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The pattern and outcome of poisoning among children admitted to Sohag University Hospitals

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Abstract

Introduction: poisoning is a major health problem among children that are affected by many factors. Each year a large number of children presented to hospitals with poisoning by different agents such as household products, over-the-counter medications, and others. This study aims to outline the pattern and outcome of poisoning cases among patients less than 18 years admitted to Sohag University Hospitals to find statistical relationships between children's toxicity and different factors and to start using a database for toxic cases in Sohag University Hospitals. **Methods:** The study is a cross-sectional study conducted on 91 acutely poisoned patients by different agents aged from 0 to 18 years old, who were admitted to Sohag University Hospitals in the period from October 2013 to September 20214. Data including sociodemographic data, causative agents, mode and route of poisoning, the delay time of presentation, and outcome. **Results:** among 91 children who presented with toxicity, toddlers and adolescents were the most affected (38.46 & 37.36 %). Females were more than males(61.54%). Accidental poisoning and oral route were the commonest mode and routes of poisoning respectively (71.43, 92.31 %). Pesticides were the commonest agent and most cases presented within 6 hours after poisoning. 52% of cases were discharged after 6 hours without complications and the mortality rate was 2.2%. Delay time and duration of hospitalization were factors that affected the outcome. **Conclusion:** childhood poisoning is a common problem that is affected by many factors so aware of them and their parents and preventive measures should be taken to decrease its occurrence.

Keywords: children, poisoning, sociodemographic, outcome.

Introduction

Poisoning among children is the third most common emergency that has a high social and economic effect [(1)].

It causes about 7% of all accidents in children less than 5 years and accounts for 2% of all deaths among children in the developed countries, and more than 5% in the developing countries [(2)].

Many agents are implicated to cause poisoning among children including chemicals such as household products, cleaning agents, cosmetics, and others. Over-the-counter medications are also a common cause of poisoning due to their easy availability at home. In agricultural countries, pesticides are the commonest causative agent of acute poisoning. Also poisoning

by snakes, spiders, and scorpions is common [3].

There are many factors that affect poisoning in children such as the size of the family, socioeconomic level, degree of child care, and storage of toxic agents in a safe place. It is important to be aware of these risk factors to prevent acute poisoning[1]. Despite the that childhood poisoning is a major health problem all over the world, causative agents and the rate of morbidity and mortality differ from place to place and change over time. In the developed countries there is an accurate information system on the incidence and prevalence of poisoning and its mortality rate from different poison control centers (PCC). But in developing countries poisoning is poorly documented [4].

So, documentation of different variables of childhood poisoning is very important to carry out accurate preventive measures [5]. This work aims to study the pattern and outcome of poisoning cases among children admitted to Sohag University Hospitals to find statistical relationships between children's toxicity and different factors and to start using a database for toxic cases in Sohag University Hospital.

Patient and method

The study is a cross-sectional hospital-based observational study. It was carried out on 91 acutely poisoned patients by different agents aged from 0 to 18 years old, who were admitted to Sohag University Hospitals for a duration of one year from October 2013 to September 2014.

Recording and documentation of all the obtained data were ensured and well-fed into a special sheet designed for the study. This data includes:

- Sociodemographic Data: as age, sex and residence.
- Type of toxic agent responsible for the poisoning.
- Delay time between poisoning and admission.
- Route of exposure: Oral, inhalation, injection, dermal, sting, or bite.
- Mode of poisoning: Whether homicidal, suicidal, accidental, addiction (overdose), criminal or therapeutic error.
- Different treatment measures applied to each patient as emergency treatment, supportive treatment, decontamination measures, or antidotal therapy.
- Duration of hospital stay.
- Causes of admission to the ICU.
- Outcome (complete recovery, recovery with complication, discharged against medical advice (AMA), transfer to another department, death escape).

The obtained results were revised, coded, and organized for statistical analysis using *SPSS* (Statistical Package for Social Science) version 15 software. Data were presented and suitable analysis was done according to the type of data obtained for each parameter.

Results

A total of 91 acutely poisoned children were included in the study with a mean age of 8.290 ± 6.225 and a range of 0.167-18. It was found that the majority of patients (38.46 %) fall in the toddler stage followed by (37.36%) in the adolescent stage. The female patients represented the majority of cases with a percentage of (61.54-%) in comparison to male patients who were only (38.46%). According to residence (72.53%) acutely poisoned children were from rural areas in contrast to urban areas (27.47%) **(Table 1)**.

According to **(Table 2)** accidental poisoning was the main mode of poisoning among studied cases (71.43%) followed by suicide (23.08%), iatrogenic (4.4%), and lastly overdose (1.1%).

Regarding the route of poisoning oral route was the commonest route of poisoning (92.31%) of all cases followed by inhalation (6.59%) while I.V was the least used route of poisoning (1.1%).

As shown in **(table 3)** it was found that pesticides occupied the highest prevalence of acute poisoning among children (23 cases, 25.27%) followed by CNS drugs (17.58%) and chemicals (17.58%). Poisoning from gases and theophylline were the least toxic agents responsible for poisoning among studied patients.

Regarding the delay time before seeking medical help, **Figure (1)** shows that most of the patients came between 1-6 hours after poisoning (63.7%) while the least number of cases was presented with a delay time of more than 24 hours (2.2%).

As regards decontamination and enhancement of elimination procedures **(Figure 2),** gastric lavage was done in 36.26% of cases. Activated charcoal was received in 40.66 % of cases. No hemodialysis or alkalinization of urine was done. Hemoperfusion is not available and the only method for enhancement of elimination was multiple-dose activated charcoal accounting for 18.68% of the total number of cases. The fate of children presented to the hos-pital during the study period **(Table 4)** shows that 52.75% of children were discharged after admission to ED for an observational period not exceeding 6 hours and 39.56% of children were admitted to inpatient wards and 7.69% w-ere admitted to ICU. The outcome of the patients according to hospital disposition was represented showing that 79.12% of patients were discharged with complete recovery and 13.19% of patients escaped while only two patients died representing 2.2%. As regards the causes of ICU admission to children presented to the hospital duri-ng the study period **(Figure 3)** shows that 28.57% of children were admitted to ICU because they needed cardiac monitoring.

Table (5) compare the outcome of patients according to hospital admission concerning delay time and hospital stay duration by using one-way ANOVA statistical analysis showing significant difference in the outcome of patients regarding the duration of hospitalization and delay time.

Table (1): percentage of age, sex and residence of acutely poisoned children

	Number	Percentage (%)
Age groups (years)		
Infant	3	3.30
Toddler	35	38.46
Preschooler	4	4.40
School	15	16.48
Adolescent	34	37.36
Total	91	100%
Range	0.167-18	
Mean ±SD	8.290 ± 6.225	
Sex		
Male	35	38.46
Female	56	61.54
Total	91	100%
Residence		
Urban	25	27.47
Rural	66	72.53
Total	91	100%

SD = Standard Deviation

Table (2): percentage of mode and route of poisoning in acutely poisoned children.

Mode	Number	Percentage (%)
Accidental	65	71.43
Suicidal	21	23.08
Iatrogenic	4	4.40
Overdose	1	1.10
Total	91	100%
Route	**Number**	**Percentage (%)**
Oral	84	92.31
Inhalation	6	6.59
I.V	1	1.10
Total	91	100%

Table (3): Percentage of different toxic agents encountered in the study.

Toxic agent	Number	Percentage (%)
Pesticide	23	25.27
CNS drugs	16	17.58
CVS drugs	5	5.49
Chemicals	16	17.58
Gases	2	2.20
Drug of abuse	4	4.40
Food poisoning	4	4.40
Analgesics	4	4.40
Theophylline	2	2.20
Endocrine drugs	4	4.40
Unknown	4	4.40
Others	7	7.69
Total	91	100%

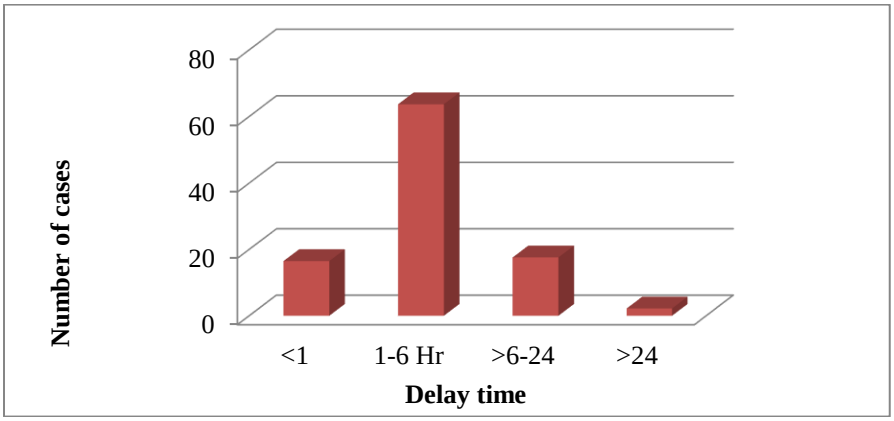

Figure (1): Bar chart of delay time in acutely poisoned children admitted to Sohag University Hospitals during the period from October 2013 to September 2014.

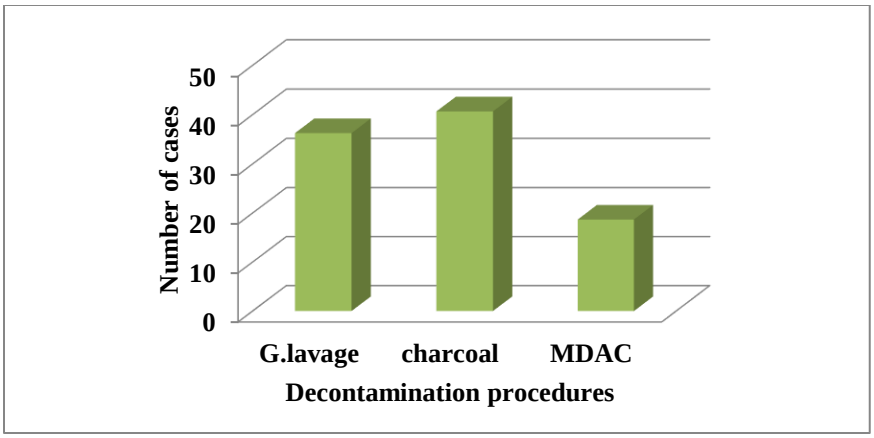

Figure (2): Bar chart of decontamination and enhancement of elimination procedures in acutely poisoned children

Table (4): Fate and outcome of 91 acutely poisoned children.

Fate	Number	Percentage (%)
Discharge after observation in ER for period not exceeding 6 hours	48	52.75
Inpatient wards	36	39.56
ICU	7	7.69
Total	91	100%
Outcome	**Number**	**Percentage (%)**
Complete recovery	72	79.12
Recovery with complications	2	2.20
Referal	2	2.20
AMA	1	1.10
Escaped	12	13.19
Death	2	2.20
Total	91	100%

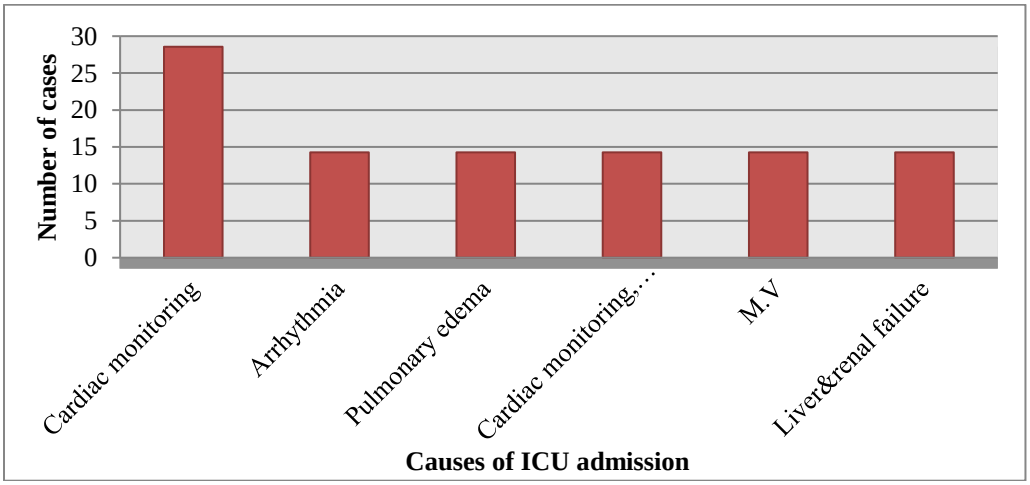

Figure (3): Bar chart showing cause of ICU admission of acutely poisoned children.

Table (5): Outcome of the studied cases in relation to delay time and duration of hospital stay.

Outcome		N	Range	Mean ± SD	F	P-value
Delay time(hours)	Complete recovery	72	0.5 - 96	6.24 ± 12.21	5.63	0.00
	Recovery with complications	2	0.5 - 120	60.25 ± 84.50		
	Referal	2	2 - 4	3.00 ± 1.41		
	AMA	1	3 - 3	3.00 ± .		
	Escaped	12	0.5 - 11	4.04 ± 3.11		
	Death	2	2 - 3	2.50 ± 0.71		
Duration of hospitalization (days)	Complete recovery	37	1 - 8	1.70 ± 1.37	12.32	0.00
	Recovery with complications	2	5 - 15	10.00 ± 7.07		
	Referal	1	10 - 10	10.00 ± .		
	AMA	0	. - .	. ± .		
	Escaped	3	1 - 1	1.00 ± 0.00		
	Death	0	. - .	. ± .		

SD: Standard deviation P-value <0.05 is statistically significant
Fc = variance ratio calculated by ANOVA one-way statistical analysis.

Discussion

One of the most common causes of emergency unit admissions in acute poisoning. So it is important to establish an information system recording the different variables in childhood poisoning to know the proper preventive measures. In the developed countries poisoning represents 0.28% to 0.66% of the pediatric emergency service admission. This poisoning is still an important issue in Egypt ***(5).***

Despite that poisoning in children has been extensively studied in different developed countries. But, there are few reports from developing countries due to limited cases records and limited knowledge about poison ***(6&1).***

In the present study Toddler (ages 1 – 3 years) and the adolescent (ages 12 – 18) constituted about 38.46% and 37.36% respectively of the whole children population in the present study with a mean age of 8.290 ± 6.225. This percentage was nearly similar to the percentage found in the study conducted by ***Yip et al. (2011)(7)*** in their study on children in Hong Kong where the toddler stage accounts for 35% of cases and the adolescent stage was about 31 %. Also, Regarding ***El Masry & Tawfik (2013)(8)*** Children younger than 3 years of age were involved in 36.2% of exposures, and children younger than 6 years accounted for approximately half of all human exposures (48.9%). The reasons behind this may be that at this age children can move independently and deal with different objects around them through touch and taste without being aware of their risk ***(9).***

The present study revealed that the percentage of females was higher than males (61.54% and 38.46% respectively). These results approximately go hand in hand with the results recorded by ***Yip et al. (2011)(7)*** on children in Hong Kong. Female predominance over the male was also observed in other studies like those conducted by ***Budhathoki et al. (2009)(10); Sahin et al. (2011)(11) and Haghighat et al. (2013)(1)*** but with lower percentages**.** In contrast to the present results, ***Shivam et al. (2013)(12)*** recorded that the percentage of males (61.6%) was more than the percentage of females (38.4%). This incidence may be due to the high suicidal

incidence in females by self-poisoning [13]. Also, females are exposed to social stress and are more liable to an emotional and situational crisis that may lead them to self-harm [7].

Regarding residence in the present study, 72.53% of patients came from rural areas while 24.47 % were from urban areas. These percentages go in harmony with those results found by ***Shivam et al. (2013)***[12] as 70.4% of cases were from the village and 29.6% were from urban areas. In another study done by ***Azemi et al. (2012)***[9] most of the cases came from urban areas (53%). This could be attributed to many factors that include medical and parental perceptions of risk, socioeconomic demographics, and the availability of information resources [14].

In the current study accidental poisoning constitutes about 71.43%, suicidal poisoning was 23.08 %, iatrogenic poisoning was 4.4% and overdose was 0.05%. This is approximately similar to the results of a study made by ***Lin et al. (2011)***[15] where accidental poisoning was 61.4% and suicidal was 38.6%. In another study performed in Nigeria by ***Shwe et al. (2013)***[16] accidental poisoning was observed in 92.3% of children, and suicidal poisoning was in 7.7%. Also, ***Mutlu et al. (2010)***[17]***; Azemi et al. (2012)***[9]***, and Bhat et al. (2011)***[18] recorded that accidental poisoning is more than suicidal among children but with different percentages.

Many factors may be attributed to unintentional poisoning among children such as easy accessibility to poison, lack of supervision, and ignorance of parents about the toxicity of common household products so they do not store these products appropriately [19]. While, adolescents are faced with many challenges such as making their own identity, learning to depend on themselves, and increased intellectual and physical skills. All these tasks are difficult even with support and they may not be able to handle life leading to their attempt to suicide by self-poisoning [20].

In the present study, the main route of poisoning was ingestion 92.31% followed by inhalation 6.59% and injection 1.1%. ***Mutlu et al. (2010)***[17] found that (93.5%) of the cases were poisoned through ingestion, and (4.6%) through inhalation. In a study made by ***Shwe et al. (2013)***[16] ingestion represents 76.9 % of exposures and inhalation represents 7.7%. ***Alazab. (2012)***[5] stated that ingestion accounted for 99.3%. This could be explained by the convenience and easy availability of orally consumable poisons [21].

In the present study, the most prevalent toxin involved in acute poisoning among children was pesticides (25.27%) followed by CNS drugs and chemicals by the same percentage (17.58%). In Nigeria ***Shwe et al. (2013)***[16] stated that 34.6 % of the cases under the study were due to insecticide poisoning followed by 15.4% due to pharmaceuticals poisoning. In another study made by ***Randev et al. (2011)***[22] in India organophosphorus represented about 57% of the toxic agents that caused toxicity to children. Also, ***Budhathoki et al. (2009)***[10] showed that insecticides were the most common type of toxin involved (59.9%) and organophosphorus were the most commonly used (45.1%).

In agricultural countries, children are vulnerable to pesticide poisoning as organophosphate is a common household product used to control rodents. In situations where there is a thin line between work and the home environments, children may be exposed to pesticides present in such work environments, clothes, the air from spraying, and household dust [16].

The present study showed that most of the patients arrived at the hospital 1-6 hours

after poison exposure (63.7%) and the least number of patients came after 24 hours (2.2%). ***Aqeel et al. (2009)*** [23]stated that 78 % of cases were brought to the hospital within the first six hours of poison exposure, while the rest 22 % arrived after six hours of exposure. ***Alazab (2012)***[5] found that (65.5%) of cases reached the poisoning unit within 2 - 4 hours of accidental poisoning, (24%) of cases reached within 4 - 6 hours, (7.3%) of cases reached after more than six hours, and (3.2%) reached within less than two hours. This may be explained that difficult geographical terrain and traffic jam may be the causes of delays to reach the hospital [22].

In the present study, 36.26% required gastric lavage, 40.66% received a single dose of activated charcoal, while MDAC was required in 18.68 %. The present results agreed with the results of ***Lucas (2000)***[24] in which gastric lavage was performed in (20.50%) of cases and activated charcoal was used in (1%) of cases. While in another study performed by ***Andýran & Sarýkayalar (2004)***[25] gastric lavage was performed on about half of the children (48.7%) who ingested poison. Activated charcoal treatment was given to more than half of the patients (55.1%), with 30% of them receiving multiple dosages.

In the current study, most of the patients (52.75%) were admitted to ED and discharged after an observational period not exceeding six hours while 39.56% were admitted to the inpatient and only 7.69% were admitted to ICU. These results are not greatly different from a study done by ***Haghighat et al. (2013)***[1] where 67.9 % of cases were admitted to ED, 26.3% to inpatient, and 5.8% to ICU. High percentages of patients presented to ED and then discharged without the need for admission to inpatient or ICU may be explained by ***Marahatta et al. (2009)***[26] who stated that most patients always harry to the hospital regardless of the amount or type of poison ingested.

In the study, the majority of patients discharged with complete recovery (79.12%) ,2.2 % developed complications,13.19% of cases escaped before they complete treatment, 1.1% discharged AMA, 2.2% died and 2.2 % were transferred to another hospital. This is quite similar to the results recorded by ***Gheshlaghi et al. (2013)***[27] where (91.6 %) of patients were discharged with full recovery, 6.7 % were discharged with few complications, and (1.5 %) of patients died as a result of poisoning. ***Ozdogan et al. (2008)***[28] stated that a total of 196 (98.8%) cases were discharged with full recovery, and four patients (2%) died.

Low mortality may be due to early hospital admissions so a short delay time and the availability of critical care facilities [29].

In the present study, the main cause of ICU admission was cardiac monitoring in three of the seven patients admitted to ICU due to poisoning by CVS drugs. Other causes were arrhythmia, pulmonary edema, mechanical ventilation, and organ failure. Also, ***Abbas et al. (2012)***[30] recorded that 17 patients were admitted to ICU; five of them with respiratory distress and five were admitted due to bleeding from the mouth while three were admitted to ICU due to ingestion of pharmacologic agents.

A statistically significant difference was found between the outcome of patients with duration of hospital stay as well as between outcome and delay time between intake of poison and arrival to the hospital. These results were similar to those obtained by ***Sam et al. (2009)***[31] who insisted on the importance of the duration of the pre-hospitalization period as being a strong predictive factor of the severity of

poisoning, explaining this by the fact that if the treatment is delayed, the suspected initial peak blood level of poison may induce irreversible tissue damage to the organs. Also, early management is the most important cause of survival in poisoned patients.

Hawton & Harriss (2006)[32] reported that more severe clinical presentations between cases presented after a long delay time and also those who did not receive immediate medical care and early management.

According to ***Paterson et al. (2006)[33],*** significant mortality and morbidity are associated with increased hospital stay duration.

Conclusion

- Poisoning is a major problem in children. Toddlers and adolescents are the commonest age groups with Female predominance and most cases were from rural areas.
- Accidental poisoning was the most common mode of poisoning. The majority of patients consumed the poison through the oral route.
- Different agents are implicated but pesticides were the most common.
- Most of the patients came to ED within the first six hours. The majority of patients (52.75%) were discharged within 6 hours and the mortality rate was 2.2%. Delay time and duration of hospital stay were factors affecting the outcome.

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