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Evaluation of Severity of Poisoning Exposures among Patients Presented to Poison Control Center, Ain Shams University Hospitals, Egypt during 2019

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Abstract

Background: Poisoning exposure continues to be an important public health concern in many developing countries and a major cause of morbidity and mortality in Egypt. The information released by the Poison Control Center of Ain Shams University Hospitals (PCC-ASUH) is mostly a trigger for increasing hazards challenging the community.

Aim: To evaluate severity of poisoning exposures among patients presented to PCC-ASUH during year 2019.

Methods: A retrospective study involved patients presented to the PCC-ASUH with history of poisoning during 2019.

Results: This study included 21,492 patients. The majority of poisoning incidents were at the age group of 15 – 25 years (34%) and females outnumbered males (54.8% versus 45.2%). Route of poisoning was mostly oral (89.1%). Most poison exposures were suicidal (51.5%). Drug poisoning constituted the majority of cases (59.5%). Centrally acting drugs were the commonest drugs (18%) and household chemicals were the commonly used poisons (13.4%). Poisoning severity score was mild in 79.4% of cases, moderate in 14.4% and severe in 6.2% of cases. Mortality rate was 0.66%. Higher PSS was associated with prolonged hospital stay and death.

Conclusion: Poisoning is more common in young and middle-aged people. Ingestion was the main route of poisoning and suicidal poisoning predominated. Corrosives and detergents were the most commonly involved toxic substances while centrally acting drugs topped the list of drug poisoning. Higher PSS was associated with prolonged hospital stay and death.

Recommendations:

Poisoning severity score is a simple tool for better poisoning assessment. Strict regulations are needed to control medication marketing.

Key words Egypt; Pattern; PCC-ASUH; Poisoning severity score; Suicidal

Introduction

Poisoning exposure continues to be an important public health concern in many developing countries and a major cause of morbidity and mortality in Egypt *(Tawfik and Khalifa, 2017).* Poisoning develops when a toxic substance is ingested, injected, inhaled, or absorbed through the skin, either intentionally or unintentionally *(Mowry et al., 2014).* Factors affecting the severity and outcome of poisoning in a poisoned patient are multiple and interlinked *(Lam, 2003).*

Poisoning exposures are increasing day-by-day due to rapid changes in the life style and social behavior *(Shadnia et al., 2007)*. The World Health Organization (WHO) estimated that poisons are responsible for more than one million illnesses worldwide and 0.3 million deaths every year *(Thundiyil et al., 2008)*. Regarding Egypt, the exact total number of poisoning incidents that occur each year is difficult to quantify since most of these events actually go unreported and previous epidemiological studies have focused only on regional data.

Thus recognition of the nature, severity and outcome of acute poisoning cases specific for each country is necessary to determine the characteristics and magnitude of the problem according to which adequate preventive measures and management techniques can be taken *(Sahin et al., 2011).*

Poison Control Center of Ain Shams University Hospitals (PCC-ASUH) is the major poison control center in Egypt. Since its establishment in 1981, it has provided adequate services in diagnosis and treatment of approximately 23,000 patients annually throughout Egypt. The information released by the PCC-ASUH is mostly a trigger for increasing hazards challenging the *community (Tawfik and Khalifa, 2017).*

Aim of the Study

The aim of this study is evaluation of severity of poisoning among patients presented to PCC-ASUH during year 2019, and highlighting different changes in trend of this problem as regards the collected data. Annual reports are essential for interpretation of

poisoning data to identify continuously emerging hazards and issue warning reports, thus reducing morbidity and mortality of poisoning exposures.

Patients and Methods

Study design:

This was a retrospective hospital-based study involved all patients presented to the PCC-ASUH with history of acute poisoning from January to December 2019.

Study setting:

The data had been collected from electronic database and medical records of PCC-ASUH. The study variables included demographics (age, sex and residence); type; route and mode of the poison taken; severity; place and duration of admission; management of poisoning and outcome. Poisoning Severity Score (PSS) of European Association of Poisons Centers and Clinical Toxicologists (EAPCCT) was used to grade severity of poisoning at the time of peak manifestations as regards the patient's clinical features (*Persson et al., 1998)*. Grading was described as: (0): None, no symptoms or signs related to poisoning, (1): Mild, transient and spontaneously resolving symptoms, (2): Moderate, Pronounced or prolonged symptoms, (3): Severe or life-threatening symptoms and (4): Death. The collected data were subjected to statistical analysis and tabulation using SPSS program, version 20. Chi-square test was used to test the association between qualitative variables.

Ethical considerations:

Administrative approval was obtained from PCC-ASUH. The study was approved by the Institutional Review Boards of Faculty of Medicine, Ain Shams University. Patient consent was waived because this was a retrospective study based on medical records. Confidentiality of data was maintained and used only for the purpose of epidemiological analysis.

Results

During the study period, a total of 21,492 patients of acute poisoning attended the ED of PCC-ASUH. Age distribution revealed that the majority of poisoning incidents were at the age group of 15 – 25 years accounting for 34% of total cases followed by the age group less than seven years (26.4%) while those between seven and 15 years were the least presentable age group (5.9%) (Table 1). Incidence of toxic exposure was more common among females compared to males (54.8% versus 45.2%) (Table 2). Most of cases originated from Cairo (66.5%) followed by Kalioubeya (18.2%) and Giza (8.1%) governorates (Table 3).

Route of poisoning was mostly oral in 89.1% of cases. Other routes, including inhalation, injection and skin exposures, did not exceed 10.9% of cases (Table 4). Table (5) showed that suicidal mode of poisoning represented 51.5% of cases followed by accidental mode, accounting for 39.6% of cases. Drug overdose, therapeutic errors and criminal causes constituted 8.9% of cases.

Pharmaceuticals and drugs of abuse were responsible for 59.5% of poisoning incidents while non-drug poisoning represented 40.5% of cases (Table 6). Drug poisoning was remarkably due to centrally acting drugs (18%), where antidepressants predominated (4.6%). Drugs of abuse were responsible for 7.9% of poisoning exposures where cannabis represented the majority of cases (4.35%) followed by opiates (1.78%) (Table 7).

Regarding non-drug poisoning, the highest percentage was related to household chemicals (13.4%), mainly corrosives which comprised 6.49% of recorded cases while insecticides and rodenticides accounted for 12.29% of cases. Cases presented with food poisoning were 7.7% while animal poisoning was seen in 2.25% of cases. However toxic gases poisoned cases were 2.32% which involved mainly carbon monoxide poisoning (Table 8). Table (9) and figure (1) summarized the top ten most frequently involved exposure substances received in PCC-ASUH during the year 2019.

Poisoning severity was mild in the majority (79.4%) of cases, moderate in (14.4%) and severe in (6.2%) (Table 10). Table (11) showed that the majority of studied patients (79.4%) needed only observation for a period less than six hours while 14.5% stayed for six hours to one day and 5.4% of cases were admitted for more than one day up to four days. Only 0.3% stayed in the hospital for more than 7 days. Most of studied patients (97.2%) were discharged after complete improvement while 2.15% were discharged against medical advice and death occurred in 143 cases (0.66%). (Table 12) The leading causes of death were mainly organophosphates (34 cases), followed by opiates (21 cases), aluminium phosphide (20 cases) and methanol (9 cases) (Figure 2). Other causes of death from different poisons were displayed in Table (13).

Table (14) outlined the use of emergency measures in the studied poisoned patients where 1.24% of cases required urgent endotracheal intubation and 1.19% of cases were mechanically ventilated. Dopamine was indicated in 0.27% of cases. Decontamination procedures were accomplished on 2% of cases either in the form of gastric lavage or skin wash. Enhanced elimination in the form of activated charcoal was administered for 42.3% of cases while hemodialysis was the mainstay treatment of 22 cases (0.1%). Antidotes treatment accounted for 9.65% of cases. Atropine and obidoxime were the most common antidotes used followed by naloxone, then snake and scorpion anti venoms.

On studying the association between types of toxic agents and age shown in table (15), there were statistically significant differences between different age groups where household chemicals were the most prevalent types in poisoned cases < 7 years (35.9%) followed by therapeutic drugs (34%) and insecticides (12.5%). Otherwise, insecticides were the most prevalent type in the age group from 7-< 15 years (27.9%) followed by drugs (24.2%). On the other hand, drug poisoning was more prevalent in the age groups from 15-<25 years (60.9%), 25-40 years (64.7%) and

>40 years (49.8%). The table also revealed that patients from 15-<25 years were mostly affected by drugs of abuse compared to other age groups.

There was a statistically significant difference as regards types of toxic agents with sex (P= 0.000) where drugs were the prevalent type of poisoning in males (44.8%) followed by substance abuse (12.1%). Regarding females, drug poisoning also predominated (57.3%) followed by household chemicals (16.1%) as shown in table (16).

Table (17) showed a significant difference regarding age when compared to PSS, period of hospitalization and outcome where increasing age was associated with higher PSS, prolonged hospital stay and higher mortality rate. No significant difference had been observed between males and females regarding PSS, period of hospitalization and outcome as shown in table (18).

A significant difference was found between PSS and length of stay where 4.2% of patients with PSS (3) were admitted for a period exceeding seven days and only 0.4% needed observation for a period less than six hours. Mortality rate was significantly higher in patients with PSS (3) compared to those with PSS (1) (7.8% and 0.01% respectively) (Table 19). In addition, there was a significant relation between period of hospitalization and mortality (Table 20, Figure 3).

Regarding toxic agents responsible for mortality in the studied patients, table (21) showed a significant difference between survivors and non-survivors observed with several toxins (e.g. organophosphates, opiates, aluminium phosphide, methanol, corrosives and psychotropics). No significant difference was observed with other toxins (e.g. tramadol, carbon monoxide, zinc phosphide and carbamazepine).

Table (1): Age distribution of poisoned cases received in PCC-ASUH during the year 2019

Age (years)	N	%
<7	5666	26.4
7 - <15	1269	5.9
15 - <25	7289	34
25 – 40	5452	25.3
>40	1816	8.4
Total	21492	100

N: Number of patients, %: Percentage

Table (2): Sex distribution of poisoned cases received in PCC-ASUH during the year 2019

Sex	N	%
Female	11771	54.8
Male	9721	45.2
Total	21492	100

N: Number of patients %: Percentage

Table (3): Residence distribution of poisoned cases received in PCC-ASUH during the year 2019

Region	N	%
Cairo	14285	66.5
Kalioubeya	3911	18.2
Giza	1747	8.1
Upper Egypt Governorates	780	3.6
Other Delta Governorates	429	2
Suez Canal Governorates	285	1.3
Sina	55	0.3
Total	21492	100

N: Number of patients %: Percentage

Table (4): Routes of poisoning in poisoned cases received in PCC-ASUH through year 2019

Route	N	%
Ingestion / Oral	19157	89.1
Inhalation / nasal	1556	7.2
Bite / sting	483	2.2
Injection	210	1
Dermal / skin	86	0.4
Total	21492	100

N: Number of patients, %: Percentage

Table (5): Modes of poisoning in poisoned cases received in PCC-ASUH during the year 2019

Mode	N	%
Suicidal	11063	51.5
Accidental	8521	39.6
Overdose by drug of abuse	1808	8.4
Therapeutic error	80	0.4
Criminal	20	0.1
Total	21492	100

N: Number of patients, %: Percentage

Table (6): Type of causative agents in poisoned cases received in PCC-ASUH during the year 2019

Type	N	%
Drug poisoning	12797	59.5
Non- drug poisoning	8695	40.5
Total	21492	100

N: Number of patients, %: Percentage

Table (7): Pharmaceuticals and drug of abuse intoxicated cases received in PCC-ASUH during the year 2019

Drug	N	%
Addiction drugs	**1693**	**7.9**
Cannabis	936	4.35
Opiates	382	1.78
Tramadol	245	1.14
Strox	100	0.46
Vodoo	30	0.14
Centrally acting drugs	**3874**	**18**
Benzodiazepines	879	4.089
Tricyclic antidepressants	992	4.615
Selective serotonin reuptake inhibitors	46	0.214
Lithium	8	0.037
Psychotropics	960	4.466
Carbamazepine	380	1.768
Other antiepileptics	230	1.07
Pregabalin	240	1.11
Anticholinergics	6	0.027
Cogentin	19	0.088
Baclofen	114	0.53
Analgesics	**1614**	**7.5**
NSAIDs	676	3.145
Acetaminophen-containing analgesics	833	3.875
Salicylates	105	0.488
Cardiovascular drugs	**1435**	**6.7**
Theophylline	611	2.842
Beta Blockers	507	2.36
Antihypertensives	287	1.33
Digoxin	18	0.083
Calcium channel antagonists	12	0.05
Antidiabetic medications	**475**	**2.2**
Insulin and oral hypoglycemic drugs	475	2.2
Others	**3706**	**17.2**
Antibiotics	511	2.377
Methotrexate	12	0.05
Oral contraceptive pills	183	0.851
Antihistaminics	558	2.596
Vitamins	328	1.526
Flagyl	131	0.609
Miscellaneous	446	2.07
Unknown	1537	7.15
Total	**12797**	**59.5**

N: Number of patients, %: Percentage, NSAIDs: Non-steroidal anti-inflammatory drugs

Table (8): Non-drug most frequently involved in poisoned cases received in PCC-ASUH during the year 2019

Type	N	%
Food poisoning	**1649**	**7.7**
Bacterial	1629	7.6
Ciguatara	14	0.065
Botulism	6	0.03
Insecticides & rodenticides	**2644**	**12.29**
Organophosphate insecticides	1958	9.11
Zinc Phosphide	640	2.97
Aluminium phosphide	46	0.21
Household chemicals	**2891**	**13.4**
Corrosives	1394	6.49
Detergents	918	4.27
Kerosene and petroleum distillates	479	2.23
Phenol	100	0.46
Animal poisoning	**483**	**2.25**
Scorpion	334	1.55
Snake	149	0.69
Toxic gases	**499**	**2.32**
Carbon Monoxide	494	2.3
Hydrogen sulfide	5	0.02
Alcohols	**468**	**2.18**
Ethanol	426	1.98
Methanol	42	0.2
Metals	**12**	**0.056**
Lead	5	0.02
Mercury	2	0.01
Cyanide	5	0.02
Other non-drug agents	**49**	**0.23**
Plants and herbals	8	0.04
Phenylenediamine (PPD)	29	0.13
Methemogobinemia	3	0.01
Nicotine	4	0.02
Dormex	5	0.02
Total	**8695**	**40.5**

N: Number of patients, %: Percentage

Table (9): Top ten most frequently involved exposure substances received in PCC-ASUH during the year 2019

All exposures	N	%
Corrosives and detergents	2312	10.76
Organophosphate insecticides	1958	9.11
Food poisoning	1649	7.7
Tricyclic antidepressants	992	4.61
Psychotropics	960	4.46
Cannabis	936	4.35
Benzodiazepines	879	4.08
Acetaminophen-containing analgesics	833	3.87
NSAIDs	676	3.14
Zinc Phosphide	640	2.97

N: Number of patients, %: Percentage, NSAIDs: Non-steroidal anti-inflammatory drugs

Table (10): Severity grading of poisoning cases received in PCC-ASUH during the year 2019 according to poisoning severity score *(Persson et al., 1998)*

PSS	N	%
Mild (1)	17066	79.4
Moderate (2)	3084	14.4
Severe (3)	1342	6.2
Total	**21492**	**100**

N: Number of patients, %: Percentage, PSS: Poisoning severity score

Table (11): Period of hospitalization of poisoned cases received in PCC-ASUH during the year 2019

Period of hospitalization	N	%
< 6 hrs	17066	79.4
6 hrs - 1 day	3106	14.5
>1 day - 4 days	1160	5.4
> 4 days - 7 days	88	0.4
> 7 days	72	0.3
Total	**21492**	**100**

N: Number of patients, %: Percentage

Table (12): Outcome of acutely poisoned cases received in PCC-ASUH through year 2019

Outcome	N	%
Discharge with complete improvement	20885	97.2
Discharge against medical advice	464	2.2
Death	143	0.7
Total	**21492**	**100**

N: Number of patients, %: Percentage

Table (13): Death-related offending agents in 143 acutely poisoned cases received in PCC-ASUH through year 2019

Agent	N	%	Agent	N	%
Organophosphates	34	23.8	Calcium channel antagonists	3	2.1
Opiates	21	14.7	Theophylline	2	1.4
Aluminium phosphide	20	13.9	Pregabalin	2	1.4
Methanol	9	6.3	Insulin & oral hypoglycemic drugs	1	0.7
Tramadol	5	3.5	Digoxin	1	0.7
Carbon monoxide	5	3.5	Paraphenylenediamine	1	0.7
Corrosives	5	3.5	Methemoglobinemia	1	0.7
Psychotropics	4	2.8	Dormex	1	0.7
Zinc phosphide	4	2.8	Acetaminophen	1	0.7
Carbamazepine	3	2.1	Cannabis	1	0.7
Methotrexate	3	2.1	Hydrogen sulfide	1	0.7
Benzodiazepines	3	2.1	Unknown	12	8.4
Total	**143**	**0.66**			

N: Number of patients *%: Percentage*

Table (14): Emergency treatment and interventions offered to acutely poisoned cases received in PCC-ASUH during the year 2019

Type of intervention	**N (%)**
Endotracheal intubation	268 (1.24)
Mechanical Ventilation	255 (1.19)
Dopamine	58 (0.27)
Decontamination (2%)	
Gastric lavage	344 (1.6)
Skin wash	88 (0.4)
Enhanced elimination (42.7%)	
Activated charcoal	9102 (42.3)
Hemodialysis	22 (0.1)
Sodium bicarbonate	54 (0.25)
Antidotes (9.65%)	
Atropine	1117 (5.19)
Obidoxime	475 (2.2)
Naloxone	104 (0.48)
Scorpion anti-venom	99 (0.46)
Snake anti-venom	87 (0.4)
N-acetylcysteine	67 (0.3)
Hyperbaric O2 therapy	35 (0.16)
Ethanol	29 (0.13)
Flumazenil	25 (0.11)
Folinic acid	12 (0.05)
Glucagon	11 (0.05)
Antibotulinum	6 (0.03)
Calcium gluconate	5 (0.02)
Methylene blue	3 (0.01)
Total	**2075**

N: Number of patients %: Percentage

Table (15): Chi- Square statistical analysis of types of toxic agents in acutely poisoned cases received in PCC-ASUH during 2019 regarding age groups

Types of toxic agents	**Age (years)**										**Total (N = 21492)**	**X^2**	**P-value**
	<7 (N= 5666)		**7 - <15 (N = 1269)**		**15 - < 25 (N = 7289)**		**25 - 40 (N = 5452)**		**>40 (N = 1816)**				
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	N	%			
Therapeutic drugs	1928	34	308	24.2	4437	60.9	3527	64.7	904	49.8	**11104**	1716.8	0.000*
Drugs/substances of abuse	330	5.8	117	9.2	636	8.7	567	10.4	43	2.4	**1693**	219.9	0.000*
Insecticides/rodenticides	709	12.5	355	27.9	855	11.7	570	10.5	155	8.5	**2644**	209.9	0.000*
Household chemicals	2035	35.9	214	16.9	233	3.2	203	3.7	206	11.3	**2891**	3149.9	0.000*
Food poisoning	397	7.1	203	16	487	6.7	289	5.3	273	15	**1649**	319.9	0.000*
Animal poisoning	47	0.8	33	2.6	213	2.9	117	2.1	73	4	**483**	93.9	0.000*
Toxic gases	90	1.6	15	1.2	190	2.6	104	1.9	100	5.5	**499**	196.9	0.000*
Alcohols	125	2.2	18	1.4	220	3	55	1	50	2.8	**468**	65.4	0.000*
Others[#]	5	0.1	6	0.5	18	0.2	20	0.4	12	0.7	**61**	20.05	0.000*

(#): Metals and other non-drug agents (*): statistically significant difference

Table (16): Chi- Square statistical analysis of types of toxic agents in acutely poisoned cases received in PCC-ASUH during 2019 regarding sex

Types of toxic agents	Sex				Total (N = 21492)	X^2	P-value
	Males (N = 9721)		Females (N = 11771)				
	N	%	N	%			
Therapeutic drugs	4356	44.8	6748	57.3	**11104**	334.04	0.000*
Drugs/substances of abuse	1180	12.1	513	4.4	**1693**	444.14	0.000*
Insecticides/rodenticides	1131	11.6	1513	12.9	**2644**	7.33	0.007*
Household chemicals	994	10.2	1897	16.1	**2891**	158.68	0.000*
Food poisoning	1094	11.3	555	4.7	**1649**	321.36	0.000*
Animal poisoning	349	3.6	134	1.1	**483**	145.68	0.000*
Toxic gases	265	2.7	234	2	**499**	12.79	0.000*
Alcohols	325	3.3	143	1.2	**468**	113.23	0.000*
Others#	27	0.3	34	0.3	**61**	0.023	0.879

(#): Metals and other non-drug agents, (*): statistically significant difference, P-value > 0.05: Non significant difference

Table (17): Age group distribution in relation to poisoning severity score, period of hospitalization and outcome in acutely poisoned cases received in PCC-ASUH during the year 2019

		Age (years)										X^2	P-value
		<7 (N= 5666)		7 - <15 (N = 1269)		15 - < 25 (N = 7289)		25 - 40 (N = 5452)		>40 (N = 1816)			
		N	%	N	%	N	%	N	%	N	%		
PSS	Mild (1)	4838	85.4	1080	85.1	6135	84.2	4108	75.3	905	49.8	7175.9	0.000*
	Moderate (2)	634	11.2	134	10.6	807	11	930	17.1	579	31.9		
	Severe (3)	194	3.4	55	4.3	347	4.8	414	7.6	332	18.3		
Period of hospitalization	< 6 hrs	5292	93.4	1122	88.4	6973	95.7	3014	55.3	665	36.6	8508.7	0.000*
	6 hrs - 1 day	53	0.9	69	5.4	50	0.7	1991	36.5	943	51.9		
	>1 day - 4 days	300	5.3	51	4	230	3.1	431	7.9	148	8.1		
	> 4 days - 7 days	7	0.1	23	1.8	19	0.3	3	0.1	36	2		
	> 7 days	14	0.2	4	0.3	17	0.2	13	0.2	24	1.3		
Outcome	Survival	5643	99.6	1258	99.1	7262	99.6	5407	99.2	1779	98	99.2	0.000*
	Death	23	0.4	11	0.9	27	0.4	45	0.8	37	2		

Chi square test was used, PSS: Poisoning severity score, (*): statistically significant difference

Table (18): Sex distribution in relation to poisoning severity score, period of hospitalization and outcome in acutely poisoned cases received in PCC-ASUH during the year 2019

		Sex				X^2	P-value
		Males (N = 9721)		Females (N = 11771)			
		N	%	N	%		
PSS	Mild (1)	7682	79	9384	79.7	2.652	0.27
	Moderate (2)	1405	14.5	1679	14.3		
	Severe (3)	634	6.5	708	6		
Period of hospitalization	< 6 hrs	7700	79.2	9366	79.6	8.036	0.09
	6 hrs - 1 day	1387	14.3	1719	14.6		
	>1 day - 4 days	565	5.8	595	5.1		
	> 4 days - 7 days	34	0.3	54	0.5		
	> 7 days	35	0.4	37	0.3		
Outcome	Survival	9651	99.3	11698	99.4	0.804	0.37
	Death	70	0.7	73	0.6		

Chi square test was used, PSS: Poisoning severity score, P-value > 0.05: Non significant difference

Table (19): Poisoning severity score in relation to period of hospitalization and outcome in acutely poisoned cases received in PCC-ASUH during the year 2019

		PSS						X^2	P-value
		Mild (1) (N = 17066)		Moderate (2) (N = 3084)		Severe (3) (N = 1342)			
		N	%	N	%	N	%		
Period of hospitalization	< 6 hrs	15816	92.7	1244	40.3	6	0.4	22833.65	0.000*
	6 hrs - 1 day	1241	7.3	1736	56.3	129	9.6		
	>1 day - 4 days	9	0.1	79	2.6	1072	79.9		
	> 4 days - 7 days	0	0.0	10	0.3	78	5.8		
	> 7 days	0	0.0	15	0.5	57	4.2		
Outcome	Survival	17063	99.9	3049	98.8	1237	92.2	1166.2	0.000*
	Death	3	0.01	35	1.1	105	7.8		

Chi square test was used, PSS: Poisoning severity score, (*): statistically significant difference

Table (20): Relation between outcome and period of hospitalization in acutely poisoned cases received in PCC-ASUH during the year 2019

Period of hospitalization	Outcome		X^2	P-value
	Survivors (N = 21349)	Non-survivors		
	N (%)	No. = 143		
< 6 hrs	17057 (79.9%)	9 (6.3%)	2155.4	0.000*
6 hrs - 1 day	3087 (14.5%)	19 (13.3%)		
>1 day - 4 days	1085 (5.1%)	75 (52.4%)		
> 4 days - 7 days	69 (0.3%)	19 (13.3%)		
> 7 days	51 (0.2%)	21 (14.7%)		

Chi square test was used, (*): statistically significant difference

Table (21): Relation between types of toxic agents and outcome in acutely poisoned cases received in PCC-ASUH during the year 2019

Toxic agents	Survivors (N = 11993)	Non survivors (N = 143)	X^2	P-value
	N (%)	N (%)		
Organophosphates	1924 (16%)	34 (23.8%)	6.246	0.012*
Opiates	361 (3%)	21 (14.7%)	63.186	0.000*
Aluminium phosphide	26 (0.2%)	20 (13.9%)	709.535	0.000*
Methanol	33 (0.3%)	9 (6.3%)	148.424	0.000*
Tramadol	240 (2%)	5 (3.5%)	1.597	0.206
Carbon monoxide	489 (4.1%)	5 (3.5%)	0.122	0.727
Corrosives	1389 (11.6%)	5 (3.5%)	9.086	0.003*
Psychotropics	956 (8%)	4 (2.8%)	5.193	0.023*
Zinc phosphide	636 (5.3%)	4 (2.8%)	1.776	0.183
Carbamazepine	377 (3.1%)	3 (2.1%)	0.509	0.476
Methotrexate	9 (0.1%)	3 (2.1%)	58.539	0.000*
Benzodiazepines	876 (7.3%)	3 (2.1%)	5.702	0.017*
Calcium channel antagonists	9 (0.1%)	3 (2.1%)	58.539	0.000*
Theophylline	609 (5.1%)	2 (1.4%)	4.001	0.045*
Pregabalin	238 (2%)	2 (1.4%)	0.250	0.617
Insulin and oral hypoglycemic drugs	474 (4%)	1 (0.7%)	3.976	0.046*
Digoxin	17 (0.1%)	1 (0.7%)	2.966	0.085
Paraphenylenediamine	28 (0.2%)	1 (0.7%)	1.286	0.257
Methemoglobinemia	2 (0.02%)	1 (0.7%)	26.645	0.000*
Dormex	4 (0.03%)	1 (0.7%)	15.218	0.000*
Acetaminophen	832 (6.9%)	1 (0.7%)	8.602	0.003*
Cannabis	935 (7.8%)	1 (0.7%)	10.000	0.002*
Hydrogen sulfide	4 (0.03%)	1 (0.7%)	15.218	0.000*
Unknown	1525 (12.7%)	12 (8.4%)	2.389	0.122

Chi square test was used, (*): statistically significant difference, P-value > 0.05: Non significant difference

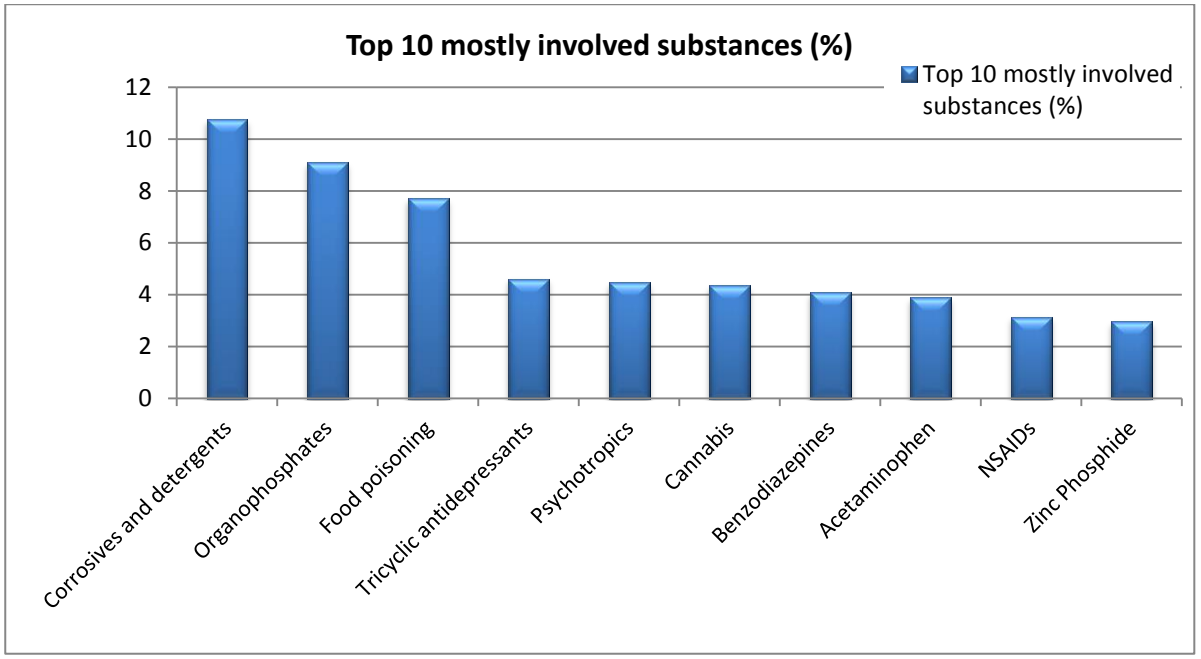

Figure (1): Top 10 most frequently involved substances in PCC-ASUH during the year 2019.

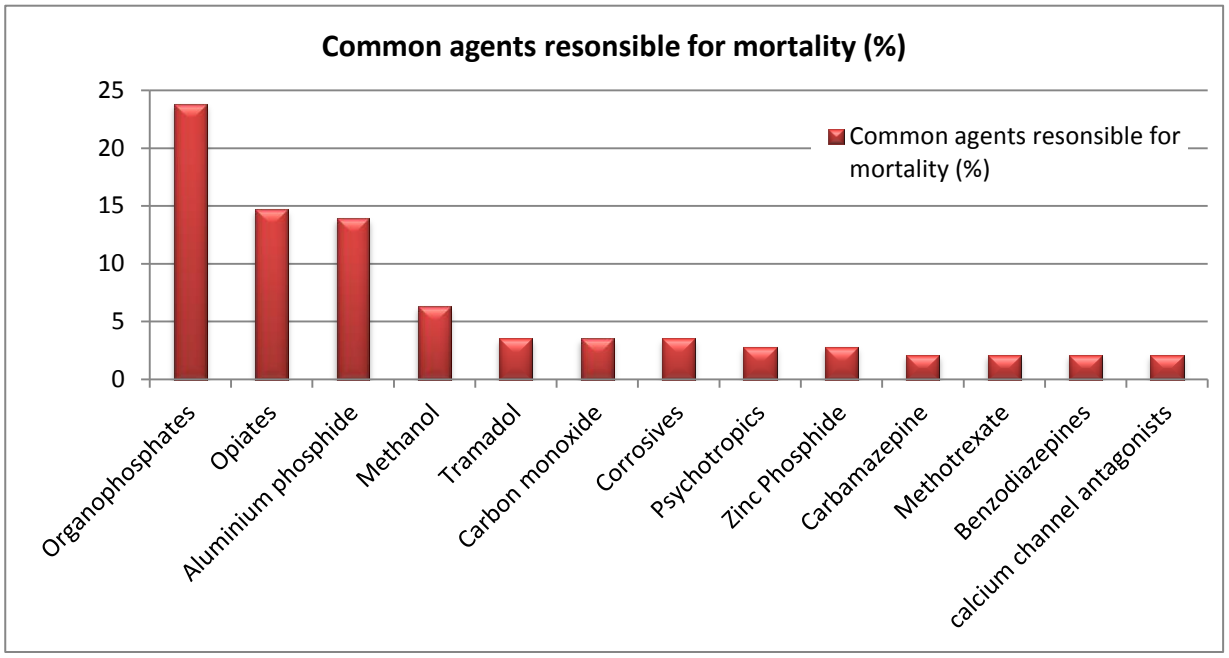

Figure (2): Common agents responsible for mortality in PCC-ASUH during the year 2019.

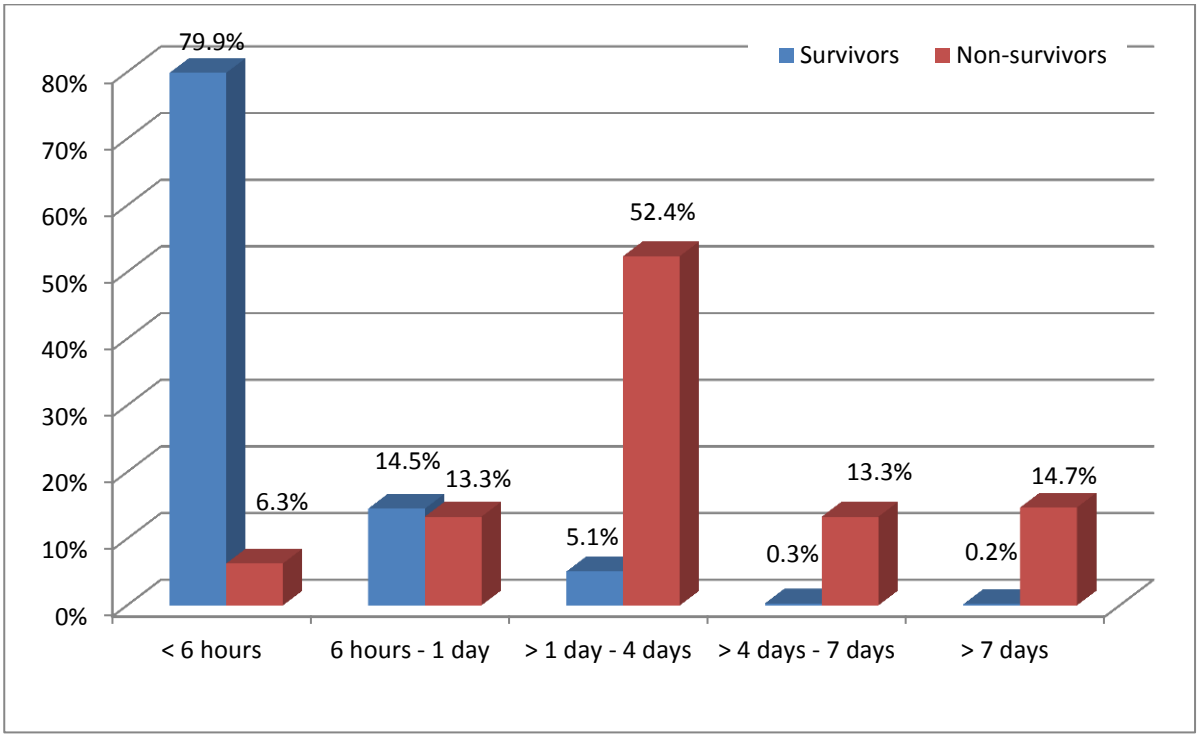

Figure (3): Relation between the outcome and hospital stay in the studied cases.

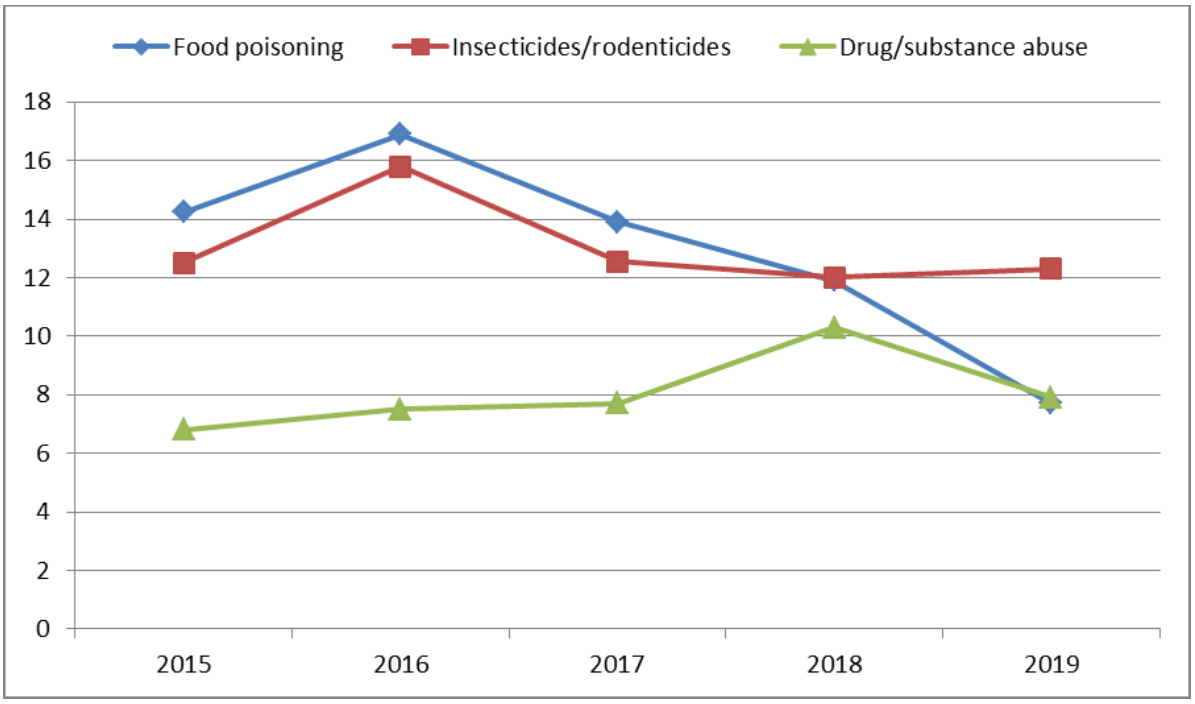

Figure (4): Yearly variation of some types of intoxication presented to PCC-ASUH.

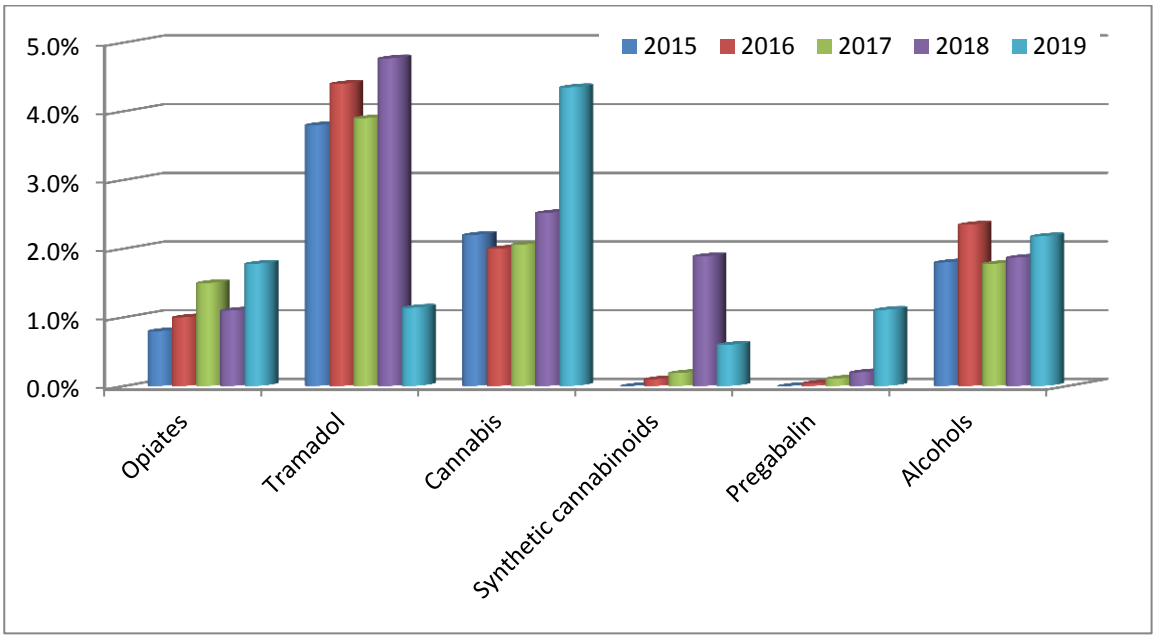

Figure (5): Yearly variation of drug/substance abuse presented to PCC-ASUH.

Discussion

Toxicological exposures, whether intentional or unintentional, continue to be a significant cause of morbidity and mortality in Egypt. Poison Control Center of Ain Shams University hospitals is the first and largest national poison treatment center in Egypt where thousands of poisoned patients are received yearly. The current study included a total number of 21,492 poisoned patients presented to the PCC-ASUH during the year 2019.

The study revealed that the majority of cases (59.3%) were from 15 to 40 years old followed by the age group less than seven years (26.4%). This came in accordance with previous PCC-ASUH annual reports where poisoned patients between 15 and 40 years ranged between 59.2% and 63.5% *(Halawa et al., 2013; Tawfik and ElHelaly, 2015; Tawfik and Khalifa 2017).* Additionally, other studies observed that acute poisoning was prevalent among younger adults with less than 3% of toxic exposures observed in people aged 60 years or older (*Cassidy et al., 2008; Karbakhsh and Zandi, 2008)*. The high incidence of poisoning in this age group deserves particular attention and could be attributed to

tremendous emotional, social, political and economic challenges in Egypt *(El Masry and Tawfik, 2013)*. In contrast, a similar Egyptian study done by *Hegazy and Elfiky (2016)* in Menoufia showed that poisoned cases aged less than seven years predominated (40.1%) followed by those aged from seven to 15 years (27.9%). In addition, the 2018 annual report of the American Association of Poison Control Centers' National Poison Data System (NPDS) revealed that approximately half of poisonings (44.2%) occurred in children aged five years and younger *(Gummin et al., 2019)*.

In the current study, 54.8% of poisoned patients were females and 45.2% were males. This was in agreement with an Egyptian study done by *Abo El-Noor (2013)* and an Ethiopian study done by *Adinew and Asrie (2016)* where females represented 57.1% and 63.5% of their patients respectively. On the contrary, these results disagreed with those obtained by *Anthony and Kulkarni (2012) and Prayag et al. (2016)* who reported that male poisoned patients outnumbered females in India, representing 52.5% and 62.7% of cases respectively. Female preponderance in our study could be due to higher rate of psychological stress, family conflicts and emotional liability in young women with their tendency to prefer suicidal attempts using different poisons or drugs as a way of salvation.

The majority of cases in this study originated from Cairo (66.5%) which was largely expected as the PCC-ASUH is located in Cairo. This distribution was similar to data recorded during the year 2015 which revealed that most of cases came from Cairo (69.2%) *(Tawfik and Khalifa, 2017)*. Poisoned patients in other governorates could have been treated in their regional poison control centers or district hospitals.

More than 89% of studied poisoned cases were exposed through oral route while other routes represented only 10.9%. This agreed with *Hegazy and Elfiky (2016)* and *Asawari et al. (2017)* where ingestion was the main route of exposure. Oral route could reflect the increased potential for suicidal attempts or household exposure and decreased possibility of occupational and environmental toxicities in our study.

Despite the strong religious morals that ban self-destruction and deliberate self-killing, yet suicidal attempts occurred in 51.5% of our studied patients followed by accidental poisoning (39.6%). These results were in accordance with *Adinew and Asrie (2016)* and *Bamathy et al. (2017)*. Acute deliberate self-poisoning is mostly a dynamic medical illness that represents acute exacerbation of a chronic underlying psychological disorder *(Moghaddam et al., 2014)*. Suicidal attempts could be also linked to several social reasons as poverty, unemployment, stress owing to family burden, serious health problems, substance abuse, educational issues (e.g. failure in examinations or lack of financial support), and disappointment in love affairs *(Prayag et al., 2016)*. In contrast, the 2018 annual report of the American Association of Poison Control Centers found that only 19.1 % of poisoning was intentional *(Gummin et al., 2019)*.

The current study declared that drug poisoning was more prevalent cause of poisoning (59.5%) compared to non-drug poisoning (40.5%), bearing a great resemblance to the data issued by *Wijegoonawardene et al. (2015) and Hegazy and Elfiky (2016)* where drugs were responsible for poisoning in 63.6% and 52.9% of their studied patients, respectively. On the other hand, *Sigdel et al. (2019)* recorded non-drug poisoning, mainly by organophosphorous insecticides in 68.4% of their poisoned patients in Nepal.

It was obvious that centrally acting drugs constituted 18% of toxic exposures in the current study, where antidepressants predominated (4.6%) followed by psychotropics (4.46%). This was in agreement with poisoning pattern of cases presented to PCC-ASUH during 2015 *(Tawfik and Khalifa, 2017) and Bamathy et al. (2017)*. This could be attributed to the availability of medications among the general population without restriction rules or banning programs enrolled by the government. In contrast, *Asawari et al. (2017)* reported NSAIDs and analgesics as the major causes of drug poisoning in their study.

Drug of abuse poisoning constituted 7.9% of presentations in 2019 compared to 10.3% in 2018 (as shown in figure 4) and cannabis represented the majority of cases (4.35%) followed by opiates (1.78%). Though an alarming figure has been observed following the progressive rise in synthetic cannabinoids exposures recently, reaching 472 cases in 2018 (1.89% of all cases), a sharp decrease was found in our study where they accounted for 130 cases (0.6%) *(PCC-ASUH annual report, 2018)*. The recent emergence of synthetic cannabinoids is mainly connected to their ability to induce psychoactive effects but with negative drug screening test. In addition, they are highly available with easy access and have lower costs compared to traditional cannabis *(Zanda and Fattore, 2018)*. The observed reduction in synthetic cannabinoids exposures during 2019 was most likely attributed to their placement into Schedule I and/or reduced use due to increased public awareness regarding their toxicity (*Hassen et al., 2018)*. Another observed result is the continuous increase in pregabalin exposures in the present study, rising from only 9 cases (0.04%) reported during 2016 to 240 cases (1.11%) during 2019 *(PCC-ASUH annual report, 2016)*. Recently, pregabalin is used by opiate and benzodiazepine abusers to potentiate the effect of their abused drugs or as a substitute for their high abuse potential. Potent binding of pregabalin at calcium channels results in reduction in the release of excitatory molecules. Furthermore, it is thought to possess GABA-mimetic properties presented with direct and indirect effects on the dopaminergic 'reward' system *(Schifano, 2014)*. Despite low pregabalin addictive liability at therapeutic dosages, misusers' perceptions for these molecules to constitute a valid substitute for common illicit drugs may be a reason of concern. These yearly variations (shown in figure 5) enable the PCC-ASUH to declare new recommendations concerning drug of abuse screening lists and issue several warnings in media that are given much concern by health and drugs of abuse authorities.

The results from our research revealed that the top five mostly involved toxic substances were corrosives and detergents (10.76%), organophosphates

(9.11%), food poisoning (7.7%), tricyclic antidepressants (4.61%) and finally psychotropics (4.46%). Household products are easily available with high concentration ingredients without safety manufacturing measures. They are often stored in an improper manner due to lack of facilities and community awareness of their hazards. This agreed with the 2015 annual report of the Australian Poisons Information Centers where household cleaning substances topped their list of toxic substances (14.5%) followed by acetaminophen-containing analgesics (7.3%) then antidepressants (4.2%) *(Huynh et al., 2018)*. On the contrary, drug poisoning made up the largest proportion of poisoning exposures (43.5%) followed by pesticides (37.5%) in a similar Indian study implemented by Nair and Revi (2015). In addition, *Sande and kumar (2017)* stated that snake bites exceeded 30% in their Indian studied patients. This affirms variations in toxicological profiles in different countries and sometimes within different regions in the same country.

As regards types of toxic agents in relation to age in this study, there was statistically significant differences as household chemicals were more prevalent in poisoned cases <7 years (35.9%) followed by therapeutic drugs (34%). This can be attributed to the specific behavior of this age group characterized by curiosity, oral identification, inability to discriminate in addition to taste and smell immaturity with availability and easy access to household agents. Insecticides were the most prevalent type in the age group from 7-< 15 years (27.9%). This agreed with Azab et al. (2015) who found that pesticides were the commonest non-pharmaceutical agents in adolescents. On the other hand, drug poisoning was more prevalent in the age groups from 15-<25 years (60.9%), 25-40 years (64.7%) and >40 years (49.8%). Similar results were reported by Hegazy and Elfiky (2016).

The current study showed that poisoning by substance abuse was significantly common in males compared to females (12.1% versus 4.4%). This was similar to Abo *El- Noor (2013)*. *Foto-Özdemir et al. (2016)* also stated that self-poisoning by drugs is mostly the main manner of intoxication in females, whereas drug abuse and addiction is more common in males.

This study showed that poisoning severity was mild in the majority (79.4%) of cases, moderate in (14.4%) and severe in (6.2%). Similar results were found by *Tawfik and ElHelaly (2015)*. Poisoning severity score is a simple scoring system that can be used as a mode of grading of poisoning in peripheral hospitals, which subsequently helps in timely referral of patients. On the other hand, *Prayag et al. (2016)* recorded PSS (1) in 42.7% of their studied patients, PSS (2) in 35.4% and documented severe intoxication in 21.8% of patients.

The recorded mortality rate in our study was 0.66% which agreed *with Tawfik and Khalifa (2017)* who recorded a mortality rate of 0.56% in their study. A mortality rate exceeding 25% was reported *by Prayag et al. (2016*) attributing variations in mortality rates to several factors that contribute in deciding the fate of the patient as the type of poison exposures; time elapsed from exposure to arrival to poison control center; proper assessment of severity of intoxication; availability of life-saving measures and transport services; and provision of spot laboratory diagnosis.

The present study showed that increasing age was associated with higher PSS, prolonged hospital stay and higher mortality rate. Nearly similar results were obtained by *Barratt et al. (2013)*. Additionally, higher PSS was significantly associated with prolonged hospital stay and death. This was in agreement with *Yuan et al. (2018*) who observed an association between severe clinical course of poisoning and death.

The most frequent cause of death was organophosphates in our study representing 23.8% of total number of deaths. They used to be the first cause of poisoning-related deaths in Egypt for several years as documented by the 2011-2015 PCC-ASUH annual reports. *Wijegoonawardene et al. (2015)* stated that organophosphates had also the first rank of deaths due to poisoning in Sri Lanka (42.9%). The high percentage of organophosphate poisoned cases, severity of manifestations and necessity for ICU admission with relatively high frequency of mechanical ventilation and the large number of fatalities make organophosphates poisoning of particular importance to health care system and invite for more rigid regulations concerning their misuse. In contrast, *Hegazy and Elfiky (2016)* reported death due to poisoning with aluminum and zinc phosphide in 60% of their deceased patients followed by organophosphates while fentanyl was the first cause of death in United States followed by acetaminophen *(Gummin et al., 2019)*. Despite being the second cause of poisoning-induced mortality during the years from 2011 to 2017, tramadol is now responsible for about 1.14% of the toxicities and only 3.5% of the deaths. This may be due to government stringency to punish those who sell, buy, or consume various drugs of abuse. However, development of its severe toxic effects mandates patients' referral to poison control centers despite fear government prosecution.

On studying the relation between different toxic agents responsible for mortality and outcome, a significant difference was found between survivors and non-survivors regarding several toxins (e.g. organophosphates, opiates, aluminium phosphide, methanol, corrosives and psychotropics) while no significant difference was observed with other toxins (e.g. tramadol, carbon monoxide, zinc phosphide and carbamazepine). Despite the importance of identifying toxic agents significantly associated with death, poisoning-related mortality varies widely and is influenced by many factors like increasing age, delay time, compromised immunity and presence of multiple comorbidities *(Arun et al., 2005)*.

As regards hospital period of stay, this study declared that most of the cases (79.4%) were observed for a period not exceeding six hours and 14.5% stayed for six hours to one day while 5.8% were admitted for one to seven days. Only 0.3% of patients were admitted for a period exceeding seven days. This agreed with *Tawfik and ElHelaly (2015)*. *Jalali et. al. (2012)* also reported that 82.8% of their cases did not need admission. Mild severity of intoxication seen in most

of our patients could explain this small admission rate. In a study done by *Adinew and Asrie (2016)*, only 48% of patients were discharged from the ER. Longer hospital stay was explained by *Anthony and Kulkarni (2012)* who postulated that duration of hospital stay and ventilator requirement depend on the nature and quantity of poison, presence of medical co-morbidities and poison-related complications. Moreover, the duration of hospitalization correlated significantly with mortality in this study which agreed with *Tawfik and Khalifa (2017)*. In contrast, *Anthony and Kulkarni (2012*) reported that duration of hospital stay did not correlate with mortality.

In the present study, activated charcoal was the most frequent procedure undertaken in 42.3% of poisoned cases. The most frequently used antidotes were atropine and obidoxime reflecting the large number of received organophosphate poisoned cases.

Conclusion

This study demonstrated the magnitude of poisoning in a particular region of Egypt. It revealed that young and middle aged people were the most vulnerable for acute poisoning episodes. In addition, children younger than seven years accounted for more than 26% of cases. Females outnumbered males. Ingestion was the main route of poisoning and suicidal poisoning predominated. Corrosives and detergents were the most commonly involved toxic substances followed by organophosphates while antidepressants and psychotropics topped the list of drug poisoning. Poisoning severity score was mild in the majority of patients. Higher fatality rate for certain poisons compared to others could assist emergency physicians to triage poisoning cases in an overcrowded emergency department.

Recommendations

As presented by our study, PSS is a simple tool that could be involved in the training module of medical officers for better assessment and referral. A new governmental policy is needed to control medication marketing with strict regulations for household products and insecticides free availability. Legislations should be implemented to sell potentially dangerous chemicals in childproof containers and to ban the sale of commonly abused drugs without proper prescription by a qualified specialist. Collaboration between poison centers all over the country is necessary to provide a nation-wide surveillance for accurate mapping of poisoning in Egypt and to outline a unified protocol. Patients with suicidal poisoning should undergo compulsory in-patient psychiatric consultation to reduce the risk of future attempts. Provision of educational and awareness programs for the community about hazards of poison exposures along with effective poison information center are considered important strategies for the prevention of these emergencies.

Limitations:

This study was conducted retrospectively by collecting the data from medical records, which sometimes lacked detailed documentation of cases, especially those referred from other hospitals. In some cases, the chemical nature of the poison was obtained by direct observation of the bottles or packages brought by the patients and/or their relatives. Hence, this information was not always reliable. In addition, only patients presented to PCC-ASUH were included in the study without considering other poison centers, private clinics or patients treated at home. Therefore, the full extent of poisoning in Egypt is likely under-estimated. Finally, the study was conducted over a 1-year period. However, a longer duration would provide greater analysis regarding the problem of poisoning.

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تقييم شدة التعرض للتسمم لدى المرضى الذين تم استقبالهم بمركز علاج التسمم بمستشفيات جامعة عين شمس، جمهورية مصر العربية خلال عام ٢٠١٩

ولاء جمعة عبد الحميد [١]

الملخص العربي

المقدمة: يُعتبر التعرض للتسمم مُشكلة هامة بالنسبة للصحة العامة في العديد من البلدان النامية وسببًا رئيسيًا للمرض والوفاة في مصر، وفي الغالب تُعد المعلومات الصادرة من مركز علاج التسمم بمستشفيات جامعة عين شمس مُؤشراً لزيادة المخاطر التي يواجهها المجتمع.

الهدف من الدراسة: تقييم شدة التعرض للتسمم لدى المرضى الذين تم استقبالهم بمركز علاج التسمم بمستشفيات جامعة عين شمس خلال عام ٢٠١٩.

طريقة البحث: دراسَةٌ استِرجاعية شملت المرضى الذين تم استقبالهم بمركز علاج التسمم بمستشفيات جامعة عين شمس خلال عام ٢٠١٩، ويعانون من التسمم.

نتائج البحث: شملت هذه الدراسة ٢١٤٩٢ مريضاً. حدثت غالبية حوادث التسمم في الفئة العمرية من ١٥-٢٥ سنة (٣٤٪) وكانت إصابة الإناث أكثر من الذكور (٥٤،٨٪ مقابل ٤٥،٢٪). كان التسمم في الغالب عن طريق الفم (٨٩،١٪). كانت معظم حالات التعرض للتسمم انتحارية (٥١،٥٪). وشكل التسمم عن طريق تناول الأدوية غالبية الحالات (٥٩،٥٪). كانت الأدوية ذات التأثير على الجهاز العصبي المركزي هي الأكثر شيوعًا (١٨٪) والمواد الكيميائية المنزلية هي السموم الشائعة الاستخدام (١٣،٤٪). كان "مقياس شدة التسمم" بسيطاً في ٧٩،٤٪ من الحالات، ومتوسطاً في ١٤،٤٪ وشديداً في ٦،٢٪ من الحالات. وقد بلغ معدل الوفاة ٠،٦٦٪. ارتبط ارتفاع "مقياس شدة التسمم" بطول مدة الإقامة بالمستشفى وحدوث الوفاة.

الخلاصة: يُعد التسمم أكثر شيوعًا لدى الشباب ومتوسطي العمر. كانت إصابة الإناث أكثر من الذكور. كان الابتلاع هو الطريق الرئيسي للتسمم وكان التسمم الانتحاري هو السائد. كانت المواد الكاوية والمنظفات هي الأكثر شيوعًا بينما تصدرت الأدوية ذات التأثير على الجهاز العصبي المركزي قائمة التسمم بالعقاقير. ارتبط ارتفاع "مقياس شدة التسمم" بطول مدة الإقامة بالمستشفى وحدوث الوفاة.

التوصيات: يُعتبر "مقياس شدة التسمم" وسيلة بسيطة لتقييم التسمم. نحتاج إلى لوائح صارمة للتحكم في تسويق الأدوية.

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