

CASE REPORT

Patterns of Pediatric Acute Poisoning at Banha Poisoning Control Center, Egypt: One-Year Prospective Study

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Abstract

Background: Acute children poisoning is considered a serious issue worldwide, and a common cause of children morbidity and mortality. It is a preventable burden on emergency departments and healthcare facilities. Thus, surveillance of epidemiology and patterns of children acute poisoning in each country is beneficial to define the scope of the problem and its management regarding prevention and treatment. The aim of this work is to study the patterns of children acute poisoning in Banha poisoning control center, Banha University, Egypt.

Methods: One year prospective cross-sectional study of the pattern of acute poisoning of children equal to or less than 18 years old, who presented to Banha poisoning control center from January 1st 2019 to December 31st 2019. The analyzed data included demographics, mode and route of poisoning, causative poisonous agents, clinical presentation and patients' outcome.

Results: The peak of poisoning occurred in children from 2 to 6 year old accounted for (36.5%) of all cases. Accidental poisoning was the predominant method represented 82.1% of all cases. Pharmaceutical drugs were the most common cause of poisoning (42.3%) followed by household cleaning products (27.8%). In addition, poisoning occurred more indoors (91%) and in the summer season (45.2%). The majority of poisoned cases presented by mild symptoms (70.9%) and mainly were gastrointestinal (70.8%). As regards the outcome, most of the cases recovered and discharged.

Conclusion: Pediatric acute poisoning is still a matter of great concern in Egypt. More attention and prevention strategies are needed.

Keywords: Poisoning, Pediatrics, Epidemiology, Toxicology

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INTRODUCTION

Acute children poisoning is a major health problem worldwide and deemed one of the leading causes of unintended deaths ^(1,2). Also, it is still a serious issue in developing countries where it represents a common cause of emergency department presentation and admission ^(3,4,5). In Egypt acute poisoning represents a significant proportion of emergency visits of children and young people ⁽⁶⁾. This labors a burden on healthcare, society and economy and thus, it drains resources and multiplies workload ^(2,3). In fact, it is a preventable cause of morbidity and mortality ^(1,2). Children poisoning is a result of multiple risk factors including social, demographic, and industrial factors ⁽³⁾. Insufficient public awareness, easy accessibility to poison, negligence of caregivers, technological and industrial advances and even the nature of the environment are of the main causes, ⁽⁷⁾ in addition to the curious exploratory nature of children at the young age ⁽⁸⁾. The epidemiology of poisoning differs from one country to another, and even within the geographical areas of the same country. This difference highlights the importance of studying poisoning epidemiology in different

geographical areas, to define the scope of the problem, take necessary preventive measures and improve management approaches ⁽⁹⁾. The present study was conducted in Banha Poisoning Control Center (BPCC) in Banha university hospital. Banha is the capital city of Qalyubia governorate in north east Egypt, with estimated population of about 5,830,001 in 2019 according to Central Agency for Public Mobilization and Statistics (CAMPAS) ⁽¹⁰⁾. The BPCC receives all suspected cases of poisoning -either primarily presented or referred- from Banha City, other Qalyubia cities & rural areas. It also serves nearby areas in other governorates ⁽⁵⁾. And as the BPCC serves this large area with a considerable number of cases, it is important to study the patterns and epidemiology of children poisoning in order to control the problem. The present study is the first one in Qalyubia to focus on the patterns of children acute poisoning in the BPCC, as per our literature review none of previous studies discussed that issue.

This study aims to analyze the pattern, epidemiology, symptomatology, and outcome of acute poisoning among children presented to the BPCC through a prospective study conducted from January 1st 2019 to December 31st 2019. It

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also aims to recommend suggestions for prevention and diminishing the problem.

METHODS

Study design:

A hospital-based prospective observational cross sectional study was conducted in the BPCC, at Banha university hospital, Egypt from January 1st 2019 to December 31st 2019.

Patients:

A total number of 836 patients were included in the study based on the following inclusion and exclusion criteria:

- Inclusion criteria:

All patients 18 year old or younger, presented with the history of poisoning to the BPCC, between January 1st 2019 and December 31st 2019.

- Exclusion criteria:

Patients presented with food allergy, food poisoning, animal bites or idiosyncratic drug reaction.

Source of data:

Collection of patients' data was based on filling specially designated sheets by the treating physicians, at the time of presentation to BPCC.

Collected data:

- Sociodemographic data: including age, gender and residence of patients.

- Toxicological data: included causative agent, route and mode of poisoning, scene of poisoning, time interval to reach hospital.

- Clinical examination data: including general examination and systemic examination (CNS, CVS, respiratory, GIT, dermal)

- Patients were classified according to the Poison Severity Score (PSS) into:⁽¹¹⁾

- Grade 0 (None): asymptomatic with no symptoms or signs related to toxicity.

- Grade I (minor): mild symptoms and signs of toxicity

- Grade II (moderate): pronounced symptoms or signs of toxicity

- Grade III (severe): life-threatening symptoms or signs of toxicity

- Grade IV (Fatal): Fatal toxicity

- Management data: duration of hospitalization, clinical treatment (GIT decontamination, antidotes, symptomatic treatment, just observation)

- Patients' outcome data: available data of outcome of care (discharge, admission, referral, lost follow up)

- Discharge: cases after complete recovery, and observation for 6 – 8 hours.

- Admission: cases are admitted in the toxicology department for further observation and management until complete recovery.

- Referral: cases are referred to another poisoning center.

- Lost follow up: escaped cases that left hospital before being discharged.

Statistical methods:

- The collected data were tabulated and analyzed using SPSS version 16 software (SPSS Inc, Chicago, ILL Company). Categorical data were presented as number and

percentages. Chi square test (X²), or Fisher's exact test (FET) were used to analyze categorical variables. Quantitative data were expressed as mean ± standard deviation, and ranges. And the P <0.05 was considered significant ⁽¹²⁾.

Ethical considerations:

Ethical considerations were carried out. Permission was taken from toxicology department administration to collect information. The study was authorized and approved by the local research ethics committee of Banha faculty of medicine, Banha University. Patients were identified by being given serial numbers with all information stored privately.

RESULTS

During the one year study period from January 1st 2019 to December 31st 2019, a total of 3443 patients were presented for exposure to poisons at the BPCC. Of these patients, 836 (24.3%) were < 18 years of age.

Male gender predominated among all the studied age groups. The greatest proportion of the cases presented to the BPCC were 2 to 6 year-old children (36.5%). The majority of the patients in all age groups were residents of Qalyubia (90.8%), while nearby governorates accounted for (9.2%). With the overall urban residence of 56.9%, and the rural of 43.1%, as explicated in Table 1.

Seasonal variation in the incidence of poisoning substances was noticed. Hot seasons (spring and summer) had the peak of incidence of contact with pesticides and corrosives. While in the winter and the autumn the peak of incidence was for poisoning by gases mainly carbon monoxide. With the overall highest incidence of poisoning in summer 45.2%, as shown in Table 1.

The mean of time interval between the poisoning and the hospital arrival time was 1.27±1.26. The oral route was the most common mode of poisoning by 87.6%. Followed by the inhalation route in 10.0% of cases, while dermal exposure accounted for 1.9% and the least proportion was for eye exposure accounted for only (0.5%). Domestic premises were most common places of poisoning of the cases (91.0%), compared to outdoors (9.0%). Pharmaceutical drugs constituted the most commonly encountered group of toxins (42.3%). Other groups included household cleaning agents (27.8%), pesticides (14.8), toxic gases (9.7%), and illicit drugs (1.9%), as shown in Table 1.

The mode of exposure varied by the age and the gender. Unintentional poisonings accounted for most of the exposures in the preschool (<6 year old) and school-age groups (6- 12 year old). Among adolescents, intentional exposures predominated. Overall, the male gender was significantly associated with the accidental poisoning (89.2%) whereas the female gender was significantly associated with the intentional poisoning (30.1%) (p <0.001), as explicated in Table 2.

Severity of poisoning according to the PSS, were reported as the followings; Grade 0 : asymptomatic cases 15.1%, Grade I minor cases 70.9%, Grade II moderate cases 12.0%, Grade III severe cases 2.0%, Grade IV fatalities 0%, the outcome and the treatment are interpreted in Figure 1.

Table 1. Baseline demographics and circumstances of acute poisoned children presented to BPCC during the study period.

Variable		n=836	% (100.0)	
Age	Up to 2 ys ¹	247	29.5	
	2-6 ys	305	36.5	
	6-12 ys	109	13.0	
	>12 ys	175	20.9	
	Mean±SD (Range)	6.3±5.6 (7 months – 18 ys)		
Sex	Male	527	63.0	
	Female	309	37.0	
Residence	Qalyubia Gov ² (n=759)	Banha city	248	29.7
		Other cities	203	24.3
		Rural	308	36.8
	Other Gov (n=77)	Urban	24	2.9
		Rural	53	6.3
Season	Winter	154	18.4	
	Spring	202	24.2	
	Summer	378	45.2	
	Autumn	102	12.2	
Time since poisoning (hours) to hospital arrival	Mean±SD (Range)	1.27±1.26 (0.5 -14)		
Route of poisoning	Bites/Stings	0	0.0	
	Oral	732	87.6	
	Inhalation	84	10.0	
	Eye	4	0.5	
	Dermal	16	1.9	
Poisoning scene location	Indoor	761	91.0	
	Outdoor	75	9.0	
Causative agent	Pesticides (n ³ =124)	Insecticides	80	9.6
		Rodenticides	28	3.3
		Pyrethroid	16	1.9
		Corrosive	181	21.7
		Household chemicals (n=232)	Kerosene	30
	Pharmaceuticals drugs	Phenol	21	2.5
		Alcohol	6	0.7
		Illicit drug (n=16)	Cannabis	10
	Others	others	0	0.0
		CO ⁴	81	9.7
Others		29	3.5	

1 Years \ 2 Governorate \ 3 Number \ 4 Carbon monoxide

There were different types of poisoning exposures among the selected age groups. Household cleaning agents were the most common types of causative poisoning agents in children younger than 2 year old while among the three older age groups 2-6, 6-12, 12-18 years pharmaceutical drugs were the most common types, as shown in Table 3.

As illustrated in Table 4, the patients in asymptomatic

group and with dermal presentation group were 100.0% improved and discharged without stay at the hospital. Followed by 75% of the patients with respiratory symptoms and 70.8% of the patients presented with GIT symptoms. On the other hand, patients with CVS and CNS manifestations admitted to the hospital (80.6% & 43.3% respectively).

Table (2). Relation between mode of poisoning and age and gender groups

Variable	Accidental		Intentional		Fisher's test	P	
	No.	%	No.	%			
Age	Up to 2 ys	2477	100.0%	0	0%	X2=603.8	<0.001 (HS)
	2-6 ys	305	100.0%	0	0%		
	6-12 ys	101	92.7%	8	7.3%		
	>12 ys	33	18.9%	142	81.1%		
Gender	Male	470	89.2%	57	10.8%	X2=49.2	<0.001 (HS)
	Female	216	69.9%	93	30.1%		

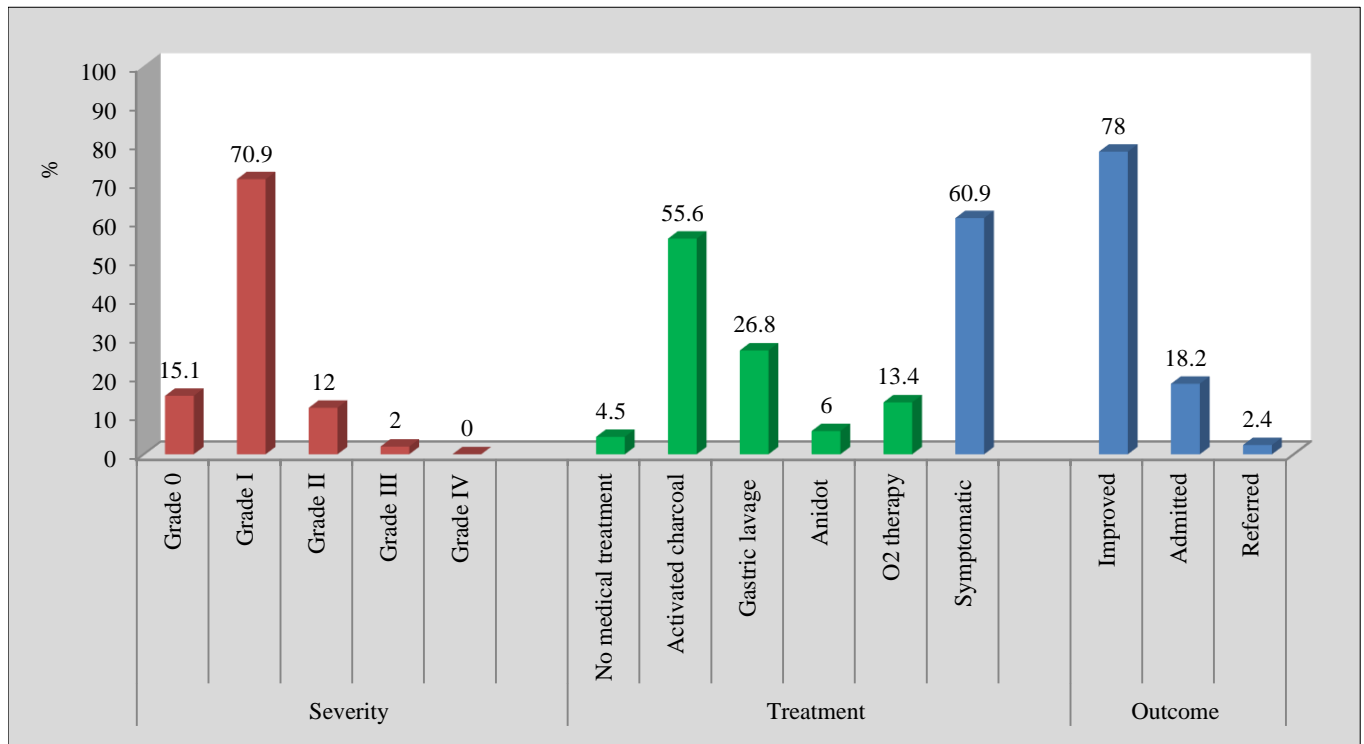


Figure 1. Severity of poisoning, outcome and treatment among acutely poisoned children presented to the BPCC during study period.

According to PSS, (100.0%) of grade 0 and (88.7%) grade I were improved and discharged. While, grade II and III (29.4% & 24.0% respectively) were admitted to hospital, as shown in Figure 2.

DISCUSSION

Acute children poisoning is a serious preventable health problem worldwide especially in developing countries. Thus, tackling such a problem needs a careful surveillance of its patterns and risk factors in order to plan appropriate measures in its prevention.

Children accounted for 24.3% of all cases presented to the BPCC during the year of study. Multiple other studies found similar results ^(9,10). In Z'gambo et al., study in Zambia the proportion of poisoned children were reported as high as

54.3% of total cases ⁽¹³⁾.

Regarding the age, the peak frequency of cases was in (2-6 year old) age group. This can be explained by the curious exploratory nature of children among this age group, and the accessibility of toxic substances that may be stored on the floor level ⁽⁶⁾. These results were supported by studies conducted in Iran, Turkey, and other governorates within Egypt ^(8,14,15).

In the present study male cases outnumbered female cases. This was consistent with studies conducted in most of the other countries ^(14,16). In agreement with that, WHO reported overall higher rate of poisoning in boys than girls in different world regions ⁽¹⁷⁾. This can be attributed to the nature of boys who are usually more active in exploring surrounding environment and less obedient, this increases their potentiality

Table 3. Analysis of the type of poison based on the patients' age groups.

		Age				Total
		up to 2 ys	2-6 ys	6-12 ys	>12 ys	
Pesticides	Count	34	39	14	37	124
	% within Age	13.8%	12.8%	12.8%	21.1%	14.8%
Households	Count	110	96	17	9	232
	% within Age	44.5%	31.5%	15.6%	5.1%	27.8%
Illicit Drugs	Count	6	6	0	4	16
	% within Age	2.4%	2.0%	.0%	2.3%	1.9%
Pharmaceuticals	Count	90	128	34	102	354
	% within Age	36.4%	42.0%	31.2%	58.3%	42.3%
CO	Count	4	24	32	21	81
	% within Age	1.6%	7.9%	29.4%	12.0%	9.7%
Others	Count	3	12	12	2	29
	% within Age	1.2%	3.9%	11.0%	1.1%	3.5%
Total	Count	247	305	109	175	836
	% within Age	100.0%	100.0%	100.0%	100.0%	100.0%

FET=174.0

P<0.001 (HS)

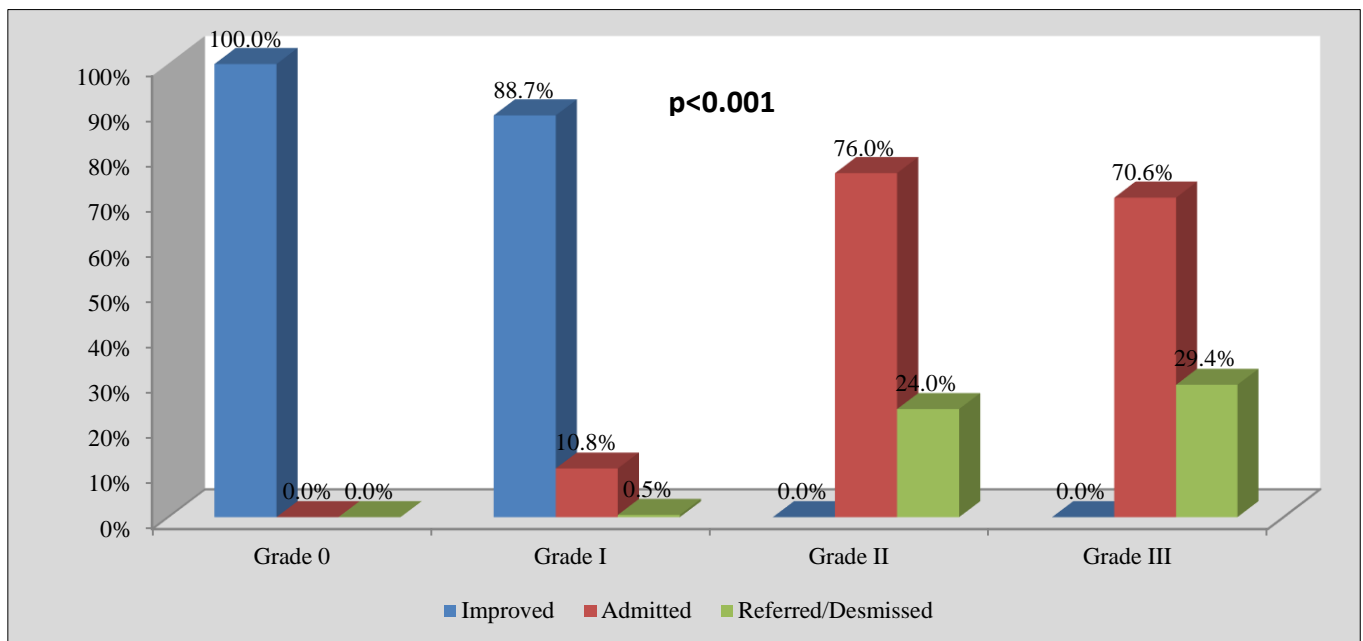


Figure 2. Bar chart showing the outcome according to the severity of poisoning defined by PSS

of exposure to poison⁽⁸⁾. On the contrary, Abd El-haleem et al., and Devaranavadagi et al., stated higher female percentage^(4,18). While Memon et al., found equal percentage from both genders⁽¹⁹⁾. The discrepancy of findings among these studies may be attributed to the difference in number of cases of each gender included in each age group from a study to another⁽²⁰⁾.

Number of the cases with urban residence were more than rural ones. This was in accordance with Alazab et al., and barakizou et al.,^(3,21). This can be explained by the fact that the BPCC is in Banha City and receives all the cases from the city. And the possibility that the most of mild cases in rural areas may have been neglected or managed successfully in primary health care units without the need to be referred to

Table 4. Correlation between clinical symptoms of acutely poisoned children and their outcome.

Variable		Improved and discharged (n=652)		Admitted (n=152)		Referred/ lost follow up (n=32)		Fisher's test	P
		No.	%	No.	%	No.	%		
Asymptomatic	No	548	74.9%	152	20.8%	32	4.4%	48.2	<0.001 (HS)
	Yes	104	100%	0	.0%	0	.0%		
GIT ¹	No	509	80.3%	97	15.3%	28	4.4%	X ² =16.1	<0.001 (HS)
	Yes	143	70.8%	55	27.2%	4	2.0%		
CNS ²	No	590	83.2%	97	13.7%	22	3.1%	64.6	<0.001 (HS)
	Yes	62	48.8%	55	43.3%	10	7.9%		
CVS ³	No	646	83.5%	102	13.2%	26	3.4%	150.2	<0.001 (HS)
	Yes	6	9.7%	50	80.6%	6	9.7%		
Respiratory	No	628	78.1%	146	18.2%	30	3.7%	1.04	0.57 (NS)
	Yes	24	75%	6	18.8%	2	6.2%		
Dermal	No	640	77.7%	152	18.4%	32	3.9%	2.6	0.24 (NS)
	Yes	12	100.0%	0	.0%	0	.0%		

1 Gastrointestinal \ 2 Central nervous system \ 3 Cardiovascular

the BPCC. In addition to increased use of poisonous substances and their availability in the urban areas compared to rural areas⁽³⁾. On the other hand, contradictory results were found by Agarwal et al., and Hassan et al.,^(22,23) who showed higher incidence of poisoning in the rural areas in their studies, this can be attributed to the negligence of people and the difficult life style, in addition to the unsafe use of agricultural insecticides in some rural areas.

In the present study, number of cases varied from one season to another with the summer presented the highest, and the autumn the lowest. The similar results found by Agarwal et al., and Sobeeh et al.,^(9,22) Peak children poisoning reported in summer can be referred to a number of factors. In the summer there is increased frequency of cleaning houses by different household cleaning agents. There is also increased presence of insects and pests resulting in more frequent usage of pesticides⁽⁵⁾. Moreover, majority of the studied age groups have their school vacation in summer with obviously increased play time and being more active indoors and outdoors. However, studies conducted in Iran and Saudi Arabia showed the peak incidence in autumn^(14,18). On the other hand, in a Turkish study most cases were in spring⁽¹⁵⁾.

The present study showed pharmaceutical drugs as the major cause of poisoning, followed by the household cleaning agents. The high proportion of poisoning by pharmaceutical drugs can be attributed to several factors. Children generally tend to simulate behavior of others including taking medications. Also some parents are used to present the medications they give to their children as candies. This is in addition to the lack of childproof medication containers' caps and formulation of drugs with palatable flavors to increase patients' compliance⁽²⁴⁾. This was in agreement with other studies^(18,25,26). In discrepancy, results from studies conducted in India and Iran showed household cleaning agents as the

major cause of poisoning^(19,27). It is obvious that causative agent differs according to the environment. Alizadeh et al., presented alcohol as the most common cause of children poisoning because of its availability at domestic premises⁽²⁸⁾ while it is an inconsiderable cause in our study representing 0.7% only, which reflects the role of the environment⁽⁷⁾. According to the present study a highly significant relation was found between the age and the type of poisonous substance. Household cleaning agents were found to be the most common cause of poisoning in the age group below 2 years while pharmaceutical drugs were the main cause in the remaining age groups. This can be explained by the habit of storing corrosives and other household chemicals in water and juice bottles, which are usually kept on the floor level with easy accessibility to toddlers and infants⁽¹⁹⁾.

Oral route was the most common route of poisoning 87.6%, which is consistent with the findings of many other studies^(8,14,18) and it is followed inhalation, dermal and eye exposure, respectively. This can be due to the children's tendency in exploring the substances using their taste sensation and putting small foreign objects into their mouths⁽¹⁴⁾.

Most common scene of poisoning was indoors, which can be explained by the presence of poisonous substances in domestic premises. This was supported by other studies conducted in India and Tunisia^(16,21).

Accidental poisoning was the predominant mode, this was in accordance with Sobeeh et al., and Andiran et al.,^(9,15) This reflects that the problem is a preventable cause of children morbidity and mortality, and points out the need of more care and attention by parents and caregivers. A relation was found between mode of poisoning and the age and the gender of the patients. The mode of poisoning changed from one age group to another showing accidental mode in all poisoned children up to 6 years of age, and in most of 6-12 age group as well.

In contrast, intentional poisoning outnumbered the accidental one in adolescents group (12- 18 year old). These results are similar to those found by Azab et al.,⁽²⁹⁾ This may be due to several social, economic, family stressors as well as psychological and emotional fragility experienced by adolescents. A significant relation was found between poisoning mode and the gender. Accidental poisoning exceeded intentional one in males, whereas the contradictory results were found in females. This may be attributed to the more emotional nature of females than males⁽³⁰⁾. In addition, previous studies on the relation between the gender and the suicide attempts showed that females tended to use nonviolent methods as medication overdose or gas poisoning, while males were more likely to use violent methods as firearms or jumping from heights⁽³¹⁾. These results are in agreement with multiple studies^(15,21,29).

The mean time interval to reach to the hospital was 1.27 ± 1.26. Based on the PSS, most of the cases were found to be of grade I followed by grade 0. This may be due to high proportion of accidental poisoning in which the amount of ingested poison is usually small, and short hospital arrival time. In addition, most of the children poisoned by ingestions of non toxic substances or non toxic dose of likely toxic substances. Which mostly because of their bad taste and the ingested amount is generally small.⁽³²⁾ This shows agreement with Jose et al., study in India showing most cases of grade I or 0, where 90.1% recovered completely⁽³³⁾. Contradictory results were shown by Alije et al., in which majority of cases were moderate to severe⁽³⁴⁾.

In the present study GIT symptoms were the most common, followed by CNS manifestations. This may be due to the predominance of oral route and early hospital arrival of most cases leaving not enough time for complete absorption of the poison or appearance of the systemic manifestations, Sobeeha et al., reported similar findings, while in Gheshlaghi et al., study CNS affection presentations predominated^(9,14).

Most cases in the present study received nonspecific hospital treatment, including supportive symptomatic treatment and general decontamination methods as gastric lavage and activated charcoal. Only 6% of cases received specific antidote which can be due to the short time interval between poisoning and the hospital arrival making decontamination methods highly effective,⁽⁴⁾ this is in accordance with Andiran et al.,⁽¹⁵⁾

Majority of the cases were discharged with complete recovery. This result is similar to those found by Seif et al., and Gheshlaghi et al.,^(14,35). No fatalities were found during the period of the study. This can be explained that most cases were mild, with early arrival of the most cases to the poisoning center, and the early the arrival the better the outcome⁽⁴⁾. A relation was found between the severity and the outcome. Vast majority of patients of grades 0 and I were improved and discharged. While admission was the most common outcome of grades II, III. Patients poisoning symptoms were found to affect the outcome. Most of the patients complaining of GIT symptoms were fully recovered. While most of the CVS affected patients were admitted. This can be explained by considering that CVS manifestations are

generally associated with higher morbidity and mortality than GIT manifestations⁽³⁵⁾. There was statistically significant correlation between the outcome and the presenting clinical symptoms of poisoned patients with P value < 0.001.

It is obvious from the results of the current study and other studies that combating acute poisoning could avoid a huge financial and economic burden on emergency departments and healthcare facilities⁽³⁶⁾, in the present study children represented 24.3% of the total number of patients treated in the BPCC costing hospital expenditure and work load that cannot be ignored. So efforts should be made to avoid this preventable costs.

In order to control the acute pediatric poisoning problem the following recommendations can help. It is advisable to increase awareness of parents and caregivers about prevention and child care by different methods including mass media and workshops. Other useful measure is to educate parents and caregivers to keep toxic substances out of reach of children and in their original containers and to develop child-proof caps for medications' packages. Also providing psychological and social support as well as health education for adolescents in schools is playing a key role. Attention should be given to proper documentation of cases and conducting more multicentric larger scale studies, in order to estimate the extent of the problem and provide health strategies to control it.

CONCLUSION

The present study has showed that acute children poisoning is an important problem in Egypt. It is more common in young age and by accidental mode which reflects the importance of the prevention as the best solution to reduce morbidity and mortality of acute pediatric poisoning. A key strength of the present study is that it is the first one in the governorate which has a mixed urban and agricultural rural nature. This can be a guide to other studies for similar residential mixture. A limitation of this study is that it is conducted for one year only which is a short period of time. There is a need for further longer prospective studies to provide clearer picture of the different aspects of this health concern and lead to preventive measures more comprehensive implementable and programs.

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