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Epidemiological Profile of Accidental Poisoning in Children, Retrospective Study at Benghazi Children's Hospital, Libya, 2021

Eman Alaqeli [a*], Salma. Elzwai [b], Ahmed Atia [c], Fawzia Ahmed [d], Manal Abuagela [d], Najia Alwaseea [d], Arij Mousa [d], Rehab Jerbi [e], Abir Ben Ashur [f], Hamida El Magrahi [f] and Eman Abdulwahed [f]

[a] Department of Health Services Administration, Faculty of Public Health, University of Benghazi, Libya.
[b] General Pediatric Department, Faculty of Medicine, University of Benghazi, Libya.
[c] Department of Anesthesia and Intensive Care, Faculty of Medical Technology, The University of Tripoli, Libya.
[d] Department of Public Health, Faculty of Medical Technology, The University of Tripoli, Libya.
[e] Department of Community Medicine, Faculty of Medicine, The University of Tripoli, Libya.
[f] Department of Medical Laboratories Sciences, Faculty of Medical Technology, The University of Tripoli, Libya.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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**Corresponding author: Email: eman.alaqeli@uob.edu.ly;*

ABSTRACT

Aims: This study aimed to determine the clinical and epidemiological profile, and outcomes of accidental poisonings in children.
Study Design: This observational retrospective study.
Place and Duration of Study: General ward and ICU of Benghazi Children's Hospital, from the 1st of January to the 31 of December 2021.
Methodology: The study included 232 children up to 15 years old (131 males, 101 females) who were admitted with acute poisoning (either comatose or stable). Complete demographical, clinical, and outcomes data were recorded and analyzed using SPSS version 26.0 software.
Results: out of 232 children admitted for poisoning 56% were drug poisoning, while 44% were non-drug poisoning. Children, less than 3 years were more liable for poisoning 61.2%. Males were poisoned more than females in all age groups 56.5%. The type of poisoning was found strong correlation with age and was higher in younger (*P*=.002), living in urban areas (*P*=.022). The results showed that there was a statistically significant difference between the types of drugs and age groups (*P*=.000). In almost all cases 93.1% were due to accidental/ unintentional poisoning. More than 88.3% of the cases were exposed to poisoning through the oral route. Overall, 29.3% of drug-poisoning children were asymptomatic, whereas all non-drug-poisoning children were symptomatic and most had mild symptoms. Most cases were discharged in good condition, and only one case died due to anti-psychiatric drug poisoning.
Conclusion: The findings confirm that children under 3 years are more prone to accidental poisoning**.** Antipsychiatry drugs and cannabis were the most commonly involved in the poisoning.
Recommendations: Accidental toxic exposures could be avoidable by preventive measures. The cornerstone of management for children's poisoning is appropriate public education and raising awareness among parents about safe practices of storing medications and toxic household chemicals.

Keywords: Epidemiological; accidental poisoning; children; Libya.

1. INTRODUCTION

Childhood poisoning is a serious global public health issue [1,2,3]. It represents one of the main causes of morbidity and even mortality in pediatrics, occurring in virtually every country in the world, including both developing and well-developed countries [4,5]. Most poisonings that occur in young children are unintentional and seem to be mainly accidental [6,7,3]. Because children most of the time are at home, the home and its environment can be an unsafe place in which poisonous substances are unintentionally ingested [3]. Furthermore, children of preschool age need to explore and investigate their surroundings with all their senses, including taste [5,4]. Also, the curiosity of children leads to accidental ingestion of unattended pills or different household products like; domestic cleaning products, pesticides, and other medicinal products. [2,7] as well as due to parental negligence in keeping medicines and household chemicals; out of reach of children [3].

Poisoning is the deterioration of the body's functions by the ingestion of any substance that is toxic to the body or by overdosing on a nontoxic substance at a normal dose. The exposure may be acute or chronic, and the clinical presentation varies accordingly [2,3]. Thousands of children are subsequently evaluated in emergency department EDs mainly due to ingestion of household products, medicines, or pesticides, most of which are preventable [1] Poisonings, like other types of injuries, are understandable, predictable, and preventable events [6].

The extent of this problem and the underlying causes of poisoning are different from one country to the other, depending, amongst others, on the local customs and beliefs, demography, socio-economic status of the population in that area, and level of education. Besides, poisoning patterns may vary concerning the age and gender of the individuals [3,5,8].

In addition, interrelated factors determine the incision of poisoning and its outcomes in a child. These include the type of poison, the dose, the formulation, the route of exposure, the age of the child, the presence of other poisons, the state of nutrition of the child, and the presence of other diseases or injuries [3]. Studies from developed

countries predominantly demonstrate common household products as the most common cause of acute childhood poisonings and lower incidence of drugs and pharmaceuticals, possibly because of the use of child-proof blister packing and bottling of medicines. Even studies from South Africa have shown that the use of child-resistant containers for kerosene use has reduced the incidence of acute childhood poisoning significantly [9].

Although progress has been made regarding the prevention of accidental poisonings, by using more resistant packaging and raising awareness of the composition of toxic products, they are still frequent in children, particularly in those aged 2 to 3 years old [4]. Therefore, identifying the epidemiology aspects of acute/ accidental poisoning in children may help in improving and applying adequate preventive measures [4,1]. From this context, this study aimed to determine the epidemiological and clinical profile and outcomes of accidental poisonings in children up to 15 years at Benghazi Children's Hospital.

2. MATERIAL AND METHODS

This study was carried out with an observational retrospective analysis of the information of 232 patients up to 15 years old who were admitted with acute poisoning to the general ward or ICU (either comatose or unstable) of Benghazi Children's Hospital in Libya during the period from the 1st of January to the 31st of December 2021.

Benghazi Children's Hospital in Libya is the main medical institution that provides healthcare to young patients from (0 to 15 years old) in local communities in Benghazi and surrounding areas in eastern Libya and it receives around 400 patients per day at Out Patient Department OPD.

The data of this study were collected from this hospital's medical records and all data were identified and abstracted by medical record officers. This study only examined accidental/unintentional cases; food poisoning cases were excluded.

The poisonings children were divided into 4 groups according to their age: (i) Less than 3 years; (ii) From 3 to 6 years, (iii) From 6 to 9 years; (iv) More than 9 years.

The collected data included: patient demographic profiles (age, gender, place of residence), the type of poison, mode of poisoning (accidental/unintentional, intentional), route of poisoning (oral, inhalation, sting, other routes), and toxic gas inhalations were accepted as accidentally poisoning. Signs and symptoms (gastrointestinal, neurology, respiratory CVS, others (skin, mouth, lips, limbs), or no symptoms). In addition, laboratory tests include CBC (Complete Blood Count), RFT (Renal Function Test), LFT (Liver Function Test), Blood sugar, coagulation profile arterial blood gases, and drug levels. Data collected also included treatment, admission units, and the outcome.

Poisoning factors have been classified into two categories: Drug Poisoning (anti-psychiatric, CVS drug, analgesic and antipyretic, an anticonvulsant drug**,** unknown drug) and Non-Drug Poisoning (cannabis, kerosene and petroleum products, corrosive, carbon monoxide, scorpions sting, organophosphorus, rat poisoning and insecticide).

Statistical analysis of the data was performed using Statistical Package for Social Science (SPSS) version 26.0 software. The values of categorical variables were presented as numbers and percentages, and the comparison between the groups was done by using the Pearson Chi-Square Test. The statistical significance was accepted at the P-value was less than 0.05.

Official approval has been taken from the Faculty of Public Health, the University of Benghazi, and the Benghazi Children's Hospital where the study was conducted. All personal data were kept anonymous to ensure the confidentiality of records. All procedures performed in the study followed the ethical standards of the institution.

3. RESULTS AND DISCUSSION

During the study period, the total number of children admitted for poisoning was 232 cases 56% were drug poisoning whereas 44% were non-drug poisoning.

Table 1 illustrates the results regarding the incidence of drug and non-drug accidental poisoning in various age groups and summarizes all demographic and clinical data of poisoned children. The maximum frequency for drug and non-drug poisoning was in the age group less than 3 years 61.2%. These results were corresponded with the findings of several studies [2,4,5,10,11,12]. The result indicated that there was a strong correlation between age group and type of poisoning (*P*=.002).

Table 1. Demographical and clinical data of poisoned children according to drug and non-drug poisoning

Variable	Drug poisoning		Non-Drug poisoning		Total	
	No	%	No	%	No	%
Age (years)						
Less than 3 years	84	64.6%	58	56.8%	142	61.2%
3 - 6 years	33	25.4%	26	25.4%	59	25.4%
6 – 9 years	3	2.3%	7	6.8%	10	4.3%
More than 9 years	10	7.6%	11	10.7%	21	9.1%
P value=0.002						
Gender						
Male	66	50.7%	65	63.7%	131	56.5%
Female	64	49.3%	37	36.3%	101	43.5%
P value=0.56						
Place of Residence						
Urban	127	79%	83	80.4	210	90.5%
Rural	3	3%	19	19.6	22	9.5%
P value=0.022						
Mode of Poisoning						
Accidental/ Unintentional	116	89%	100	98%	216	93.1%
Intentional	14	11%	2	1%	16	6.9%
Route of Poisoning						
Oral	130	100%	75	70.5%	205	88.3%
Inhalation	0	0	13	12.7%	13	5.6%
Sting	0	0	14	13.7%	14	6%
Other Routes	-	-	-	-		
Signs & Symptoms						
Gastrointestinal	13	1%	50	49%	63	27.2%
Neurological	36	27.6%	37	36%	73	31.5%
Respiratory	5	3.8%	23	22.2%	28	12.1%
CVS	6	4.6%	3	2.3%	9	3.9%
Others (skin, mouth, lips, limbs)	-	-	21	20.5%	21	9.1%
NO Symptoms	68	52.3%	-	-	68	29.3%
Outcome for Admission						
Admission to ICU	42	32.3%	39	38.2%	81	35%
Discharge	105	80.7%	68	66.6%	173	74.6%
Discharged Against Medical Advice DAMA	24	52%	34	33.3%	58	25%
Expired	1	0.76%	-	-	1	0.43%

** Total number of drug poisoning=130, total number of non-drug poisoning= 102*

Based on the results males 56.5% were more than females 43.5% in all age groups. This result was in line with the study of Hassan and Siam in Egypt [10], Alwan et al. study in Malaysia [5], and Lee et al. study in Taiwan [11], and disagrees with Kazanasmaz et al. study in Turkey [2] reported that female more than male while Berta et al. study in Italy [12] found that male and female were equal. The results showed that there was no statistically significant difference found in gender (*P* = 0.56).

This study showed no statistically significant differences regarding the effect of gender on the number of poisoned cases. Significant differences were found between the age groups and between the types of poisoning.

The majority of cases 90.5% were living in the urban area (*P* =0.02). There were statistically significant differences found in residency status. In this study, findings indicated that the urban areas are more than rural areas in cases of poisoned children which was in disagreement with the study conducted by Hassan and Siam in Egypt which reported that the number of poisoned children was higher in rural areas than in urban areas [9].

Almost all cases of poisoning 93% were accidental/ unintentional, whereas, 7% of cases were intentional poisoning, (attempted suicide in 9 cases, and 4 of them had multiple drug ingestion). The maximum age was 15 years for suicide attempts and the minimum age was 3 months for carbon monoxide poisoning. Various studies [2,10,11,12] have reported that most of the poisoned cases amongst children occurred accidentally. This is consistent with the findings of the current study.

Findings displayed that the most common route of poisoning was the oral route 88.3%, followed by 6 %, scorpion sting, 5.6% of cases was the inhalation route of toxic chlorine gas (either used in weapons 4%, inhalation of cannabis smoke of 0.86%, and 0.43% by carbon monoxide poisoning). This study indicated that the oral route of poisoning was the most common, these findings had similarities to what previous studies were carried out in some different countries [10,11,12].

The finding of this study also demonstrated that more than fifty percent of cases were drug poisoning and 43% were non-drug poisoning. In contrast, the findings of other studies reported that non-drug poisoning was more than drug poisoning. [4, 11,12].

Among 130 drug poisoning cases, 4.7% were unknown drug types; while the remaining 95.3% were identified drugs. Approximately 24.5% of cases were neurological drugs (including 3.3% anticonvulsant drugs, 20.3% psychiatry drugs) followed by CVS drugs in 18.6 % of cases, then analgesic and antipyretic drugs in 13.5% of cases. These findings were in agreement with the, study where neurological drugs were in (29.4%) of cases, analgesics in 22% of cases, and CVS in 13.2 % [10]. Also, the results agreed with the results of study which found that antipsychiatry drugs were 29.6% followed by analgesics drugs 16.1% and CVS 11.8%. In a Turkish study the most common drug associated with children's poisoning was an anticonvulsant more than an analgesic [2] while an Italian study was in disagreement with the previous findings; where analgesics were the first drug responsible for children's poisoning 20.8 %, followed by Psychiatry 18.2 % then CVS 12.6% [12].

The current study revealed that 97% of the poisoned cases were single drug poisoning and 3% were multiple drug poisoning which is consistent with results who found that in the majority of cases, 91% were ingested single drug and 9% were multiple drugs poisoning [10]. Also, that was in agreement with who reported that patients ingested single drugs were higher at 79% and multiple drugs were 19.1 % [11]. The results of the current study showed that there was a statistically significant correlation between the types of drugs and age groups (*P* =0.00).

Regarding non-drug poisoning, Cannabis was number one responsible for approximately %35 of a total of 102 cases of non-drug poisoning, with roughly 16.3% of total poisoning cases. This result was similar to the result of [10], representing about 24% of a total of 930 acutely cannabis intoxication in preschool children. Also, it is similar to the result of a French study by Claudet et al. [13], which seems to link the incidences of poisoning to the changing consumer trends and increased concerns about the availability of the substances responsible for children poisoning in markets raising a real public health issue.

The second recorded poisoner was kerosene and petroleum products represented 22.5% of nondrug poisoning, followed by toxic chlorine gas 10.7 % which was used in the weapon that happened in the area of the last war in Libya, both needed preventive measures, 9.8% of corrosive household cleaning, then organophosphorus and insecticide 7.8% cases, carbon monoxide poisoning only in one case (0.09%). This finding was similar to [14] who reported that petroleum was responsible for (13%) of cases and, a small number of carbon monoxide poisoning cases. This agrees with the results of many developing countries' studies and disagrees with the Egyptian study (9) where the pesticide was the most common poisoning suspect. This also disagrees with the Romanian study (2018) where household corrosive products; For instance, carbon monoxide and insecticide were the most commonly responsible products which disagreed with the Taiwan study (2019) where carbon monoxide was more

common than pesticides and unknown products in (5.7 %) of all cases. In Turkey chemicals were the most common reason for poisoning, especially the corrosive rat poisoning then pesticide and carbon monoxide in (5.8 %) [2].

Moreover, in our study, the scorpion sting was responsible for the poisoning in 10.7% of cases, and no snake bite results. This finding disagrees with Turkey's study where scorpions in 16 cases (13.2%) and snakes in 7 cases (5.8 %) [2]. Also, disagree with Taiwan's study (2019) where snake bites were found in 12 cases and no scorpion sting was found there (10). The result indicated that there is a strong relationship between the type of non-drug poisoning and the age group of cases (*P*-value was 0.028) which is statistically significant.

In the present study, cases were laboratory tested using CBC, RFT, LFT, blood sugar, and coagulation profile test arterial blood gases and drug levels. One patient with paracetamol poisoning had low blood sugar another three patients had low serum potassium and abnormal coagulation profiles. No one had tested the drug levels due to the lack of equipment.

Regarding symptoms, the current study's findings showed that the children with drug poisoning were asymptomatic in 29.3% which explains the high rate of early discharge, and all non-drug poisoning were symptomatic. Most of them had mild symptoms (mild abdominal pain, mild vomiting, or mild cough). agreeing with the Taiwan study (2019) where more than 50% were asymptomatic and had CNS and GIT symptoms.

The most common symptoms were; drowsy, vomiting, and confusion which were similar to the study in Egypt (2014) which did not agree with most cases of corrosive ingestion that had only local ulceration of the mouth except 2 cases had GIT bleeding, and one developed oesophageal stenosis

Furthermore, the most common symptoms in non-drug poisoning were gastrointestinal GIT pain 49% with neurological 36% and respiratory symptoms 22.5%, while in drug poisoning the neurological CNS symptoms 27.6% were the most common symptoms. Most cases were observed with or without supportive measures. No charcoal or antiemetic was given. These results disagree with the Romanian study 31% developed oesophageal stenosis. Cases of organophosphorus and insecticide ingestion which doing well are only a result of early seeking of medical advice and gastric lavage done for them [4].

Regarding treatment, all cases received IVF; charcoal as a chelating agent 0%. This result disagreed with the Taiwan study where charcoal was used in 5.4%. In the current study gastric lavage done in 107 cases was positive in 36 cases. Atropine was the only antidote available for organophosphorus poisoning. Although all cases needed to antidote, no one has given it because it is not available in the hospital. Notably, all cases were discharged in good condition.

Regarding the outcome, 35% of cases were admitted to ICU, 2.4% with coma and intractable convulsions, and one case died due to anti-psychiatrist drug poisoning. 99% were discharged in good condition after the exclusion of those who were discharged against medical advice (DAMA) 25%. One case expired due to antipsychiatry drug poisoning at 0.43%, these findings disagree with the Romanian study (2018) had 2 deaths of organophosphorus poisoning cases [4].

The limitations of this study due to it being a retrospective study, we had difficulty calculating the incidence rate because the total number of hospital admissions included other branches of surgical nephrological, hematology, oncology, and neonatology departments admission in the year of the study conducted. Moreover, we have not found previous studies in our study field of children poisoning in Libya to compare. Finally, although this study was conducted in the largest hospital of children in the eastern part of the country, it is not expressive on the whole of Libya. So further studies are needed to compare patterns and causes of children's poisoning in different regions of Libya.

4. CONCLUSION

It can be concluded from this study that accidental poisoning's highest incidence was noticed among children under 6 years old, especially 1-2 years and the mortality rate was 0.43%. Additionally, there was a strong relationship between age group and type of poisoning, and between the types of poisonings and residences of the status. Antipsychiatry and cannabis were the most commonly involved in the poisoning.

5. RECOMMENDATIONS

Many accidental toxic exposures could be avoidable by preventive measures. To put it briefly, the cornerstone of management for children's poisoning is appropriate public education on safe practices of storing medications and toxic household chemicals, using child-resistant containers, and keeping medicines and household chemicals; out of reach of children. Furthermore, raises the awareness among parents about the potential harms related to cannabis and Kerosene exposure through organized measures in the community.

CONSENT

As per international standards, parental written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

This study obtained approval from the Faculty of Public Health, the University of Benghazi, and the Benghazi Children's Hospital where the study was conducted. All personal data were kept anonymous to ensure the confidentiality of records. All procedures performed in the study followed the ethical standards of the institution.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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