuse caused 12.4% of intentional intoxications (Table 3). Among the children aged 12 to 17 years who attempted suicide, a markedly higher proportion of female cases (1132, 70.7%), as compared to male cases (465, 29.0%), was observed. Fig. 1D shows the annual number of suicide cases during the study period. As shown, a significant increase in the total number of suicide cases was observed after the year 2016, which peaked in 2019. The female pediatric cases consistently outnumbered the male pediatric cases, showing a prominent growth in the latter years; however, the number of male cases remained low and more stable.

4. DISCUSSION

In this extensive analysis of 19 893 pediatric cases of drug intoxication over a 36-year period, pharmaceuticals emerged as the most common toxic substances. Our findings highlight a bimodal age distribution, revealing distinct patterns between younger children and adolescents. Specifically, we observed different sex predominance, with male patients more affected in early childhood and female patients in adolescence. The outcome severity also varied with age, which increases significantly in the adolescent group. Additionally, the cause of drug intoxication differed, with unintentional poisoning being more prevalent in younger children and intentional poisoning, especially related to suicide attempts, predominantly occurring in adolescents.

Although many studies have focused on children admitted to the ED due to poisoning,[1,3,10,21,22] the present study took a broader approach, as we included children who might not have been admitted to the ED due to their mild symptoms. Furthermore, our study was not limited to only one hospital center; instead, it included patients from various medical institutions. Additionally, our data spanned a 36-year period. These aspects collectively allowed us to include a more extensive and representative population, closely mirroring the real-world scenario.

Long-term epidemiological data spanning several decades, particularly in the Asian context, are scarce. This gap underscores the necessity of our study, which aimed to fill the void by offering a 36-year perspective on pediatric intoxication in Taiwan. Our study utilized a comprehensive dataset from PCC-Taiwan database, covering a 36-year period from 1985 to 2020. The extensive data allowed us to identify trends in pediatric drug intoxication across different age groups, from infants to older adolescents, and to understand the various risk profiles and mechanisms of intoxication. Detailed records of the patient demographics, toxic substances involved, and clinical outcomes enhance the reliability of our study findings. These insights are useful for establishing targeted preventive strategies for different pediatric age groups in Taiwan and can support future research and policy development to reduce the risk for pediatric drug intoxication. Our study results suggest that more attention should be given to preventing unintentional and intentional intoxications in young children aged 0 to 5 and 12 to 17 years, respectively.

Compared to Marano et al's[13] study, both studies analyzed data from their own PCC database. The present study was a retrospective cohort analysis of data spanning for over 36 years from PCC-Taiwan, focusing on data obtained from telephone consultations, whereas the Italian study analyzed data covering over 3 years, including data collected from both telephone consultations and ED visits.[13] Both studies found that men are more likely to experience poisoning than women, that poisoning most commonly occurs at home, and that pharmaceuticals are the most frequent cause of poisoning. The Italian study reported that preschool children most commonly experienced drug intoxication, whereas the current Taiwan study indicated that the highest proportion of drug intoxication cases was seen in children aged 0 to 2 years, followed by those aged 3 to 5 years. Both studies identified intentional exposure among adolescents as a significant concern, highlighting the need for specialized pediatric PCCs. Importantly, the percentages of pediatric poisoning cases related to substance abuse and suicide attempts in Italy and Taiwan were 7.7% and 9.8%, respectively. These findings underscore the necessity for pediatricians and public health managers to address this issue and support the establishment of specialized pediatric PCCs to manage diverse intoxication cases.

The annual incidence rate of pediatric poisoning remained higher in boys (54.7%) than in girls during the 36-year study period. The majority of cases were unintentional (n = 16 981, 85.4%) and occurred in the younger age groups (age, 0-5 years). These are consistent with the findings of many

previous studies.[4,6,22–24] Noteworthy, in our study, the incidence of poisoning was higher in the youngest age group (0-2 years, 56.4%) than in the second youngest group (3-5 years, 23.0%). Much attention should be given to preventing unintentional drug intoxication in the younger children, especially in children aged 0 to 2 years.

Our study demonstrated a bimodal age distribution of poisoning cases, peaking in younger children and decreasing in older adolescents. Similarly, Mintegi et al (Spain), Zahran et al (Lebanon), and Alwan et al (Malaysia) have also reported this bimodal distribution.[6,10,25] All of these studies showed that intentional intoxication was the major cause of poisoning in adolescents, contrasting with the unintentional causes seen in young children. Suicide attempts were specifically found to be most common among adolescents and girls. Mintegi et al[10] noted that 82.4% of these suicide attempts occurred in girls, and our study found that 70.7% of all suicide attempts occurred in girls aged 12 to 17 years, underscoring a critical mental health issue among adolescent girls. Additionally, Hernandez et al[8] further observed an increase in suicide attempts by self-poisoning among adolescents since the coronavirus disease 2019 pandemic, particularly using over-the-counter and prescription drugs. Further research is essential to understand and address this escalating crisis of suicide in adolescent girls.

There are regional differences in pediatric poisoning. Our study demonstrated that pharmaceuticals were the leading toxic substances among the drug intoxication cases, which is a common finding in many places.[10,13] However, household materials are also a common cause of pediatric poisoning,[1] and some specific agents have been reported from different regions. Kerosene is the most common cause of pediatric poisoning in North India.[24] A report from Iran found that methadone was the most frequent toxic agent, causing 29.7% of their reported pediatric intoxication cases.[23] In South Asia, deaths from unintentional poisoning and disability-adjusted life years in pediatric cases showed a decreasing trend from 1990 to 2019 after the implementation of aggressive prevention policies.[26] In the United States, the Annual Report of the American Association of Poison Control Centers revealed that the top five most common exposures in children aged <6 years were cosmetics/personal care products, household cleaning substances, analgesics, dietary supplements/herbal medicines/homeopathic drugs, and foreign bodies/toys/miscellaneous.[2] Therefore, ongoing public health efforts designed for general requirements as well as regional specificity are needed to further reduce the burden of unintentional poisoning worldwide.

Targeted interventions at each developmental stage are essential for reducing the incidence of pediatric intoxications. Our study found that the majority of incidents occurred in children aged 0 to 2 years, which predominantly involved exposure to pharmaceuticals, whereas intentional intoxication was most common among adolescent girls. Preventive strategies must be age-specific. For children aged 0 to 2 years, educating caregivers on safe medication storage and the use of child-resistant packaging is critical. For preschoolers (3-5 years) and school-aged children (6-11 years), educational programs can effectively raise awareness about the dangers of medications. For adolescents aged 12 to 17 years, particularly girls, access to mental health support in schools and communities is vital to address self-harm and foster discussions about the risks of medication misuse.

Our study also identified concerning trends in suicide cases among adolescents aged 12 to 17 years. The female cases consistently outnumbered the male cases, with a significant increase observed after the year 2016, which peaked in 2019, particularly among girls. Contrarily, the suicide rates among boys remained lower and more stable. This highlights a growing vulnerability among adolescent girls, underscoring the need for age- and sex-specific intervention strategies. The increasing overall suicide rates present serious public health concerns, necessitating targeted mental health support and preventive measures, especially for adolescent girls. Further research focusing on intentional drug intoxication and suicide in adolescents is critical for developing effective preventive interventions.

The present study has several limitations. First, the retrospective cohort design may introduce recall and reporting biases, affecting data accuracy and comprehensiveness. Second, relying solely on the PCC data might result in an underestimation of the true incidence rates, as not all pediatric intoxication cases in Taiwan may be included. Third, socioeconomic factors and specific treatment protocols were not assessed, limiting insights into their effects on the study outcomes. Finally, the lack of a detailed analysis on the contexts of intoxications, including access to toxic substances and levels of parental supervision, limits the depth of conclusions regarding the preventive and intervention measures for these cases.

In conclusion, this analysis of data spanning for over 36 years from PCC-Taiwan database reveals crucial trends in pediatric drug intoxications, which are characterized by a high incidence in young children due to unintentional exposures and a peak in intentional poisoning among adolescents, particularly among girls. Our findings highlight the need for targeted preventive strategies, including caregiver education and mental health support for adolescents. Our study emphasizes the urgency of addressing the risk factors for pediatric drug intoxication to improve the health outcomes of individuals across different age groups as well as their sex-specific needs.

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