

Clinical Profile and Outcome of Poisoned Pediatric Patients Admitted To Poison Control Center, Ain Shams University Hospitals during the Year 2012

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Abstract

Childhood poisoning comprises a significant component of injury-related morbidity and mortality all over the world and exerts a huge amount of pressure on the resources of the health care system as well as the workload on the health care staff. Early and accurate diagnosis and management of poisoning decrease the risk of morbidity and mortality. Therefore, study of manifestations and severity of poisoning by variable agents, effects of treatments and outcome is essential to assess the impact of poisonous substances and the effectiveness of treatment.

Aim of the study: this study aims to determine the clinical profile, management and outcome of acutely poisoned children admitted to Poison Control Center (PCC), Ain Shams University Hospitals during a one year period starting from 1/1/2012 to 31/12/2012.

Methods: The collected data from the cases' medical records included: age, gender, delay time, pre-consultation treatment, clinical manifestations, findings of investigations, place and period of hospitalization, received treatment in the PCC and the outcome.

Results: adolescence was the most frequent age group in this study and female gender was more prominent than male gender. Delay time was significantly increased in non-survivors than survivors. The proportion of deaths in group of patients who received pre-consultation treatment was significantly higher than that in patients who didn't receive any treatment before arrival to the PCC. Faulty management in the form of induction of emesis by salty water intake was found in 2.6% of the cases; 7.7% of these cases were died. Most cases presented with unremarkable changes in vital signs and gastrointestinal manifestations (mainly nausea and vomiting) were the most frequent manifestations in the cases. Hypoglycemia, hyponatremia, hypokalemia and metabolic acidosis were the most common abnormalities found in laboratory investigations. Sinus tachycardia was the most common abnormality found in ECG.

Most of the included cases in this study were admitted in the inpatient section (83 %). The majority of the cases (75%) were hospitalized for short period that didn't exceed 24 hours. Higher PSS was associated with longer hospital stay periods. Corrosives, followed by pesticides were the most frequent cause of prolonged hospitalization (≥ 4 days). Emergency managements were indicated in 11% of the cases and procedures for gastric decontamination were done for 1296 cases (87.3%). All cases received supportive and symptomatic treatments. Atropine was the most frequent antidote that was used either alone or with toxogonin.

The overall mortality ratio was 2.2%. Preschool age group had the greatest mortality ratio (3.7%), followed by infant group (3.6%). Hyponatremia had the highest case fatality rate (100 %), followed by CO poisoning (28.6%).

Conclusion: Gastrointestinal manifestations (mainly nausea and vomiting) were the most frequent manifestations. Hypoglycemia, hyponatremia, hypokalemia and metabolic acidosis were the most common abnormalities found in laboratory investigations. Sinus tachycardia was the most common abnormality found in ECG. Corrosives, followed by pesticides were the most frequent cause of prolonged hospitalization. Atropine was the most frequently used antidote. The overall mortality was 2.2%. Hyponatremia had the highest case fatality rate (100 %).

Recommendations: Increasing public awareness of the first aid measures in childhood poisoning is crucial to avoid complications of faulty measures. Also, it is important to increase public awareness of the services of the information center in the PCC as it presents guidance about management of poisoned cases. Ongoing childhood poisoning surveillance is needed to track its effects and risk factors and to monitor the impact of appropriate interventions.

Keywords Poisoning , Children , Outcome , Clinical , Management

Introduction

Childhood poisoning comprises a significant component of injury-related morbidity and mortality all over the world. According to the WHO world report on child injury prevention, acute poisoning accounts for an estimated 45,000 deaths annually in children and young people under the age of 20 years (Holder et al., 2008).

Acute poisoning in children represents one of the most common medical emergencies encountered in young children, and accounts for a significant proportion of emergency room visits for the adolescent population (Aqeel et al., 2009). It exerts a huge amount of pressure on the resources of the health care system as well as the workload on the health care staff (Randev et al., 2011).

Early and accurate diagnosis and management of poisoning decrease the risk of morbidity and mortality. Therefore, study of manifestations and severity of poisoning by variable agents, effects of treatments and outcome is essential to assess the impact of poisonous substances and effectiveness of treatment.

This study aims to determine the clinical profile, management and outcome of acutely poisoned children admitted to Poison Control Center (PCC), Ain Shams University Hospitals during a one year period starting from 1/1/2012 to 31/12/2012.

Subjects and Methods

This retrospective study was carried out on all acutely poisoned children of both sexes, aged ≤ 18 years old who were admitted to PCC, Ain Shams University Hospitals, during one year period starting from 1/1/2012 to 31/12/2012.

An official permission was taken from the director of the PCC. The approval of The Local Research Ethics Committee was obtained. All personal data were kept anonymous to ensure confidentiality of records.

The medical records of the pediatric patients were revised and the following data were obtained:

1. Age and gender
2. Delay time in hours.
3. Pre-consultation treatment (at hospital or at home)
4. Clinical manifestations: the routine clinical examination of poisoned cases includes recording of vital signs as well as systematic general examination of all body systems. Cases were categorized as cases with normal vital functions or abnormal according to the normal ranges of vital signs in children (Hutchison et al., 2008 and Schafermayer, 2012).- Reed's classification of the level of consciousness (Chadha, 2003) was used for grading of coma in cases with disturbed level of consciousness.

5. Findings of investigations: cases were categorized to normal/abnormal according to the reference ranges.
6. Place and period of hospitalization.
7. Received treatment in the PCC
8. Outcome of the case, either recovery and discharge or death.
9. Severity of poisoning all cases were categorized according to severity of poisoning using poisoning severity score (PSS) (Persson et al., 1998).

Statistical analysis

of the data was done using Statistical package for Social Science (SPSS) version 19 software. Chi-square test was used for comparison of frequencies of qualitative variables between groups. Spearman correlation test was used to assess the strength of association between grades of PSS (as ordinal categorical variable) and delay time (continuous variable). Non-parametric test (Mann-Whitney test) was used for comparison of delay time between two groups since its distribution was not normal. All measured (P) values were two-sided. $P < 0.05$ was considered significant.

Results

This study included 1,521 children who were admitted to the PCC and represented about 22% of the total pediatric cases. For comparison of poisoning between age groups; the included cases were subdivided into: infants (less than one year old), toddlers (1 : <3 years old), preschool age group (3 : <6 years old), school age group (6 : <12 years old) and adolescents (12: 18 years old) (Kail, 2004).

Figure (1) shows the gender distribution in age groups of the included cases. Adolescents represented the most frequent age group among the admitted pediatric cases, followed by toddlers. Female gender was predominant in the adolescent and school age groups while male gender was predominant in younger age groups. This difference was statistically significant.

The delay time in the included cases ranged from 1 to 24 hours. Mann-Whitney test revealed significant increase in the median of delay time in non-survivors than that in survivors (table (1)). Spearman correlation test revealed non-significant correlation between delay time and severity of poisoning (table (2)).

There were 63 cases (4.1%) who received treatments before arrival to the PCC either at home or at another health care facility (figure (2)). Specific treatment was the most frequent pre-consultation treatment; it included atropine injection (20 cases), toxogonin injection (6 cases) and antivenom (2 cases). This was followed by gastric decontamination; gastric lavage (13 cases) and ingestion of activated charcoal (4 cases).

Induction of emesis by salty water was found as faulty management given to 39 cases, 3 cases of them (7.7%) were died.

Figure (3) shows the number of deaths in relation to pre-consultation treatment of the included cases. The proportion of deaths in group of patients who received pre-consultation treatment was significantly higher than that in patients who didn't receive any treatment before arrival to the PCC.

Table (3) shows severity of poisoning according to PSS grading in relation to causative agents of poisoning in the studied cases. Pesticides were the most frequent agent (477 cases, 31.4%), followed by cardiopulmonary drugs (383, 25.2%) and drugs acting on CNS (205, 13.5%).

Regarding the clinical findings of the cases, the majority of the cases were presented in the PCC with unremarkable changes of vital signs. The most common abnormalities were tachycardia (377 cases, 24.8%), hypotension (45 cases, 2.9%), tachypnea (44 cases, 2.8%), hypothermia (100 cases, 6.6%) and disturbed consciousness level with coma grade I (213 cases, 14%) (table (4)).

Table (5) shows findings of systemic examination. Gastrointestinal manifestations (mainly nausea and vomiting) had the greatest frequency among the included cases (996 cases, 65.5%), followed by neurological (345 cases, 22.7%) and respiratory manifestations (211 cases, 13.9%).

Laboratory investigations included investigations for assessment of the patients' general conditions and specific investigations for assessment of the effects of the poisonous agent. Table (6) shows serum levels of electrolytes and blood sugar level. The most common abnormalities were hypokalemia (697 cases, 45.8%), followed by hypoglycemia (194 cases, 14.6%), hyponatremia (60 cases, 3.9%).

Blood gases tests had been done for 330 cases; table (7) shows that, metabolic acidosis was the most common abnormality as it was found in 75 cases (22.7%), followed by respiratory acidosis (45 cases, 13.6%).

Table (8) shows specific toxicological tests that were done for 487 cases (32% of all cases). Pseudo-cholinesterase level in blood was the most frequent performed specific test (351 cases, 72.1%).

Electrocardiographs (ECG) was done for 360 cases (23.7%). Sinus tachycardia was the most frequent abnormality (318 cases, 88.4%), followed by sinus bradycardia (20 cases, 5.6%) (table (9)).

Regarding the place of admission in the PCC, most of the cases were admitted in the inpatient section (1262 cases, 83 %) and 259 cases (17%) were admitted in the intensive care unit (ICU). Table (10) shows the place of admission in relation to age groups of the included cases. Chi-square statistical analysis showed that, the proportion of admitted cases to ICU was significantly smaller in both adolescents and infants than in other age groups.

Most of the cases were hospitalized for short duration not exceeding 24 hours (1141 cases, 75%) and 21.5% (326 cases) were admitted for period ranged from 1:4 days. Only 54 cases (3.5%) were hospitalized for a period \geq 4 days. Table (11) shows durations of hospital stay in relation to severity of poisoning (according to PSS grades). Severe cases (PSS grades 3 and 4) represented the majority of patients who needed hospitalization for long period (\geq 4 days) (48 cases, 88.9%).

Table (12) shows the poisonous agents responsible for prolonged hospitalization period (\geq 4 days). Corrosives, followed by pesticides, were the most common cause of prolonged hospital stay (29.6% and 24.1% respectively). All of the cases were presented with moderate to severe toxicity (PSS grades 2 and 3) and 35.2% (19 cases) of them died.

The received treatment in the PCC included emergency treatments, decontamination procedures, supportive and specific treatments. Emergency treatments were indicated in 172 cases (11.3%), (figure (4)). The most frequent procedure was endotracheal tube intubation (93 cases, 6.1%), followed by oxygen inhalation (74 cases, 4.9%) and cardiopulmonary resuscitation (5 cases, 0.3%).

Mechanical ventilation (MV) was indicated in 63 patients (4.1%). Table (13) shows that, pesticides were the most frequent poisonous agent in these cases (16 cases, 25.4%), followed by substances of abuse and poisonous gases (10 cases each, 15.9% each).

Procedures for gastric decontamination were done for 971 cases (65.4% of the cases with oral route of exposure). Induction of emesis by syrup of ipecac was the most frequent method, followed by activated charcoal administration (figure (5)).

Regarding supportive treatment, all admitted cases received maintenance intravenous fluids. Table (14) shows that, medications for treatment of gastric irritation (histamine receptor type II (H₂) blockers, proton pump inhibitors (PPIs)) and anti-emetics were the most frequent supportive treatment given to the admitted cases (856 cases, 56.3%). Blood transfusion was indicated for two cases; corrosive and snake poisoning.

Specific treatments were indicated in 338 cases (22.2%). Table (15) shows that, atropine was the most frequent antidote that was used either alone or with toxogonin (202 cases, 59.7% and 91 cases, 26.9% respectively).

The outcome of the cases was determined as recovery and discharge from the PCC or death. The percentage of mortality in the admitted cases was 2.2% (33 cases). Figure (6) shows percentages of mortality in age groups of the included cases. Preschool age group had the greatest percentage (3.7%), followed by infants (3.6%).

Table (16) shows case fatality rates of poisonous agent in the studied cases. Hyponatremia had the highest case fatality rate (100 %), followed by CO poisoning (28.6%).

Table (1): Mann-Whitney test comparing the delay time between survivor and none survivors of the pediatric poisoned patients admitted to PCC during the year 2012

Outcome	Survivors (PSS 0,1,2,3)	Non-survivors (PSS 4)
Number	1488	33
Median	2	3
Minimum	1	1
Maximum	24	14
P value: 0.014*		

*: Significant P value

Table (2): Spearman correlation test between delay time and PSS grades in all pediatric poisoned patients admitted to PCC during the year 2012

Correlation	PSS	
Delay time (in hours)	Number	1521
	r	-0.02
	P value	0.44

r: Correlation coefficient

Table (3): Severity of poisoning according to PSS in relation to causative agents of poisoning in the pediatric poisoned patients admitted to PCC, Ain Shams University Hospitals during the year 2012:

Causative agent \ PSS grades	0	1	2	3	4	Total
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Pesticides	50 (33.3)	175 (35.4)	204 (29.1)	38 (26.4)	10(30.3)	477 (31.4)
Cardio-pulmonary drugs	37 (24.7)	143 (28.9)	190 (27.1)	12 (8.3)	1 (3)	383 (25.2)
CNS drugs	10 (6.7)	37 (7.5)	139 (19.9)	12 (8.3)	7 (21.2)	205 (13.5)
Substances of abuse	10 (6.7)	49 (9.9)	52 (7.4)	30 (20.8)	2 (6.1)	143 (9.4)
Chemical substances	0 (0)	17 (3.4)	57 (8.1)	39 (27.1)	6 (18.2)	119 (7.8)
Anti-diabetic agents	27 (18)	45 (9.1)	7 (1)	0 (0)	0 (0)	79 (5.2)
Unknown drugs	1 (0.7)	3 (0.6)	24 (3.4)	2 (1.4)	1 (3)	31 (2)
Food, fish and plant poisoning	0 (0)	9 (1.8)	9 (1.3)	0 (0)	0 (0)	18 (1.2)
Animal poisoning	3 (2)	4 (0.8)	6 (0.9)	4 (2.8)	0 (0)	17 (1.1)
None opioid analgesics	5 (3.3)	8 (1.6)	4 (0.6)	0 (0)	0 (0)	17 (1.1)
Gases	0 (0)	1 (0.2)	4 (0.6)	7 (4.9)	4 (12.1)	16 (1.1)
Miscellaneous drugs [†]	0 (0)	3 (0.6)	1 (0.1)	0 (0)	2 (6.1)	6 (0.4)
Miscellaneous non-medicinal agents ^{††}	7 (4.7)	0(0)	3(0.4)	0(0)	0 (0)	10 (0.7)
Total	150	494	700	144	33	1521 (100)

N: number, (%): percentage by PSS grade, [†]: included iron supplements (2 cases), primperan (one case), colchicine (5 cases) and anticoagulants (2 cases). ^{††}: included: hypernatremia (2 cases), paraphenylene Diamine (one case), silver nitrate (one case), dormex (one case) and cyanide (one case).

Table (4): Vital signs of the paediatric poisoned patients admitted to PCC, Ain Shams University Hospitals during the year 2012:

Vital signs' findings		Number	Percentage (%)	Most frequent cause
Heart rate (beats per minute)	Normal	1095	72	
	Tachycardia	377	24.8	Theophylline (182 cases, 48.3%)
	Bradycardia	38	2.5	Digoxin (11 cases, 28.9%)
	Arrest	11	0.7	OPC (5 cases, 45.5%)
Blood pressure in mmHg	Normal	1452	95.5	
	Hypotension	45	2.9	Theophylline (12 cases, 26.7%).
	Shock	24	1.6	OPC (7 cases, 29.2%)
Respiratory rate (breaths per minute)	Normal	1435	94.4	
	Tachypnea	44	2.8	Kerosene (33 cases, 75%)
	Bradypnea	21	1.4	Carbon monoxide (10 cases, 47.6%)
	Apnea	21	1.4	OPC (8 cases, 38.1%)
Temperature (°C)	Normal	1338	87.9	
	Hypothermia	100	6.6	(OPC) (49 cases, 49%).
	Hyperthermia	83	5.5	Corrosives (21 cases, 25.3%)
Consciousness level	Come grade 0	1199	78.9	
	Coma grade I	213	14	CNS drugs (163 cases, 50.6%)
	Coma grade II	79	5.2	
	Coma grade III	11	0.7	
	Coma grade IV	19	1.2	
Total		1521	100	

Table (5): Gastro-intestinal, neurological, respiratory, genitor-urinary and cutaneous manifestations of the paediatric poisoned patients admitted to PCC, Ain Shams University Hospitals during the year 2012:

Clinical findings		Number	Percentage (%)	
Gastro-intestinal	Nausea And Vomiting	754	75.7	
	Diarrhea	116	11.7	
	Abdominal Colic	44	4.4	
	Dysphagia	39	3.9	
	Hematemesis	32	3.2	
	Melena	11	1.1	
	Total	996	100	
Neurological	Pupils	Constricted	295	19.4
		Dilated	71	4.6
	Fasciculations	98	28.4	
	Motor paresis	65	18.8	
	Agitation	50	14.5	
	Disequilibrium	34	9.9	
	Seizures	30	8.7	
	Hallucinations	29	8.4	
	Extrapyramidal	27	7.8	
	Ataxia	6	1.7	
	Sensory deficit	6	1.7	
	Total	345	100	
	Respiratory	Coarse Crepitations	89	42.2
Respiratory Distress		58	27.5	
Cough		20	9.5	
Rhonchi		20	9.5	
Pulmonary Edema		14	6.6	
Stridor		10	4.7	
Total		211	100	
Genito-Urinary	Urinary Incontinence	187	96.9	
	Urinary Retention	3	1.6	
	Priapism	3	1.6	
	Total	193	100	
Cutaneous	Sweating	98	51.3	
	Cyanosis	47	24.6	
	Flushing - Erythema	16	8.4	
	Edema	13	6.8	
	Bullae	8	4.2	
	Pallor	7	3.7	
	Pain	2	1.0	
	Total	191	100	

Table (6): Results of serum electrolytes and blood sugar levels tests for paediatric poisoned patients admitted to PCC Ain Shams University Hospitals during the year 2012:

Laboratory test		Number	Percentage (%)	Most frequent cause
Random blood sugar (RBG)	Normal	1075	80.9	
	Hypoglycemia	194	14.6	Pesticides (38 cases, 19.6%)
	Hyperglycemia	60	4.5	Theophylline (16 cases, 26.7%)
	Total	1329	100	
Sodium (Na ⁺) serum level	Normal	1459	95.9	
	Hyponatremia	60	3.9	Pesticides (35 cases, 58%).
	Hypernatremia	2	0.2	Salty water
	Total	1521	100	
Potassium (K ⁺) serum level	Normal	476	31.2	
	Hypokalemia	697	45.8	Pesticides (171 cases, 4.5%)
	Total	1521	100	

Table (7): Findings of blood gases tests that had been done for the pediatric poisoned patients admitted to PCC, Ain Shams University Hospitals during the year 2012:

Findings	N	%	Most frequent cause
Normal	167	50.7	
Metabolic acidosis	75	22.7	Pesticides (22 cases, 29.3%)
Respiratory acidosis	45	13.6	Tramadol (20 cases, 44.4%)
Respiratory alkalosis	43	13.0	Theophylline (26 cases, 57.8%)
Total	330	100	

Table (8): Specific toxicological test for diagnosis of acute poisoning in paediatric poisoned patients admitted to PCC, Ain Shams University Hospitals during the year 2012:

Findings	Number	Percentage (%)
Pseudocholinesterase level in blood	351	72.1
Screening test for tramadol	50	1.3
Digoxin level in blood	18	3.7
Carbamazepine level in blood	15	3.1
Paracetamol level in blood	12	2.5
Screening test for benzodiazepines	11	2.3
Screening test for cannabis	10	2.1
Screening test for phenothiazines	9	1.8
Salicylates level in blood	8	1.6
Screening test for opiates	3	0.6
Total	487	100

Table (9): Abnormalities of ECG of the paediatric poisoned patients, admitted to PCC, Ain Shams University Hospitals, during the year 2012:

Electrocardiograph (ECG) abnormality	Number	Percentage (%)
Sinus Tachycardia	318	88.4
Sinus Bradycardia with sagging in ST segment	12	3.4
Ventricular arrhythmias	10	2.8
Sinus bradycardia	8	2.3
Nodal rhythm	3	0.9
Second degree heart block	2	0.5
Ischemic changes	2	0.5
Dropped beats	2	0.5
Atrial arrhythmias	2	0.5
Third degree heart block	1	0.2
Total	360	100

Table (10): Chi-square statistical analysis comparing the place of admission between the age groups of the pediatric poisoned patients admitted to PCC, Ain Shams University Hospitals during the year 2012:

Age group	Admission place		(ICU)		Total
	Inpatient		Number	(%)	
Infants (<1 Y.)	24	85.7	4	14.3	28
Toddlers (1 - < 3 Y.)	259	77.5	75	22.5	334
Preschool age (3 - <6 Y.)	166	77.6	48	22.4	214
School age (6 - <12 Y.)	78	78	22	22	100
Adolescents (12 – 18 Y.)	735	87	110	13	845
Total	1262	83	259	17	1521
Chi-square	X ² : 28.634				
	P-value: <0.001*				

Y: year(s), N: Number, (%): Percentage by age group, *: statistically significant.

Table (11): Durations of hospital stay in relation to grades of PSS of the pediatric poisoned patients admitted to PCC, Ain Shams University Hospitals during the year 2012 in relation to PSS:

Hospital stay (in days)	<1		1-3		4-<7		>7		Total
	N	(%)	N	(%)	N	(%)	N	(%)	
PSS grades									
0	139	92.7	11	7.3	0	0	0	0	150
1	422	85.4	72	14.6	0	0	0	0	494
2	525	75	169	24.1	4	0.6	2	0.3	700
3	50	34.7	65	45.1	20	13.9	9	6.3	144
4	5	15.2	9	27.3	10	30.3	9	27.3	33
Total	1141	75	326	21.4	34	2.2	20	1.3	1521

N: Number, %: Percentage by PSS grade.

Table (12): The poisonous agents responsible for prolonged duration of hospital stay (≥ 4 days) in relation to PSS of the pediatric poisoned patients admitted to PCC, Ain Shams University Hospitals during the year 2012 in relation to PSS:

Poisonous agent	2		3		4		Total
	N	%	N	%	N	%	
Corrosive	4	25	8	50	4	25	16
Pesticides	1	7.7	9	69.2	3	23.1	13
Carbon monoxide	0	0	3	42.9	4	57.1	7
Antiepileptic	0	0	1	20	4	80	5
Tramadol	0	0	1	33.3	2	66.7	3
Antipsychotics	1	33.3	1	33.3	1	33.3	3
Kerosene	0	0	1	50	1	50	2
Calcium channel blockers	0	0	1	100	0	0	1
Theophylline	0	0	2	100	0	0	2
Paraphenylene Diamine (PPD)	0	0	1	100	0	0	1
Unknown	0	0	1	100	0	0	1
Total	6	11.1	29	53.7	19	35.2	54

Table (13): Poisonous agents in cases who required MV in pediatric poisoned patients admitted to PCC, Ain Shams University Hospitals, during the year 2012:

Mechanical ventilation (MV)		
Poisonous agent	Number	Percentage (%)
Pesticides	16	25.4
Substances Of Abuse	10	15.9
Gases	10	15.9
CNS Drugs	9	14.3
Chemicals	5	7.9
Rat Poison	3	4.8
Animal Poisoning	3	4.8
Cardiopulmonary	3	4.8
Unknown Drugs	2	3.1
Hypernatremia	2	3.1
Total	63	100

Table (14): Supportive treatments received by the pediatric poisoned patients admitted to PCC, Ain Shams University Hospitals during the year 2012:

Supportive Treatment	Number	Percentage (%)
IV fluids	1521	100
H ₂ Blockers/PPIs/Anti-Emetics	856	56.3
Antibiotics	169	11.1
Sedative Hypnotics/Anticonvulsants	148	9.7
Steroids	130	8.5
Mechanical Ventilation	63	4.1
Inotropic	26	1.7
Mannitol	22	1.4
Sodium Bicarbonate	18	1.2
Anti-histaminics	8	0.5
Blood transfusion	2	0.1

(%): Percentage of the number of admitted cases. †PPIs: proton pump inhibitors, IV: intravenous.

Table (15): Antidotes given to the children admitted to the PCC, Ain Shams University Hospitals during the year 2012:

Antidotes	Number	Percentage (%)
Atropine	202	59.7
Atropine and Oximes	91	26.9
Naloxone	11	3.3
N-acetyl cysteine	11	3.3
Scorpion antivenom	10	3
Oximes	6	1.8
Snake antivenom	4	1.2
Desferal	2	0.6
Flumazenil	1	0.2
Total	338	100

Table (16): Case fatality rates of acute poisoning in pediatric poisoned patients admitted to PCC, Ain Shams University Hospitals during the year 2012:

Causative agent	Deaths	Total number of cases	Case fatality rate
Organophosphates	8	220	3.6
CNS Drugs	7	205	3.4
Chemicals	6	119	5.0
Carbon monoxide	4	14	28.6
Phosphide	2	134	1.5
Tramadol	2	88	2.3
Hypernatremia	2	2	100
Digoxin	1	47	2.1
Unknown	1	31	3.2

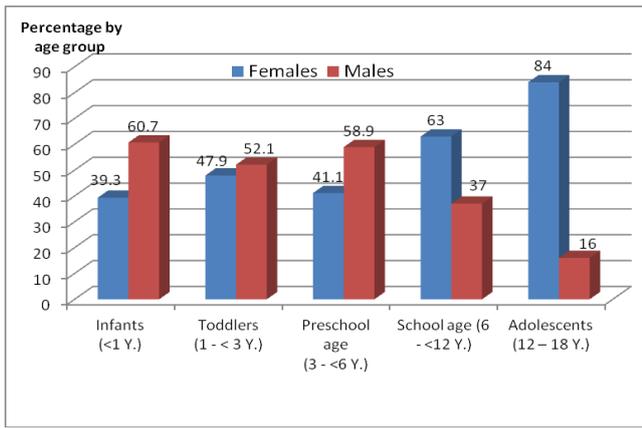


Figure (1): Gender distribution in age groups of poisoned children, admitted to PCC, Ain Shams University Hospitals during the year 2012

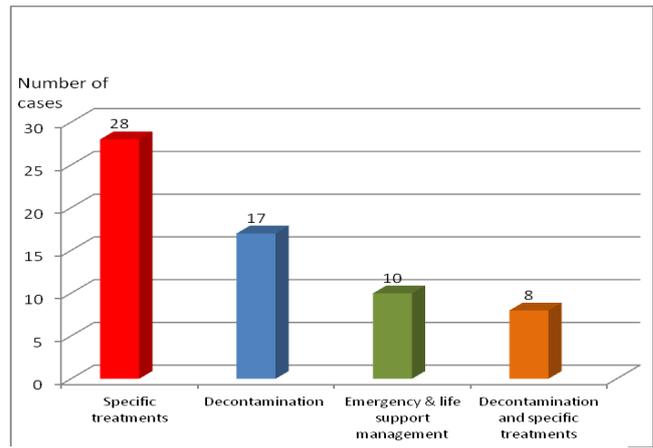


Figure (2): Pre-consultation treatment in the pediatric poisoned patients admitted to PCC, Ain Shams University Hospitals during the year 2012.

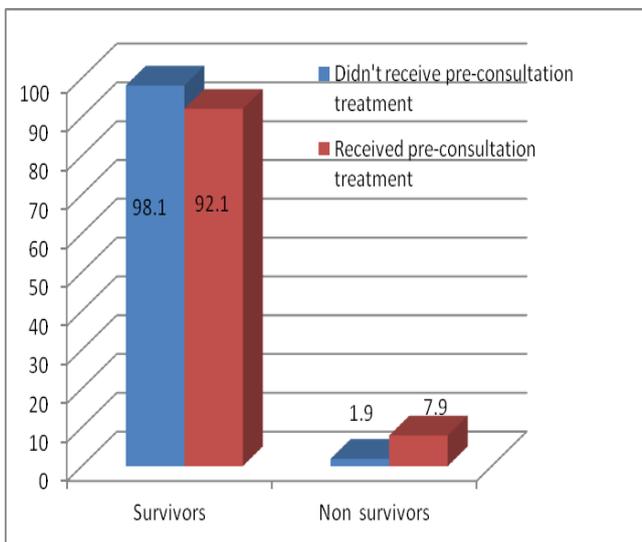


Figure (3): Mortalities in pediatric poisoned patients admitted to PCC, Ain Shams University Hospitals during the year 2012 in relation to pre-consultation treatment.

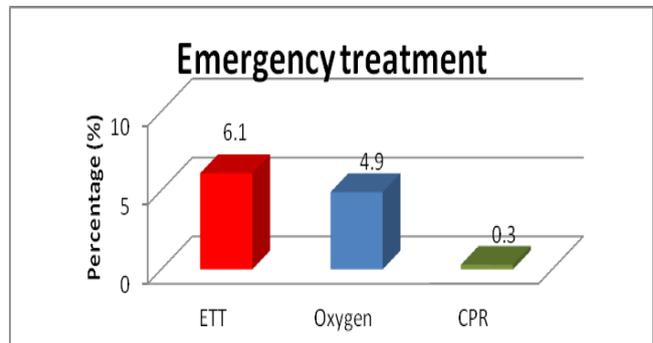


Figure (4): Emergency treatments received by the poisoned children admitted to PCC, Ain Shams University Hospitals during the year 2012.

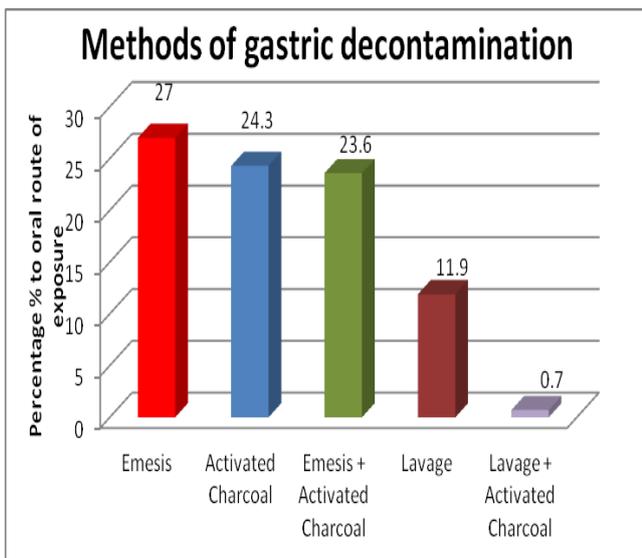


Figure (5): Methods of gastric decontamination in children with oral route of exposure admitted to PCC, Ain Shams University Hospitals during the year 2012.

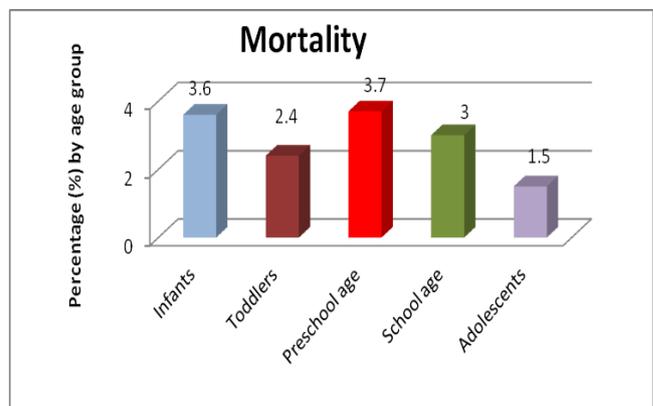


Figure (6): Percentage of mortality in age groups of pediatric poisoned patients admitted to PCC, Ain Shams University Hospitals during the year 2012.

Discussion

Hazard of poisoning by variable agents have been increased due to several factors such as rapid industrialization and exposure to hazardous chemical products, introduction of newer range of drugs for treatment, massive use of pesticides in agriculture and unhealthy dietary habits. (Kiran et al., 2008). Children are particularly at risk because of their curious and exploratory behavior (Vasavada and Desai, 2013).

This study showed a significant increase of the median of delay time in non-survivors than that in survivors. This agreed with Ozdemir et al., (2012) and Ramesha et al, (2009) who studied childhood poisoning in Turkey and India respectively and found an association between prolonged delay time and mortality as majority of deaths occurred in patients presented to the hospital with a delay time exceeding 8 hours.

The duration of pre-hospitalization period was found as a strong predictive factor of severity of poisoning. This was explained by the fact that, delayed treatment allows the suspected initial peak blood level of poison to induce irreversible tissue damage (Sam et al., (2009).

The current study found significant increase of mortality in patients who received pre-consultation treatment than that in patients who didn't receive any treatment before arrival to the PCC.

This may be due to improper pre-consultation management as found by Veale et al. (2013) who reported that, poisoning had been misdiagnosed in pre-referral hospitals in South Africa as organophosphate poisoning and atropine wrongly administered as the antidote in amitraz, glyphosate and aluminium phosphide poisoning.

The same findings were reported by El Masry and Azab, (2013) who studied inappropriate management and transfer of referred patients to the PCC, Ain Shams University Hospitals and found that, 52 cases received improper management that was either incorrect medications (40 cases) or faulty decontamination or resuscitation maneuvers (12 cases).

This study revealed faulty management in the form of induction of emesis by salty water that was given to 2.6% of the included cases (39 cases). The percentage of mortality among these cases was 7.7%. Similar findings were reported by El Masry and Azab, (2013) who found that, 9% of the cases with inappropriate management measures were given salty water for induction of emesis. Death in these cases is most probably due to hypernatremia which is a serious complication of intake of salty water (Su et al., 2010).

In this study, most of the included cases were admitted in the inpatient section. This agreed with Taghaddosinejad et al. (2012) who reported that, ICU

admission is strictly limited to severe and life threatening poisoning.

The current study found most cases were presented with normal vital signs. The most common abnormalities were tachycardia, hypotension, tachypnea and hypothermia. This agreed with Alazab, (2012) who studied acute poisoning in children admitted to a University Hospital in Egypt and found the majority of cases presented with normal vital signs. He found that, hypotension, followed by tachypnea, was the most common abnormality in vital functions.

Theophylline was the most frequent cause of tachycardia and hypotension in this study while kerosene was the most frequent cause of tachypnea and organophosphorous compounds (OPC) were the most frequent cause of hypothermia (49 cases, 49%).

Theophylline may cause sinus tachycardia and tachypnea through its sympathomimetic action and positive chronotropic effect (this was evident in ECG, as sinus tachycardia was the most common abnormality). It may also cause hypotension due to increased beta-2 receptor stimulation (Aggarwal, 2012). Tachycardia and tachypnea can occur as a physiologic response to catecholamine release due to stress and anxiety (Viswanathan and Kollef, 2012).

Poisoned cases with kerosene are commonly presented with tachypnea and signs of respiratory distress due to chemical pneumonitis (Osterhoudt et al., 2006).

(OPC) may cause initial hypothermia due to direct CNS administration of cholinergic agonists in the region of the hypothalamus or cerebral ventricles (Moffatt et al., 2010).

This study found that, cases presented with constricted pupils were more frequent than those presented with dilated pupils. This may be due to high prevalence of pesticides (mainly OPC and carbamates) as they were the most common non-medicinal poisonous agent in the included cases. They are commonly presented with constricted pupils due to the nicotinic action of the excess of acetylcholine in synapses and neuromuscular junctions (Rajendiran et al., 2009).

Mydriasis can result from increased sympathetic stimulation as in cases affected by cocaine, amphetamines and hypoglycemia or from inhibition of muscarinic cholinergic-mediated pupillary constriction secondary to exposure to anticholinergic agents (Perera et al., 2008).

In this study, gastrointestinal manifestations (mainly nausea and vomiting) were the most frequent manifestations among the included cases, followed by neurological manifestations. This agreed with previous studies on poisoned pediatric patients that found the

common presenting systems symptomatology were digestive and CNS (Bhat et al., 2012 and Shwe et al., 2013).

These can be explained by the prevalence of pesticides as they were the most common agents in the included cases. Vomiting in (OPC) toxicity occurs due to excessive muscarinic activity (Aggarwal, 2012). Neurological manifestations are common with (OPC) and carbamates due to their nicotinic action. The effects of excessive cholinergic stimulation at these sites are similar to that of a depolarizing neuromuscular blocker agent (succinylcholine) initially resulting in fasciculations, hypotonia or weakness (Clark, 2006).

Also, respiratory manifestations are common with insecticide toxicity due to excessive stimulation of muscarinic receptors which leads to bronchorrhea and bronchospasm (Rajendiran et al., 2009). (OPC) toxicity can result in respiratory failure and development of cyanosis due to weakness of the respiratory muscles, paralysis of the respiratory center, bronchospasm and increased bronchial secretion (Prasad, 2010).

In this study, the most common abnormalities found in laboratory investigations were hypoglycemia, hyponatremia and hypokalemia. Pesticides were the most common causes of hypokalemia, hypoglycemia and hyponatremia.

In (OPC), excessive adrenergic influences on metabolism cause glycogenolysis with hyperglycemia and ketosis that are occasionally mistaken for diabetic ketoacidosis. Hypoglycemia can also occur, although the mechanism is unclear (Clark, 2006). Hypoglycemia can be caused by many drugs as beta blockers, oral hypoglycemic drugs and salicylate poisoning hyperinsulinism (Josefson and Zimmerman, 2009).

Significant fluid, sodium and potassium concentration abnormalities commonly occur in the setting of xenobiotic exposure. Gastrointestinal losses may occur in the form of vomiting, diarrhea or bleeding. Renal fluid losses may result from increased glomerular filtration rate (inotropes) or impaired absorption (diuretics). Fluid losses also may occur through the skin as a result of sweating as in cases of sympathomimetics, cholinergics or salicylates poisoning or through the lungs as a result of bronchorrhea as in cholinergics (Charney and Hoffman, 2006).

Hypokalemia can result from acute theophylline toxicity due to influx of extracellular potassium into the intracellular compartment despite normal total body potassium content. Also, it is common finding in patients with toxicity from β -adrenergic agonist activity (Jones and Alpern, 2014). (OPC) can cause hypokalemia due to excessive vomiting and diarrhea (Balali-Mood and Saber, 2012).

In this study, metabolic acidosis was the most common blood gases' abnormality caused most commonly by pesticides, followed by respiratory acidosis caused mainly by tramadol.

Metabolic acidosis with increased serum lactate levels is commonly noted as a complication of OPC, theophylline, salicylate overdose (Jaiswal et al., 2009 and M \acute{e} garbane, 2014).

Respiratory acidosis can be primarily caused by the toxin as a result of central respiratory center depression (as in tramadol and opioid toxicity) (Sood et al., 2010) or a premonitory finding due to loss of respiratory compensation for the metabolic acidosis caused by other toxins as pesticides, theophylline or salicylate toxicity (Pearlman and Gambhir, 2009).

Respiratory alkalosis represents the earliest acid-base abnormality of salicylate and theophylline intoxication due to a direct stimulation of the respiratory center (Liamis et al., 2010).

In this study, most of the included cases were admitted in the inpatient department. This agreed with Veale et al., (2013) who studied poisoning in South Africa where most children were admitted for overnight observation while only 5% were admitted to the ICU.

This can be explained by the fact that, ICU admission is strictly limited to severe and life threatening poisoning (Taghaddosinejad et al., 2012).

The present study revealed an association between increased severity of poisoning and prolonged duration of hospital stay. This agrees with Paterson et al., (2006) and Sam et al., (2009) who found an association between the increased duration of hospital stay and the significant mortality and morbidity of the poisoned cases.

Corrosives, followed by pesticides were the most frequent cause of prolonged hospitalization in this study. This can be explained by the fact that, in cases with ingestion of corrosives, hospitalization is indicated for cases with severe or significant manifestation that need intensive care of complications until regaining of oral nutrition (Naik and Vadivelan, 2012).

Regarding the received treatment in the PCC, emergency managements were indicated in small percentage of the cases (11.3%). Poisoning with pesticides was the most frequent causative agent in cases indicated mechanical ventilation, followed by substances of abuse and poisonous gases. This agreed with El Masry and Tawfik, (2013) who found that, (OPC) was the most frequent cause of poisoning in cases required MV (30%), followed by tramadol (16%).

Gut decontamination of ingested poisons was performed in the majority of the cases by induction of emesis by syrup ipecac and administration of activated charcoal. Gastric lavage was done in small percentage of the included cases.

Although there is no evidence from clinical studies that emesis by ipecac improves the outcome of poisoned patient, yet its routine use is still present and

should be prohibited (Yip et al., 2011) as syrup ipecac may cause aspiration, delay the administration or reduce the effectiveness of activated charcoal, oral antidotes, and whole bowel irrigation.

Therefore, recent guidelines of the European Association of Poisons Centers and Clinical Toxicologists as well as the American Academy of Pediatrics recommended that, ipecac should no longer be used routinely as a treatment strategy for treatment of pediatric poisoning (Chyka et al., 2005).

The wide use of ipecac in the PCC for gastric decontamination may be due to limited resources and unavailability of disposable gastric lavage tubes in the market in Egypt which makes ipecac an easier and safer method for gastric decontamination.

On the other hand, activated charcoal is a universal antidote for the majority of poisons (Michael, 2007). Yet, it is contraindicated after the ingestion of corrosive substances, surfactants, or liquid hydrocarbons, and whenever the respiratory tract has not been protected (by intubation) (Chyka et al., 2005).

Symptomatic treatments were given to all of the included cases in the present study. Maintenance IV fluids, followed by medications for treatment of gastric irritation were the most frequent supportive treatment given to the admitted cases. Similar findings were reported by previous studies on childhood poisoning which found that, treatment in most of the cases was non-specific, including general decontamination and supportive-symptomatic therapy (Sahin et al., 2011, Müller and Desel, 2013).

Atropine, followed by oximes, was the most common antidote used in treatment of the included cases in this study. This is can be explained by high prevalence of poisoning by (OPC).

Regarding cases' outcome, this study found the percentage of mortality in the included cases 2.2%. Preschool age group had the greatest percentage of mortality while adolescents group had the smallest percentage.

Similar findings were reported by Bhat et al. (2012) who studied the profile of poisoning in children and adolescent in India and found the greatest mortality ratio in the preschool age group. Also, Haghighat et al., (2013) reported that, acute poisoning in both adults and children is often associated with morbidity rather than mortality. Half of mortalities were in the preschool age group with the highest mortality ratio.

Small proportion of mortality in adolescents group may be explained by predominance of suicidal poisoning in this group since most cases of suicidal attempts aim to draw attention rather than to inflict real harm or cause death. This is of course achieved by taking less toxic drugs in smaller amounts (Ozdemir et al., 2012).

(OPC) was the most frequent cause of mortalities, followed by CNS drugs. Hyponatremia

had the greatest case fatality rate, followed by carbon monoxide poisoning. These findings are in accordance with Malangu and Ogunbanjo, (2009) and Haghighat et al., (2013) who found that, (OPC) accounted for the largest proportion of deaths in acutely poisoned cases

Hyponatremia occurred as a complication of use of salty water for induction of emesis and was found to have the highest case fatality rate. It is known as a fatal complication as it results in brain edema and permanent brain damage (Bockenbauer et al., 2010).

Conclusions

Delay time was significantly increased in non-survivors than survivors. Faulty management in the form of induction of emesis by salty water intake was found in 2.6% of the cases; 7.7% of these cases were died. Most cases presented with normal vital signs and gastrointestinal manifestations (mainly nausea and vomiting) were the most frequent manifestations in the cases. Hypoglycemia, hyponatremia, hypokalemia and metabolic acidosis were the most common abnormalities found in laboratory investigations. Sinus tachycardia was the most common abnormality found in ECG

Most of the included cases in this study were admitted in the inpatient section (83 %). The majority of the cases (75%) were hospitalized for short period that didn't exceed 24 hours. Higher PSS was associated with longer hospital stay periods.

Emergency managements were indicated in 11% of the cases and procedures for gastric decontamination were done for 1296 cases (87.3%). All cases received supportive and symptomatic treatments. Atropine was the most frequent antidote that was used either alone or with toxogonin.

The overall mortality ratio was 2.2%. Preschool age group had the greatest mortality ratio (3.7%), followed by infant group (3.6%). Hyponatremia had the highest case fatality rate (100 %), followed by CO poisoning (28.6%).

Recommendations

It is important to increase the public awareness of the first aid measures in childhood poisoning to avoid complications of faulty measures as induction of emesis by salty water. Also, it is important to increase public awareness of the services of the information center in the PCC as it presents guidance about management of poisoned cases.

Ongoing childhood poisoning surveillance is needed to track its effects and risk factors and to monitor the impact of appropriate interventions

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الملخص العربي

الوجهة الاكلينيكية والنتيجة فى الأطفال المرضى المصابين بالتسمم والذين أدخلوا مركز علاج التسمم،

مستشفيات جامعة عين شمس، خلال عام ٢٠١٢

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يشمل تسمم الأطفال مكونا هاما للأمراض والوفيات المرتبطة بالاصابات فى جميع أنحاء العالم و يمارس قدرا هائلا من الضغط على موارد منظومة الرعاية الصحية فضلا عن عبء العمل على العاملين بالرعاية الصحية. ويقلل التشخيص الدقيق والمبكر والتعامل مع التسمم من خطر المرض والوفاة. لذلك، فان دراسة أعراض وخطورة التسمم بالمواد المختلفة وأثر العلاج والنتيجة ضرورية لتحديد مدى تأثير المادة السامة وفعالية العلاج.

الهدف من الدراسة: تهدف هذه الدراسة الى تحديد الوجهة الاكلينيكية والتعامل مع الأطفال المصابين بالتسمم الحاد والذين أدخلوا مركز علاج التسمم، مستشفيات جامعة عين شمس ونتيجة ذلك، خلال عام واحد يبدأ من ٢٠١٢/١/١ الى ٢٠١٢/١٢/٣١ **طريقة الدراسة:** اشتملت البيانات التى تم جمعها من سجلات المرضى الطبية: العمر، النوع، الفترة بين وقت حدوث التسمم والكشف الطبي، أخذ أى علاج قبل الاستشارة الطبية، الأعراض الاكلينيكية، نتائج الفحوصات، فترة ومكان الحجز والعلاجات التى تم تلقيها بالمركز، نتيجة الحالة.

النتائج: كانت المدة بين وقت حدوث التسمم والكشف الطبي أطول فى الوفيات عند مقارنتها بالحالات التى عاشت. وكانت نسبة الوفيات فى مجموعة المرضى الذين تلقوا علاج قبل الوصول للمركز أعلى منها فى بقية المرضى. وقد وجدت معالجة خاطئة فى صورة تنبيه القى بتعاطى الماء المملح فى ٢٠٦٪ من الحالات، وقد توفى ٧٠٧٪ من هذه الحالات. وقد جاء معظم الحالات بتغيرات غير ملحوظة فى العلامات الحيوية وكانت أعراض تأثر الجهاز الهضمي الأكثر شيوعاً (القيء والغثيان بشكل رئيسي). وقد وجد أن إنخفاض مستوى السكر والصوديوم والبوتاسيوم فى الدم والحمض الأيضى أكثر النتائج الغير طبيعية شيوعا ضمن الفحوص المختبرية. وكان تسارع معدل ضربات القلب الناشئ من العقدة الجيبية الأذينية الشذوذ الأكثر شيوعا فى رسم القلب الكهربائى.

وقد تم حجز معظم الحالات المشتبهة بالدراسة فى قسم الداخلى (٨٣٪). وتم حجز غالبية الحالات (٧٥٪) بالمركز لمدة قصيرة لم تتجاوز ٢٤ ساعة. وقد وجدت صوحبت درجات الخطورة العالية بفترات إقامة فى المستشفى أطول. وكانت المبيدات أكثر الأسباب شيوعا لطول الحجز بالمستشفى (٤ أيام).

وقد لزم عمل تدخلات عاجلة فى ١١٪ من الحالات، وتم عمل إجراءات لإزالة السم من المعدة ل ١٢٩٦ حالة (٨٧،٣٪). وقد تلقت كل الحالات علاجات داعمة وعلاجات للأعراض. وكان الأتروبين الترياق الأكثر شيوعا الذى تم استخدامه إما منفردا أو مع تكسوجونين. وكانت النسبة الكلية للوفيات ٢٠٢٪. وكانت نسبة الوفيات العظمى فى الأطفال فى سن ما قبل دخول المدرسة (٣،٧٪)، تليها مجموعة الرضع (٣،٦٪). وقد كان لحالات زيادة الصوديوم فى الدم أعلى معدل وفيات (١٠٠٪)، يليه حالات التسمم بغاز أول أكسيد الكربون (٢٨،٦٪).

الخلاصة: كانت أعراض تأثر الجهاز الهضمي (الغثيان والقيء بصفة رئيسية) هى الأكثر شيوعا. وقد وجد أن إنخفاض مستوى السكر والصوديوم والبوتاسيوم فى الدم والحمض الأيضى أكثر النتائج الغير طبيعية شيوعا ضمن الفحوص المختبرية. وكان تسارع معدل ضربات القلب الناشئ من العقدة الجيبية الأذينية الشذوذ الأكثر شيوعا فى رسم القلب الكهربائى. وكانت المواد الأكلية، تليها المبيدات، السبب الأكثر شيوعا للعلاج بالمستشفى لفترات طويلة. وكان الأتروبين الترياق الأكثر استعمالا. وكانت نسبة الوفيات الإجمالية فى الحالات ٢،٢٪ وكان لحالات زيادة الصوديوم فى الدم أعلى معدل وفيات (١٠٠٪).

التوصيات: من المهم زيادة الوعي العام بتدابير الإسعافات الأولية فى حالات تسمم الأطفال لتجنب مضاعفات الإجراءات الخاطئة. ومن المهم أيضا زيادة الوعي العام بخدمات مركز المعلومات بمركز علاج التسمم حيث يقدم ارشادا للتعامل مع حالات التسمم. كما تدعو الحاجة الى المراقبة المستمرة لتسمم الأطفال لتعقب آثاره، وعوامل خطورته، ولرصد مدى تأثير التدخلات المناسبة.

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