

A Five-Year Study on the Profile of Acute Poisoning Cases Admitted to Poison Center, Alexandria, Egypt

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Abstract

Background: Poisoning remains one of the health problems that causes significant patient mortality and morbidity worldwide regardless of a country's development or culture. It can occur secondary to exposure to natural ingredient or chemical substance.

Methods: This study was conducted to evaluate Alexandria Poison Center (APC) data for trends and modes of poisoning exposure over a 5-year period and to evaluate the characteristics of human exposure based on the cases received by APC. The data was collected retrospectively from 1st of January 2017 to 31st of December 2021 and all patients admitted through this time (36853 cases) were included.

Results: The study revealed that poisoning occurs significantly more in females than males and the highest incidence of poisoning occurred in adult category. Pesticides were accountable for the highest number of poisoning cases; also, pesticides were responsible for more than 70% of deaths. So, Pesticides were selected as a model to be analyzed in detail. On the side of the study, the effect of COVID-19 was studied and revealed no significant changes in profile of acute poisoning cases, however, suicidal tendency remarkably increased in 2020 and 2021 in comparison to other studied years.

Keywords: Acute Poisoning, Pesticides, Poisoning, Alexandria

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INTRODUCTION

Poisoning is a universal health problem known all through the history, people choose to ingest poison and die peacefully without violence. The death of Queen Cleopatra VII - Queen of Egypt - was the most famous death of acute poisoning on record [1]. Acute poisoning refers to a series of pathophysiological changes and associated clinical manifestations over a short period of time after exposure to a toxic substance or toxic dose of a pharmaceutical drug [2]. According to the World health organization in 2016, poisoning causes up to 106,683 deaths and loss of 6.3 million years of healthy life [3,4].

The problem is getting worse over time as new drugs and chemicals are developed. Moreover, poisoning cases are increasing day by day due to changes in lifestyle and social behavior [5]. To assess the characteristics and magnitude of the problem, it is vital to recognize the nature and severity of acute poisoning cases that are specific to each poison center. [6]

The Poison Control Center has a variety of tasks. Raising of public awareness is the key role of the health professionals of poison center, and its direct outcome is improved care and prevention of poisoning. Moreover, the data regularly collected by poison control centers serves as a tool for national

surveillance and is considered the only source of information about chemical and poison exposures across each country. [7,8] Considering Egypt, the precise annual number of poisoning cases is difficult to estimate because most of these cases are not recorded and previous epidemiological studies primarily focused on local data. Alexandria Poison Control Center is a major poison center in Egypt. Since its establishment, it has provided adequate services in diagnosis and treatment of thousands of patients annually throughout Egypt.

Interpretation of poisoning data is crucial in order to recognize constantly evolving dangers and issue warning reports, hence minimizing the mortality and morbidity caused by exposure to different chemicals and poisons. Therefore, the aim of the current study was to evaluate the prevalence of poisoning and assess the determinants, circumstances, and outcome of patients with intoxication in APC, Egypt during the five-year period from 2017 to 2021.

METHODS

Setting and Sample

This is a retrospective observational hospital record-based study conducted in APC, Egypt. All cases of acute poisoning admitted over a five-year period (2017 till 2021) were investigated in the current study. The primary outcome of this study is to evaluate APC data for trends in the poisoning

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exposure and modes of poisoning over a 5-year period. The secondary outcome is to evaluate the characteristics of human exposure cases based on the calls received by the APC.

Data Collection and Analysis

The data had been collected from electronic database and medical records of APC. The study variables included frequency distribution of acute poisoning cases per month for each year according to gender, age, route of poisoning (Inhalation, Oral, dermal and bites), circumstances of poisoning (Suicidal, accidental and food poisoning), type of poisoning (alcohol, analgesics, antidiabetic drugs, animal bites, CVS drugs, corrosives, food poisoning, CNS drugs, inhalational gases, drugs for respiratory system, toxic marine, pesticides, heavy metal and hydrocarbon) and the outcome. Also included data related to pesticides poisoning (age, type, circumstance, and mortality rate).

The patients were categorized into the following age groups: Infant (from one month to one year), Child (from one year to 12 years), Adolescence (from 13 years to 17 years), Adult (from 18 to 59 years) and old age (from 60 years and above) [9].

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 variables, we considered $P \leq 0.05$ statistically significant [10,11].

Ethical Considerations

The Institutional Review Board, faculty of medicine, Alexandria University approved the study Confidentiality of data was maintained and used only for the purpose of epidemiological analysis.

RESULTS

In the present study, the total number of admitted patients to APC was 36853 cases in 5 years' period from 2017 to the

end of 2021. The distribution of cases during the five-year period is illustrated by months in table 1.

As regard the gender, incidence of toxic exposure was more common among females compared to males in all studied years except in year 2021, where males slightly outnumbered the females (50.3, 49.7% respectively).

Age of hospitalized patients with acute poisoning are summarized in figure 1. The age of admitted patients ranged from less than one year up to 80 years. The most common age group of poisoning was adult category, which represent nearly half of admitted cases in each studied year, followed by child category and the least age group admitted to APC was old age category, which did not exceed 2.5% of cases in all studied years.

The frequency distribution of acute poisoning cases according to the route of administration of the poisons shows that the route of poisoning in the majority of admitted cases

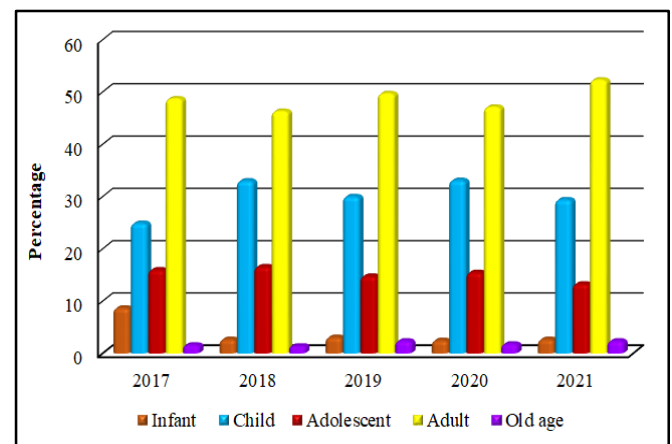


Figure 1. Frequency distribution of acute poisoning cases according to age group 2017-2021

Table 1. Frequency distribution of acute poisoning cases 2017-2021

Months	Years					Total
	2017	2018	2019	2020	2021	
January	433	504	657	529	596	2719
February	407	481	532	645	633	2698
march	435	783	578	516	751	3063
April	591	719	657	352	634	2953
May	604*	660	578	460	795	3097
June	486	483	752*	457	808*	2986
July	654*	772	792*	669	824*	3711
August	583	693	715	792	797	3580
September	512	578	574	873*	691	3228
October	470	596	606	806*	594	3072
November	479	482	556	687	538	2742
December	517	623	555	671	638	3004
Total	6171	7374	7552	7457	8299	36853

is oral in all studied years. Other routes, including inhalation, bites, and skin exposures, did not exceed 10 % of cases in each year of the five studied years.

Figure 2 showed that accidental circumstances of poisoning represented more than 50% of cases in all years, while suicidal route represents increasing in the number of cases after 2020 than before as 2017 has 2271 cases but 2020 and 2021 have 3010 and 2952 cases respectively. As regards the type of poisoning, the toxic substances in table 2 were

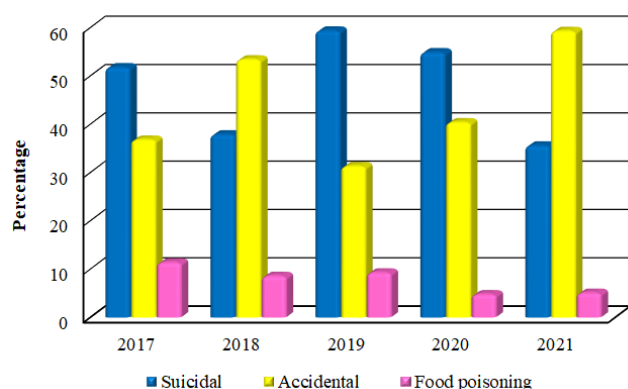


Figure 2. Frequency distribution of acute poisoning cases according to circumstances of poisoning 2017-2021

arranged according to their frequency among cases from the most common to the least common, pesticides were found to be the most often utilized poisonous substance, accounting for 6920 cases out of the total cases admitted to APC during the period of five years. Unknown substances (where the medical examiner lack sufficient information about the name of poisonous substance) ranked second with 5757 cases, followed by corrosives with 4874 cases.

Table 3 included statistics on fatalities caused by various poisons. Pesticides were discovered to be the cause of mortality in more than 70% of the deaths in APC documented over the course of five years.

Focusing on pesticides, the frequency distribution of pesticides cases according to age follow the same pattern as the total poisoning case with statistically significant difference (χ^2 160.082*, $P < 0.0001$ *). The most common age group of pesticide poisoning was the adult category showing increase in the number between year 2017 to 2021 (654 (49.6%), 802 (55%) respectively). The least age group admitted to APC with pesticide poisoning was old age category with more or less fixed percentage (1.9%), but the Infant age group showed a decreasing trend from 2007 to 2021. As regard gender distribution of pesticides cases, the female was more common than male except in 2017 and 2021, where males slightly outnumbered females with statistically significant difference (χ^2 10.637*, $P < 0.031$ *).

Table 4 showed the frequency distribution of pesticides

Table 2. Frequency distribution of acute poisoning cases according to causative poisonous agents 2017-2021

Type of poisoning	Total	Years									
		2017		2018		2019		2020		2021	
		No.	%	No.	%	No.	%	No.	%	No.	%
Pesticides	6920	1319	21.4	1427	19.4	912	12.1	1803	24.2	1459	17.6
Unknown substance	5757	351	5.7	768	10.4	2382	31.5	44	0.6	2212	26.7
Corrosives	4874	811	13.1	1281	17.4	868	11.5	1196	16.0	718	8.7
CNS drugs	3304	756	12.3	711	9.6	435	5.8	741	9.9	661	8.0
Safe drugs	3072	550	8.9	736	10.0	465	6.2	757	10.2	564	6.8
Food poisoning	2816	702	11.4	637	8.7	699	9.3	356	4.8	422	5.1
Alcohol	2150	341	5.5	249	3.4	287	3.8	534	7.2	739	8.9
Analgesics	1766	261	4.2	322	4.4	273	3.6	672	9.0	238	2.9
Hydrocarbon	1662	400	6.5	267	3.6	185	2.4	450	6.0	360	4.3
Gases	1477	85	1.4	71	1.0	483	6.4	394	5.3	444	5.4
CVS drugs	900	208	3.4	229	3.1	163	2.2	156	2.1	144	1.7
Bites	848	130	2.1	287	3.9	150	2.0	167	2.2	114	1.4
Respiratory	667	153	2.5	187	2.5	131	1.7	114	1.5	82	1.0
Antidiuretics	546	98	1.6	163	2.2	119	1.6	73	1.0	93	1.1
Heavy metal	48	0	0.0	17	0.2	0	0.0	0	0.0	31	0.4
Toxic marine	46	6	0.1	22	0.3	0	0.0	0	0.0	18	0.2
Total	36853	6171	100.0	7374	100.0	7552	100.0	7457	100.0	8299	100.0
$\chi^2(p)$											
											6379.229*(<0.001 *)

χ^2 : Chi square test

*: Statistically significant at $p \leq 0.05$

cases according to mode of exposure, the accidental route accounted for more than half of cases in all the studied years except 2021, where the suicidal route represented 51.4% of cases with statistically significant difference (χ^2 65.435*, $P < 0.001^*$). The table illustrated alarming increase in the number of suicidal cases using pesticide between year 2017 to 2021 (615, 750 respectively).

DISCUSSION

In 1979, APC opened to serve poisoned patients in Alexandria and surrounding governorates. The center starts with six beds and a call center. In 2017, the center bed's number was increased to reach 16, with several awareness campaigns about protection from the poisoning. The number of patients reached 6171 patients in 2017 then increased by 19.5 % in 2018 then by 22.3 % in 2019. Despite of COVID-19 lockdown, the overall number of admitted patients to the center remained almost the same (increased 20.8 % as compared to 2017), however, marked decrease in number of cases was observed in the months of the first wave of COVID-19. Improving the infrastructure of the center, increasing the bed's number to thirty beds can explain the rising number of the admitted patients through studied years to reach 8229 cases in 2021 (33.3 % increase as compared to 2017).

The highest incidence of poisoning in the current research occurred in adult category, followed by child category. According to the WHO report, Africa and eastern Mediterranean region are the most affected regions by poisoning accidents. Children under five had the greatest unintentional poisoning-related fatality rates this could be explained by that children have natural eagerness to explore their surroundings, propensity to put items in their mouths, lack of understanding of the hazards, and play habits [12,13]. Several research reported that prevalence of poisoning among

the age group 1–5 years in children as those in Martinique which mentioned by resiere D et al 2020, and in India which described by Halhalli HC et al 2021 and Saikia D et al 2020 [14,15,16].

In another study conducted in Egypt, the results were similar, as Abdel Hamid et al. [17] found that the majority of cases involved in his study were from 15 to 40 years old followed by the age group less than seven years. The high incidence of poisoning in adult category in Egypt may be attributed to the great emotional, social, economic, and political challenges in Egypt that may increase suicidal attempts.

Accidental and suicidal exposure are responsible for high rates of poisoning in adults as showed in the current results throughout the years of the study. The most common intoxication was pesticides because agriculture is a common profession in the nation, pesticide use and availability is increased, and poisonings from these chemicals are also consequently increased [18].

In the current study, with analyzing total number of cases females markedly outnumbered males all through the years. Similar findings have been reported from developed and developing countries as in Sri Lanka, where males represented 44.5 % of poisoned cases, in Saudi Arabia females also outnumbered males in food poisoning and drug poisoning [19,20]. Other research in Egypt showed that female presentation was more than that of male presentation [21]. This could reflect the daily stress and depression affecting females in these regions. An opinion considers depression prevalence in females found globally indicates that it is related to biological sex and may be less due to social and economic factors. There is no conclusive proof that the prevalence of depression is higher in nations where women's socioeconomic standing is noticeably lower than men's than

Table 3. Frequency distribution of mortality cases from organophosphorus to total mortality cases 2017-2021

	2017	2018	2019	2020	2021	Total
Mortality cases	57	64	30	78	105	355
Mortality from OP	40	46	18	66	81	251
Frequency of Mortality in OP cases to total mortality cases	70%	71.8%	60%	84.6%	77.1%	70.7%

Table 4. Frequency distribution of pesticides cases according to Mode of exposure 2017-2021

Mode of exposure	Years									
	2017		2018		2019		2020		2021	
	No.	%	No.	%	No.	%	No.	%	No.	%
Suicidal	615	46.6	692	48.5	420	46.1	688	38.2	750	51.4
Accidental	704	53.4	735	51.5	492	53.9	1115	61.8	709	48.6
Total	1319	100	1427	100	912	100	1803	100	1459	100
$\chi^2(p)$	65.435* (<0.001)*									

χ^2 : Chi square test

*: Statistically significant at $p \leq 0.05$

in nations where there may be more equality [22].

Yet, Contrary to the current results, males outnumbered females in Rawalpindi (54.4%) and also in India (59.89%), where males exposed to organophosphates and snakebites mainly outdoor [23,24]. In the current research, the oral route is the main route for toxicity and is far from other routes as inhalational, skin exposure, and bites. The Maryland report declared similar results, where oral intake accounting for 58.0% of cases and skin exposure and inhalation accounting for 25.3% and 7.5% of cases, respectively. In addition, it was reported by Asawari et al. 2017 that the oral route was the primary exposure route. This may be due to instances of environmental and occupational exposures in addition to suicide attempts and unintentional exposure in the house [25].

Regarding the circumstances of poisoning in the current study, the accidental mode is much more common than the suicidal mode, with notable increase in suicidal intention in 2020 to reach 688 cases. This may be explained by the first wave of COVID-19 and the lockdown, which associated with increased depression and anxiety according to WHO report 2022 [26]. This was in accordance with Maryland Poison Center annual report 2019, which also stated that most of the poisoned cases were unintentional (68%).

Pesticides (Organophosphorus, Carbamate, Aluminum phosphide, Zinc phosphide, and others) are the most frequent form of poisons used in current research. Unknown substances (It comprises poisonous compounds that the doctor was unable to identify owing to the patient's refusal to reveal the name or the person's ignorance of the sort of material causing the poisoning) came in second, followed by corrosives, including cleaning agents and household materials.

With further analysis for causative agent, it was observed that in addition to pesticides, alcohols, corrosives, hydrocarbons, analgesics, and CNS drugs were the most common poisons increased in utilization during COVID-19 time. The antiseptics, disinfectant, and cleaning agents were more encountered in accidental as well as suicidal poisoning in 2020 and 2021. This explains the paradigm change in poison consumption during lockdown as the majority of the household's readily available items were utilized.

Because of differences in national conditions, socio-economic status, and ethnicity, the type of drugs causing acute poisoning in children differs among countries and regions. Poisoning from drugs and household products is common in European and American countries, Pesticide use is most prevalent in developing agricultural countries like India, China, South Africa, and Sri Lanka ⁽¹³⁾, which is consistent with the findings of our study as Egypt is one of agricultural countries where pesticides poisoning increases either intentionally or unintentionally as pesticides are commonly employed in smallholder agriculture and hence readily available and severe pesticide poisoning is more prevalent [27-30].

Pesticides were discovered to be the cause of mortality in more than 70% of the deaths in APC documented over the course of five years. The adult age group proved to be at a significant higher risk of pesticide exposure than other age

categories, the percentage of poisoning in men and women fluctuated across the years studied, with males ranking first in 2017 and 2021, while women ranked first in the remaining years. An alarming trend has emerged in the prevalence of intended pesticide poisoning, with the number of cases of suicide using pesticides climbing to 61% in 2021 and despite of several laws that prohibited selling fatal pesticides especially aluminum phosphide, the mortality rate increased through the 5 years. This coincides with Behera et al. who stated that there was an increased consumption of aluminum phosphide in India due failing to cope the mental pressures accompanying lockdown [28].

Eddleston 2020 [30] reported that over 150,000 people die each year from pesticide poisoning. Fatalities of pesticide poisoning are caused by Organophosphorus and Carbamate, Paraquat and aluminum phosphide, and case fatalities are typically greater than 50% in several nations. Rakesh Ghimire 2022 mentioned that in India they have the same results as regard self-poisoning by pesticides, and the most harmful in Nepal was organophosphorus (OP), phosphine gas (Aluminum phosphide, zinc phosphide) and organochlorine insecticides [31].

In many cases in the current research, the parents were unaware of the poison that was consumed by the child or adolescents or they afraid from accusation by negligence or stigma, so they deny their knowledge, so unknown substances came in the second rank in the current study. The same had reported by Halhalli HC [15] who stated that in poisoning, it is crucial to anticipate broad pharmacological probable components and their potential impacts for rapid diagnostic and treatment approach. Sometimes it may not be clear exactly what the agent is and the quantity of exposure, particularly in the pediatric age range. For this reason, it is useful to be aware of the most frequent causes, for proper examination and to order laboratory tests. These individuals should be treated as forensic cases in addition to needing diagnostics and treatment as soon as possible [15].

The third cause of poisoning in the present research was corrosive and it had specific peaks in 2018 and 2020. A specific survey carried out in IRAN showed that corrosive is more common in low-and middle-income countries. The prevalence ranges from 5,000 to 15,000 cases per year according to national and cultural contexts. The majority of intoxication are usually children under the age of five years old. It is used in adults mainly to commit suicide [32].

CONCLUSION

The present study has showed that acute poisoning is an important problem in Egypt. It is more prevalent in adults and arises mainly by accident, emphasizing the significance of prevention as the greatest way to minimize morbidity and death from acute poisoning. Females outnumbered males, and poisoning by oral route predominated. Pesticides topped the list of poisonous substances and caused more than 70% of deaths that could help physicians to triage poisoning cases. The fact that the current study is the first in Egypt to analyze such a large number of cases over a period of five years is a key strength as it offers a clearer picture of the various components of this health concern and leads to more

comprehensive preventative policies and programs.

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Declarations

Ethics Approval and Consent to Participate

Approval was obtained from the Research Ethics Committee of Faculty of Medicine, Alexandria University (IRB NO:00012098, FWA NO: 00018699).

Adherence to National and International Regulations

The Ethics Committee is constituted and operates according to ICH GCP Guidelines and applicable local and institutional regulations and guidelines that govern ethics committees' operation.

Consent for Publication

Not applicable as the research didn't include any individual person's data in any form.

Author Contribution

Nourhan M.M. Saeed participated in the design of the study, and in data collection, drafted the manuscript, Maha A Ghanem participated in drafting the manuscript and reviewing its final version, Hanaa S Alhoshy participated in the design of the study and performed the statistical analysis, Maram Atef participated in data collection and storage and reviewing the final version.

Availability of Data and Materials

The authors confirm that the data supporting the findings are available from the corresponding author upon reasonable request.

Conflict of Interest: None to be declared.

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