ACUTE CHILD POISONING AND ITS RELATED RISK FACTORS DURING THE COVID ERA

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ABSTRACT

Background: Poisoning is an important emergency in pediatric age groups throughout the world. The causes and types of poisoning vary from place to place in the world and even within the same country, also depending upon factors such as education, demography, socioeconomic factors, customs, and local belief. **Aim of this study**: To determine the frequency, etiology, characteristics, clinical presentation, and outcome of acute poisoning in children presenting to the National Environmental and Clinical Toxicological Research Center (NECTR), Cairo University. **Participants and Methods:** The current study is a prospective cross-sectional study, conducted on 240 pediatric patients (under 18 years old) who presented with acute poisoning to National Environmental and Clinical Toxicological Research Center (NECTR), Cairo University over three months during the COVID episode. Data were statistically analyzed for; demographic data of the participating children, manner of toxicity, place of exposure, type of poison, its availability to the child, the form of poison, duration between exposure and presentation, and the first aid that may be done to the child. Also, the severity and mortality rate detected by poison severity scoring (PSS) and rate of admission to the center or ICU and outcome were analyzed. **Results:** The current study showed that the long stay-at-home and school absence during COVID episodes may cause an increased risk of pediatric poisoning with household poisons and medications even in educated families. Also, accidental toxicity (84.6%) is still more common than intentional toxicity (15.4%), with negligence being the most significant probable precipitating factor. The incidence significantly increased in children with educated worker fathers and in cases where only the mother is accompanying the children. In addition, the risk for ICU admission was significantly higher (51.4%) in adolescents (13 to <18 years) with intentional poisoning. **Conclusion:** Pediatric poisoning is an emergency condition with younger children (< 9 yrs.) are highly susceptible to accidental exposure, however, with older ages (9 to <18 years), the incidence of intentional poisoning and risk of bad outcome increases.

Keywords: Pediatric age, child poisoning, Manner of toxicity, COVID, Cairo, Poison severity scoring and Admission and outcome

INTRODUCTION

A poison is a substance that can cause organ dysfunction when ingested, inhaled, or taken by any route, leading to injury or death, and has the potential for adverse effects whether clinically apparent or not (Lee et al., 2019)**.**

Poisoning represents one of the leading causes of morbidity and mortality worldwide. The problem is getting worse with time as newer drugs and chemicals are developing. Poisoning cases are increasing day by day due to changes in lifestyle and social behavior (Berta et al., 2020)**.** The exact number of incidences may be higher than estimated because many poisoning cases go unreported **(Omer, 2020).**

Acute poisoning causes frequent presentations to emergency services, and its manner differs according to age. Accidental poisoning is common among children and leads to increased childhood morbidity and mortality. Adults do also get poisoned but through intentional poisoning that could be a suicidal attempt (Mintegi et al., 2017)**.**

Accidental exposure to a toxic substance by a young child represents a complex interplay of host, agent, and environmental factors (Baqir et al., 2017)**.** Pediatric poisoning cases are on the increase due to rapid industrialization, increased variety of health products, lack of adequate parental supervision, and increased media viewing **(Shirkosh et al., 2019)**.

Child poisoning became a significant component of injury-related morbidity and mortality, so detecting poisoning patterns and manner would help to identify the risk factors and allow early diagnosis and management of such cases, therefore reducing morbidity and mortality **(Mahmoud, 2019).**

While the world is facing a major pandemic situation, the COVID-19 outbreak, the risk of child poisoning is increasing due to restrictions and school closure making young children at home for a longer time and thus more exposed to poisons. In addition, disproportionate fear of COVID infection leads to dramatic behavior modification, such as misuse of cleaning products for personal hygiene or food cleaning and excessive house cleaning, making child exposure to these poisons more frequent **(Le Roux et al., 2020).**

Aim of this study: To determine the frequency, etiology, characteristics, clinical presentation, and outcome of acute poisoning in children presenting to the National Environmental and Clinical Toxicological Research Center (NECTR), Cairo University

PARTICIPANTS AND METHODS

This is a prospective cross-sectional study, conducted on 240 pediatric patients (under 18 years old) presented and admitted to the National Environmental and Clinical Toxicological Research Center (NECTR), Cairo University, for three months (from the beginning of July to end of September 2020) with a proper history of acute toxicity or with symptoms and signs suggesting acute toxicity. During this period, the world was facing episodes of COVID-19 infection.

Regarding the manner of toxicity, patients were classified into two groups:

- Group 1: Unintentional (accidental) toxicity.
- Group 2: Intentional (suicidal) toxicity.

The participants were classified into four groups depending on their age, according to Zisowsky et al., (2010):

- Group A: Infant and toddler (28 days to <3 yrs.).
- Group B: Early childhood (3 yrs. to< 9 yrs.).
- Group C: Late childhood (9 yrs. to <13 yrs.).
- Group D: Adolescent (13 to <18 years).

- Inclusion criteria:

1- Children (1 month to 18 years)

2- Both sexes.

3- History of recent exposure to a toxic substance, corrosive or adverse drug reaction, whether accidental or intentional

4- Or clinical features suggestive of possible poisoning

- Exclusion criteria:

1- Adults (above 18 years)

2- History of chronic exposure

3- Food poisoning

4- Longstanding ill health of unknown etiology

- **Methodology in detail:**

All cases of suspected or confirmed acute poisoning in children (1 month to 18 years), would be prospectively analyzed by a cross-sectional analytic study. Cases were analyzed for:

- Demographic data of the patients: age, sex, residence, level of education, and family status.
- Primary data include:

o Type of poison and its availability to the child
o Form of poison.
o Place of exposure.
o Manner of toxicity.
o The duration between exposure and presentation.
o The first aid that may be done to the patient.
o Associated morbidity.
o History of medications
o History of psychiatric diseases

- Data concerning physical examination and investigations according to the different poisons:

o CNS manifestation: alert, drowsy, coma, convulsion or hallucination.
o Vital signs: normal, affected, or shocked.

- Recorded investigations:

o The routine investigation, done or not, and specific investigation, done or not.

- Severity and mortality rate of each poison detected by poison severity scoring (PSS). The Poisoning Severity Score grades severity as (0) none, (1) minor, (2) moderate, (3) severe, and (4) fatal poisoning **(Persson et al., 1998).**
- Data regarding lines of treatment:

1- Methods of GIT decontamination: no decontamination done, gastric lavage with activated charcoal or activated charcoal only.

2- Symptomatic treatment: not done, given at home, or given in the hospital.

3- Antidote: the drug has no specific antidote and only supportive treatment was

given. Treatment was given in full regimen or given but the patient improved before the full regimen was completed. The patient was not admitted and no need for an antidote.

- The outcome of the case: Improved and discharged, discharged on his or her parent's responsibility, died, complicated, or the drug with no toxic effect.
- Admission: Admitted cases including patients admitted to ICU or observed for a certain period or not admitted.
- Ethical approval:

The study was approved by the research ethical committee of the faculty of medicine, Cairo University (code: MS-231-2020)

Informed consent was taken from the child's legal guardian before participating in this study

- Statistical analysis:

The data were analyzed using Microsoft Excel 2016 and the statistical package for social science 'IBM SPSS Statistics for Windows, version 26 (IBM Corp., Armonk, N.Y., USA). Continuous normally distributed variables were represented as mean ± standard deviation (SD) with a 95% confidence interval, while non-normal variables were summarized as median with 25 and 75 percentiles and using the frequencies and percentage for categorical variables; a p-value < 0.05 will be considered statistically significant. To compare the means of normally distributed variables between the two groups, the Student's t-test was performed, and the Mann-Whitney U test will be used in non-normal variables. To compare the means of normally distributed variables between groups, the ANOVA in multi groups was performed, and the Kruskal Wallis H test will be used in non-normal variables and $\chi 2$ test or Fisher's exact test was used to determine the distribution of categorical variables between groups. Effect modifications were evaluated by stratification, and statistical interaction was assessed by including main predictor variables and their product terms in the binary logistic regression analysis in addition to multinomial logistic regression analysis. The Survival analysis was done by "Log Rank (Mantel-Cox) Kaplan-Meier test". To assess the risk of intensive care unit (ICU) admission, we used to admit cases to ICU as cases and non-admitted as controls to be able to assess the risk using logistic regression analysis.

RESULTS

In the current study, 240 children presented to the national institution and clinical and environmental toxicology, faculty of medicine, Cairo University, for three months from the start of July to the end of September 2020. There were no homicidal cases. Poisoning incidence was significantly higher among the youngest age group (Infants and toddlers below 3 years), and among children whose fathers were educated workers. In addition, poisoning was insignificantly more common in female children than males, and in urban areas than rural ones. Family negligence was the most significant higher poisoning risk factor, and Thursday was the most significantly day higher in case rate. **(Table 1).** In addition, accidental child poisoning inside the home was significantly higher than intentional and outside home poisoning, also medications and drugs were the most significant attributed poison (antipsychotic and non-steroidal anti-inflammatory drugs (NSAID) were the commonest used drugs), while cannabis was the most significant taken drug of abuse. Furthermore, significantly, most children (P= 0.001) didn't have any history of chronic medication, psychiatric disease, associated morbidities, or previous poison exposure (**Table** 2).

In the current study, the main significant clinical and laboratory presentations (P=0.001) for the majority of children were normal vital signs, normal Glasgow coma scale (GCS), normal oxygen saturation (>94%), normal reactive pupil, and normal random blood glucose (RBS).

Also, vomiting was the main significant presenting symptom (P=0.001) and the severity and mortality rate according to poison severity scoring (PSS) was minor in most cases (**Table 3**).

Regarding management and outcome, about 20% of cases needed no treatment, while the majority of cases were admitted warding and 17 % were admitted to ICU. Also, majority of cases significantly improved (P0.001) and needed only symptomatic and supportive management (**Table 4**).

The time interval between exposure to poison and the appearance of clinical symptoms was 0.50 - 12.0 hours (median 2 hours).

Table 1: Demographic data of participating children

		Number	Percentage	P. value
Age***		0.58 - 18.0	3.0(2.0- 5.8)	-
Age Categories	Infant and toddler	102	42.5	0.001**
	Early childhood	94	39.2	
	Late childhood	9	3.8	
	Adolescent	35	14.6	
Sex	Female	116	48.3	0.739
	Male	124	51.7	
Residence	Rural	100	41.7	0.096
	Urban	140	58.3	
Father Education	Non educated	95	39.6	0.037*
	Educated	145	60.4	
Father Work	Not worker	46	19.2	0.001**
	Worker	194	80.8	
Father Smoker	No	135	56.3	0.211
	Yes	105	43.8	
Mother Education	Non educated	106	44.2	0.243
	Educated	134	55.8	
Mother Work	Not worker	138	57.5	0.134
	Worker	102	42.5	
Precipitating Factors	Family problems	32	13.3	0.001**
	Father addiction	3	1.3	
	Negligence	106	44.2	
	Overactivity of baby	75	31.3	
	Psychological problem	16	6.7	
	Wrong medication	8	3.3	
Who Is Accompanying the children	Mother	159	66.3	0.001**
	Father	57	23.8	
	Mother & Father	12	5.0	
	Friends & Relatives	12	5.0	
Day of Week	Saturday	15	6.3	0.004**
	Sunday	45	18.8	
	Monday	34	14.2	
	Tuesday	32	13.3	
	Wednesday	24	10.0	
	Thursday	64	26.7	
	Friday	26	10.8	
Time Spent In Hospital/Hrs*		1.0 - 192.0	6.0(3.0- 24.0)	-

* p. value <0.05 is significant, ** p. value <0.01 is highly significant. the data were analyzed by X^2 test.

Table 2: Poison characteristics and medical history of participating children

		Number	Percentage	P. value
Manner of Poison	Accidental	203	84.6	0.001**
	Intentional	37	15.4	
Poison Site	In home	210	87.5	0.001**
	Out home	30	12.5	
Availability of Poison	Accessible surface	65	27.1	0.001**
	Buy it	13	5.4	
	Familiar bottle	23	9.6	
	Father and mother's medication	39	16.2	
	Open cupboard	45	18.8	
	Patient medication	15	6.3	
	Used at home, everyone reaches it	40	16.7	
Type of Poison	Bite	4	1.7	0.001**
	Drug abuse	22	9.2	
	Medication	99	41.3	
	House cleaning	63	26.3	
	Pesticide	12	5.0	
	Others	32	13.3	
	Unknown	8	3.3	
Drug abuse	Cannabis	14	63.6	0.001**
	Ethyl alcohol	3	13.6	
	Tramadol	3	13.6	
	Methanol	2	9.1	
Medication	Multidrug	13	13.13	0.001**
	NSAID	15	15.15	
	Antipsychotic	18	18.18	
	Others	7	7.07	
	Antidiabetic	6	6.06	
	Aminophylline	9	9.55	
	Anti Hypertensive	4	4.04	
	Paracetamol	4	4.04	
	Antiacid	5	3.05	
	Antiepileptic	3	3.03	
	Antibiotic	5	5.05	
	Antitussive syrup	6	6.06	
Route of Poison	Ingestion	234	97.5	0.001**
	Inhalation	2	0.8	
	Venom	4	1.7	
History Medication	No	221	92.1	0.001**
	Yes	19	7.9	
Psychiatric History	No	219	91.3	0.001**
	Yes	21	8.8	
Associated Morbidity	No	233	97.1	0.001**
	Yes	7	2.9	
Previous Time	No	209	87.1	0.001**
	Yes	31	12.9	

* p. value <0.05 is significant, ** p. value <0.01 is highly significant. the data were analyzed by X^2 test.

Table 3: Initial presentation to the emergency room and clinical assessment of participating children

		Frequency	percentage	P. value
Temperature	Normal	232	96.7	0.001**
	Low	2	0.8	
	High	6	2.5	
Respiratory Rate	Normal	223	92.9	0.001**
	Bradypnea	2	0.8	
	Tachypnea	15	6.3	
Heart Rate	Normal	223	92.9	0.001**
	Low	1	0.4	
	High	5	2.1	
	Bradycardia	2	0.8	
	Tachycardia	9	3.8	
Blood pressure	Normal	238	99.2	0.001**
	Hypertension	2	0.8	
RBG	Normal	232	96.7	0.001**
	Low	3	1.3	
	Hyper	5	2.1	
Glascow coma scale (GCS)	Mean of GCS***	5.0 - 15.0	13.9±1.96	-
	<15	67	27.9	0.001**
	=15	173	72.1	
oxygen saturation	Mean of oxygen saturation	77.0 - 99.0	96.3±2.72	-
	<94	13	5.4	0.001**
	>94	227	94.6	
Pupil	Dilated	2	.8	0.001**
	PPP	14	5.8	
	Reactive	187	77.9	
	Sluggish	37	15.4	
Associated Symptom	No	53	22.1	0.001**
	Burn	5	2.1	
	CNS (Fits)	11	4.6	
	CNS symptoms (drowsiness)	33	13.8	
	Distress	8	3.3	
	Vomiting	122	50.8	
	Others	8	3.3	
Severity and mortality rate according (PSS score)	None	48	20.0	0.001**
	Minor	110	45.8	
	Moderate	68	28.3	
	Severe	11	4.6	
	Fatal	3	1.3	

* p. value <0.05 is significant, ** p. value <0.01 is highly significant. the data were analyzed by X2 test.
***Mean of GCS and Mean of oxygen saturation are represented as Mean ± SD

Table 4: Management and outcome of participating children

		Frequency	percentage	P. value
History of first aid done to the patient	No	115	48	0.677
	Yes	125	52	
Admitted	No	44	18.3	0.001**
	Admitted to ward	154	64.2	
	Admitted to ICU	42	17.5	
Antidote	Given but not completed	6	3.3	0.001**
	Given in full regimen	22	11.2	
	No specific antidote only supportive	168	85.5	
Outcome	Improved	182	92.8	0.001**
	On-demand	11	5.6	
	Died	3	1.6	

* p. value <0.05 is significant, ** p. value <0.01 is highly significant. the data were analyzed by X2 test.

Regarding the Age Categories

In the current study, in younger age groups (infants and young children < 9 years), accidental poisoning was significantly predominant (100% in infants and toddlers (28 days to <3 yrs.) and 96.8% in young children < 9 years), while intentional poisoning was significantly higher in older ages (9 – 18 years) (P=0.001).

Furthermore, medical, psychiatric history, and previous poisoning conditions were significantly higher in C&D age groups (late childhood & Adolescent (9 – 18 years)) groups (**table 5**).

In group A&B age categories when compared to other age categories; house cleaning agents significantly were the most common poisonings (**Table: 6**).

Regarding management and outcome, in all age groups as shown in **Table: 6**, there were no significant differences between age groups concerning the need for symptomatic treatment or ward admission, while a Significantly majority of adolescents were admitted to ICU (p=0.02) and their average hospital stay was longer than any other age groups (p=0.001). Infants and toddler were significantly presented with non- severity rate.

Table (5): Personal history and medical history in relation to children's age groups

		Infant and toddler n=102	Early childhood n=94	Late childhood n=9	Adolescent n=35	P. value
Sex	F	48(47.1%)	39(41.5%)	6(66.7%)	23(65.7%)	0.06
	M	54(52.9%)	55(58.5%)	3(33.3%)	12(34.3%)	
Residence	Rural	37(36.3%)	39(41.5%)	4(44.4%)	20(57.1%)	0.2
	Urban	65(63.7%)	55(58.5%)	5(55.6%)	15(42.9%)	
Manner of Poison	Accidental	102(100.0%)	91(96.8%)	5(55.6%)	5(14.3%)	0.001**
	Intentional	0(0.0%)	3(3.2%)	4(44.4%)	30(85.7%)	
History Medication	No	101(99.0%)	87(92.6%)	7(77.8%)	26(74.3%)	0.001**
	Yes	1(1.0%)	7(7.4%)	2(22.2%)	9(25.7%)	
Psychiatric History	No	102(100.0%)	91(96.8%)	6(66.7%)	20(57.1%)	0.001**
	Yes	0 (0.0%)	3(3.2%)	3(33.3%)	15(42.9%)	
Previous Time	No	97(95.1%)	83(88.3%)	5(55.6%)	24(68.6%)	0.001**
	Yes	5(4.9%)	11(11.7%)	4(44.4%)	11(31.4%)	

* p. value <0.05 is significant, ** p. value <0.01 is highly significant.

Table (6): poison characteristics and outcome in relation to children age groups

		Infant and toddler n=102	Early childhood n=94	Late childhood n=9	Adolescent n=35	P. value
Type of Poison	Bite	1(1.0%)	2(2.1%)	1(11.1%)	0(0.0%)	0.08
	Drug abuse	11(10.8%)	7(7.4%)	0(0.0%)	4(11.4%)	0.07
	House cleaning	39(38.3%)	27(28.7%)	1(11.1%)	1(2.9%)	0.05*
	Medication	34(33.2%)	38(40.4%)	4(44.4%)	18(51.4%)	0.1
	Pesticide	6(5.9%)	5(5.3%)	0(0.0%)	1(2.9%)	0.2
	Others	8(7.8%)	12(12.8%)	3(33.3%)	9(25.7%)	0.1
	Unknown	3(2.9%)	3(3.2%)	0(0.0%)	2(5.7%)	0.7
Severity and mortality rate according (PSS score)	None	30(29.4%)	17(18.1%)	1(11.1%)	0(0.0%)	0.04*
	Minor	43(42.2%)	54(57.4%)	4(44.4%)	9(25.7%)	0.1
	Moderate	25(24.5%)	17(18.1%)	4(44.4%)	22(62.9%)	0.05*
	Severe	3(2.9%)	6(6.4%)	0(0.0%)	2(5.7%)	0.2
	Fatal	1(1.0%)	0(0.0%)	0(0.0%)	2(5.7%)	0.7
Admitted	No	21(20.6%)	16(17%)	2 (22.2%)	5(14.3%)	0.08
	Admitted to ward	71(69.6%)	66(70.2%)	5 (55.6%)	12(34.3%)	0.1
	Admitted to ICU	10(9.8%)	12(12.8%)	2(22.2%)	18(51.4%)	0.02*
Outcome	Improved	100(98%)	91(96.7%)	9(100.0%)	26(74.3%)	0.1
	On-demand	1(1.0%)	3(3.2%)	0(0.0%)	7(20.0%)	0.01*
	Died	1(1.0%)	0(0.0%)	0(0.0%)	2(5.7%)	0.3
Time Spent In Hospital/Hrs***		4.0(3.0-12.0)	6.0(3.0-7.5)	6.0(4.5- 24.0)	24.0(6.0- 24.0)	0.001**

* p. value <0.05 is significant, ** p. value <0.01 is highly significant.

Regarding the Manner of Poison

Accidental poisoning was significantly more common in males than females while the reverse was true for intentional poisoning (p=0.001). Also, the age of those with intentional poisoning was significantly older than those with accidental poisoning (median age, IQR= 15 years, IQR: 13, 16) years, p=0.001.

In addition, medication and house cleaning agents were significantly (p=0.001) the most attributed poisons in accidental poisoning, while intentional poisoning was mainly through medications (64.9%) followed by pesticides (24.3%) (p=0.001). Furthermore, medical and psychiatric history and a previous history of poisoning were also highly significant (p=0.001) found in cases of intentional poisoning **(Table 7).** Regarding poison severity scoring (PSS), moderate and fatal PSS scores were more significantly found in cases with intentional poisoning (p=0.001 and p=0.03), while minor PSS and none were more common in accidental poisoning (p=0.001).

Regarding management and outcome, intentional poisoning was significantly more severe, and patients needed to be admitted (significantly ICU admission (45% compared to 12.4%, p=0.001)) and had more bad outcomes than accidental poisoning **(Table 7).**

Risk assessment for ICU admission

The risk for ICU admission was highly significant higher in adolescents (median age 10 years with ratio risk assessment 1.081(1.037-1.127) and children with intentional poisoning, and there was no significant difference in relation to sex or residence **(Table 8).** In addition, the Risk for ICU admission was highly significant higher in cases with poor vital signs (low temperature, GCS<15, O2 saturation ≤94%, and brady- or tachycardia), with CNS symptoms and moderate to severe PSS score. Furthermore, ICU admission was higher in medicinal and pesticide poisoning **(Table 9).**

DISCUSSION

The current study was a cross-sectional observational, convenience sampling, which included 240 children and adolescents presenting to the National Environmental and Clinical Toxicological Research Center (NECTR), Cairo University with acute poisoning. The mean age was 3.0 years with ages ranging from 0.58 - to 18.0 years and the largest group was the infants and toddlers (102 patients, 42.5%) while the smallest group was that representing the late childhood group (9 patients, 3.8 %) ($p<0.001$). This concurs with the findings of Azab et al., 2016, as they related this to high levels of physical activity, particularly at two years of age who usually explore the environment around them, everything goes into their mouths and they lack awareness of potential dangers.

Males demonstrated a higher representation in our cases (51.7%), which is consistent with other studies (Azab et al., 2016; Even et al., 2014; Hassan and Siam, 2014). A male predominance is found among poison exposure victims younger than 13 years, but the sex distribution is reversed in teenagers due to greater levels of physical activity in this group, cultural norms sometimes result in less family supervision of male individuals leading to a higher possibility of accidents in this gender. Ramos et al., (2010) suggested that poisoning events in children result from the complex interplay of several factors related to the child, the toxic substance, the environment, family behavior, and/or access to health services.

In the current study, around 58.3% of the victims presented from urban areas, a similar finding was approved by the Egyptian study of El Masry and Azab, 2013. This may be because our centers are present in Cairo but also some agents causing poisoning may be more available in urban than rural areas. This result was in contrast with those of Hassan and Siam, 2014 who found a greater number of victims of poisoning in children presenting from rural areas. The difficulty and cost of transport to the cities as well as the lack of proper documentation of cases makes it difficult to estimate the real number of cases.

We found that 60% of the fathers in our study were educated. This figure is higher than that recorded by Azab et al., 2016, who collected their cases from the Poisoning Unit of a university hospital in Egypt from 2009 to 2016 before the COVID era. We think that the increase in poisoning incidence among educated families during the COVID era may be due to over-awareness about dangers and methods of infection control besides over fear of infection, which leads to misuse of chemicals and disinfectants.

One of the major factors contributing to childhood poisoning may be the mother's absence during the day whether outside the home or engaged in household duties or attending to personal needs (Ahmed et al., 2020). In this study, we recorded an 80.8% employment level in the fathers of the study group compared to 42% in the mothers, which was similar to the findings by Azab et al., 2016.

Negligence was the most common factor resulting in poisoning, recorded in 44.2**%** of the study group ($p<0.01$), followed by the over-activity of the child (31%). Ramos et al., (2010), found that inattention by the parents was the primary cause.

On the weekend or around national or religious holidays, parents may be less alert to hazards or children may exhibit more attention-seeking behavior (Mansori et al., 2016; Urkin and Naimer, 2015)

In our study, Thursday was the most common day of the week for the presentation of cases with 26.7% recorded on this day ($p<0.01$) followed by Sunday (18.8% of cases) with Saturday being the day with the least presentation of cases (6.3%).

Table (7) Personal history, medical history, poison characteristics, and outcome in relation to the manner of poisoning

		Accidental (203)	Intentional (37)	P. value
Age		3.0(2.0- 4.0)	15.0(13.0-16.0)	0.001**
Sex	F	88(43.3%)	28(75.7%)	0.001**
	M	115(56.7%)	9(24.3%)	
Residence	Rural	82(40.4%)	18(48.6%)	0.3
	Urban	121(59.6%)	19(51.4%)	
Type of Poison	Bite	4(2.0%)	0(0.0%)	0.04*
	Drug abuse	20(9.9%)	2(5.4%)	0.05*
	House cleaning	63(31.0%)	0(0.0%)	0.001**
	Medication	75(36.9%)	24(64.9%)	0.001**
	Pesticide	23(11.3%)	9(24.3%)	0.001**
History Medication	No	194(95.6%)	27(73.0%)	0.01*
	Yes	9(4.4%)	10(27.0%)	
Psychiatric History	No	197(97.0%)	22(59.5%)	0.001**
	Yes	6(3.0%)	15(40.5%)	
Previous Time	No	185(91.1%)	24(64.9%)	0.001**
	Yes	18(8.9%)	13(35.1%)	
Severity and mortality rate according (PSS score)	None	47(23.2%)	1(2.7%)	0.001**
	Minor	99(48.8%)	11(29.7%)	0.001**
	Moderate	46(22.7%)	22(59.5%)	0.001**
	Severe	10(4.9%)	1(2.7%)	0.2
	Fatal	1(0.5%)	2(5.4%)	0.03*
Admitted	No	36 (17.7%)	6 (16.3%)	0.001**
	Admitted to ward	153(75.4%)	14 (37.8%)	0.3
	Admitted to ICU	25(12.3%)	17(45.9%)	0.001**
Outcome	Improved	197(97 %)	29(78.4%)	0.01*
	On-demand	5(2.5%)	6(16.2%)	0.001**
	Died	1(0.5%)	2(5.4%)	0.03*

* p. value <0.05 is significant, ** p. value <0.01 is highly significant.

Table (8): Risk assessment for ICU admission for children in the studied groups in relation to demographic data and poison characteristics

		Not Admitted N=198	ICU Admission N=42	OR(95%C.I)	P. value
Age		3.0(2.0- 4.0)	10.0(3.0- 15.3)	1.081(1.037-1.127)	0.001*
Age Categories	Infant and toddler	92(46.5%)	10(23.8%)	0.109 (0.057 - 0.209)	0.001**
	Early childhood	82(41.4%)	12(28.6%)	0.146 (0.080 - 0.268)	0.001**
	Late childhood	7(3.5%)	2(4.8%)	0.286 (0.059 - 1.375)	0.2
	Adolescent	17(8.6%)	18(42.9%)	9.741(3.843-24.694	0.001**
Sex	Females	93(47.0%)	23(54.8%)	0.732 (0.375 - 1.428)	0.3
	Males	105(53.0%)	19(45.2%)		
Residence	Rural	82(41.4%)	18(42.9%)	0.943 (0.481-1.848)	0.8
	Urban	116(58.6%)	24(57.1%)		
Manner of Poisoning	Accidental	178(89.9%)	25(59.5%)	6.052(2.801-13.074)	0.001**
	Intentional	20(10.1%)	17(40.5%)		
Type of Poison	Bite	3(1.5%)	1(2.4%)	0.333(0.035-3.205)	0.6
	Drug abuse	16(8.1%)	6(14.3%)	0.975(0.147-0.958)	0.09
	Medication	86(43.4%)	13(31.0%)	0.151(0.084-0.271)	0.001**
	House cleaning	59(29.8%)	4(9.5%)	0.068(0.025-0.187)	0.001**
	Pesticide	4(2.0%)	8(19.0%)	2.000(0.602-6.642)	0.01*
	Others	24(12.1%)	8(19.0%)	0.933(0.150 - 0.742)	0.09
	Unknown	6(3.0%)	2(4.8%)	0.333(0.067-1.652)	0.2

OR: Odds Ratio; CI: Confidence Interval; the data were analyzed by Logistic Regression analysis.
* p. value <0.05 is significant, ** p. value <0.01 is highly significant.

Table (9): Risk assessment for ICU admission for children in the studied groups in relation to initial presentation and clinical assessment

		Not Admitted (198)	ICU Admission (42)	OR(95%C.I)	P. value
Temperature	Normal	197(99.5%)	35(83.3%)	0.178(0.124-0.255)	0.01*
	High	0(0.0%)	2(4.8%)	-	-
	Low	1(0.5%)	5(11.9%)	5.000(0.584-42.797	0.001**
Respiratory Rate	Normal	190(96.0%)	33(78.6%)	0.174(0.120-0.251)	0.01*
	Bradypnea	0(0.0%)	2(4.8%)	-	-
	Tachypnea	8(4.0%)	7(16.7%)	1.875(0.317-2.413)	0.01*
Heart Rate	Normal	190(96.0%)	33(78.6%)	0.174(0.120-0.251)	0.001**
	Bradycardia	0(0.0%)	4(9.5%)	-	-
	Tachycardia	8(4%)	4(9.5%)	1.800(0.215-2.979)	0.03*
Blood pressure	Normal	198(100.0%)	40(95.2%)	0.168(0.127 - 0.223)	0.01*
	Hypertension	0(0.0%)	0(0.0%)		
	Hypotension	0(0.0%)	2(4.8%)		
Glasgow coma scale	<15	42(21.2%)	25(59.5%)	0.183(0.091-0.370)	0.001**
	=15	156(78.8%)	17(40.5%)		
oxygen saturation	<94%	2(1.0%)	11 (26.2%)	0.029(0.006-0.136)	0.001**
	>94%	196(99.0%)	31(73.8%)		
Associated Symptoms	No	51(25.8%)	2(4.8%)	0.039(0.01-0.161)	0.001**
	Burn	3(1.5%)	2(4.8%)	0.667 (0.111 - 3.99)	0.657
	CNS (Fits)	3(1.5%)	8(19.0%)	2.667(0.707-10.052)	0.01*
	CNS (drowsiness)	21(10.6%)	12(28.6%)	2.571(1.281-4.161)	0.001**
	Distress	5(2.5%)	3(7.1%)	0.6(0.143- 2.511)	0.5
	Vomiting	108(54.5%)	14(33.3%)	0.13(0.074-0.226)	0.001**
	Others	7(3.5%)	1(2.4%)	0.143(0.018-1.161)	0.069
Severity and mortality rate (PSS score)	None	47(23.7%)	1(2.4%)	0.021(0.003-0.154)	0.001**
	Minor	107(54.0%)	3(7.1%)	0.028(0.009-0.088)	0.001**
	Moderate	42(21.2%)	26(61.9%)	2.619(1.380-4.010)	0.001**
	Severe	2(1.0%)	9(21.4%)	4.500(0.972-20.827	0.001**
	Fatal	0 (0.0%)	3(7.1%)	-	-

OR: Odds Ratio; CI: Confidence Interval; the data were analyzed by Logistic Regression analysis.
* p. value <0.05 is significant, ** p. value <0.01 is highly significant.

The time interval between exposure to poison and the appearance of clinical symptoms is an important window of opportunity during which actions to reduce the effect of the toxin

can be performed so delay in presentation to the hospital may be serious (Peden, 2008). In our study, the time between exposure and hospital presentation ranged from 0.5-12hrs with a median (IQR) of 2.0 (2.0-3.0), similar to observations of Sarhan et al., (2018); and Shirkosh et al., (2019). This wide range may be due to the long distance between rural areas and poison centers or some patients who had received primary care in another healthcare facility before. Time spent in the hospital, in the current study, ranged from 1-192 hours with a median (IQR) of 6.0 (3.0- 24 hr), in contrast, Srinivasa et al., (2016) documented that majority of cases were hospitalized for 24-48 hours. Differences may stem from differences in the type of poisoning and individual characteristics of the victims.

The most common manner of poisoning in our patients was accidental (203 patients) with the intentional mode observed in only 37patients. These findings were obvious in different previous studies (Azab et al., 2016; Mahmoud, 2019; Mendonça et al., 2016). We also recorded no homicidal cases; this agrees with the findings of Cavanagh, (2005), who reported that child homicide is rare occurring at a rate of 2 per 100,000 inhabitants globally, and is mainly associated with psychological problems in the caregivers.

Furthermore, it was noticed in this study that the majority of the poisoning incidents occurred at home (87.5%), this may be explained by the fact that homes are the main familiar place to children (Trangadia et al., 2016) and a large number occurred due to the availability of the poison on an accessible surface as found in our study with 65 patients. Ramos et al, (2010) identified a height of lower than 150cm for placement of the poison as being a risk factor for accidental poisoning in young children.

Medications were the most common types of poisoning, recorded in 41.3% of our cases followed by house cleaning agents (26.3%), these are the two most available poisons indoors that children can access and easily ingest them. This is in agreement with findings in middle and high-income countries (Peden, 2008). Also, these results go with a study conducted by Devaranavadagi et al., (2017), where household products and medications represented the majority of toxicity in children aged below 5 years. In a study conducted by Trangadia et al., (2016) in India, the main type of poison was kerosene followed by other household products and snakebites. In Yemen, the commonest cause of poisoning in children admitted to Aden University between 2013 and 2017 was kerosene, house cleaning agents followed by pesticides (Omer, 2020). The most common types of medication in our study were antipsychotic drugs (18% of cases) and non-steroidal anti-inflammatory drugs (15%), which mostly belonged to the parents and were in open storage. This was due to the presence of these drugs in the home with easily accessible to the children.

The oral route represented the highest percentage in our cases (97.5% or 234 patients) ($p<0.01$) which is similar to many previous studies (Hassan and Siam, 2014; Mahmoud, 2019). This is due to the greater ease of administering poisoning agents orally compared to other routes.

The majority of cases showed a minor PSS score (45.8%) especially in the accidental group and the least were fatal (1.3%). Moderate and fatal PSS scores were more commonly observed with intentional poisoning, and significantly, the majority of those with intentional poisoning cases needed ICU admission (45%) and a higher percentage died ($p=0.03$). This is in accordance with Mahmoud (2019), in Zagazig University Hospital.

In the current study, those who died were significantly older in age, and poisoned intentionally ($p <0.05$).

CONCLUSION

Pediatric poisoning is an emergency condition with younger children are highly susceptible to accidental exposure, however, with older ages, the incidence of intentional poisoning and risk of bad outcome increases.

The current study showed (when compared with older studies before 2019) that the long stay-at-home and school absence during COVID episode may cause an increased risk of pediatric poisoning with household poisons even in educated families.

RECOMMENDATIONS

Further studies are needed on larger samples and to compare between three periods (pre, during, and post) Covid era, so that we can add or establish new guidelines for poisoning prevention and management in such pandemic eras.

Declarations

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Conflict of Interest disclosure: the first author is an associate editor in the Egyptian journal of forensic sciences and applied toxicology.

Research ethics and patient consent: The study was approved by the research ethical committee of the faculty of medicine, Cairo University (code: MS-231-2020)

Informed consent was taken from the child's legal guardian before participating in this study

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الملخص العربي

التسمم الحاد في الأطفال وعوامل الخطر المتعلقة به أثناء انتشار وباء كورونا

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يعتبر التسمم الحاد في الأطفال واحدا من أهم الحالات الطارئة التي يتعرض لها الأطفال في هذا العمر علي مستوى العالم، وتختلف أسباب التسمم وأنواعه والعوامل المؤثرة فيه من مكان لمكان ومن دولة لدولة بل وفي نفس الدولة ذاتها. ويعتمد معدل التسمم في الأطفال على عوامل شتي منها عوامل اقتصادية وديموغرافية ومستوى التعليم والمعتقدات والأفكار المختلفة.

تمت هذه الدراسة على 240 من الأطفال تحت عمر 18 عاما والذين تلقوا العلاج بالمركز القومي للسموم الاكلينيكية والبيئية بجامعة القاهرة، وكانت مدة الدراسة ثلاثة شهور في فترة الموجة الثانية لفيروس كورونا المستجد في مصر.

وتبين من هذه الدراسة أن التسمم بالخطأ مازال أكثر انتشارا في الأطفال (خصوصا السن الصغير تحت سن 13 عاما) من التسمم المتعمد والذي ينتشر في الأطفال في السن الأكبر (من 13 إلى أقل من 18 عاما) وكان معدل الحاجة إلى تلقي العلاج في العناية المركزة أكبر في الأطفال في هذا السن. كما تبين أن أهم أنواع السموم التي يتعرض لها الأطفال هي مواد التنظيف والأدوية المتاحة في المنزل.

واستنتجت هذه الدراسة أن التسمم في الأطفال من أخطر حالات الطوارئ خصوصا في العمر الأكبر الذين يتناولون السموم عن عمد مما يؤثر على حالاتهم الصحية وقد يؤدي للوفاة.