TRENDS AND ACUTE POISONING PROFILES: 2023 ANNUAL REPORT OF ZAGAZIG UNIVERSITY POISONING TREATMENT UNIT

Eman El-Sayed Khayal[1], Iman Abd El Rady[1], Alshaimaa Morsi[1]
[1]Forensic Medicine and Clinical Toxicology Department, Faculty of Medicine, Zagazig University, Egypt

ABSTRACT

Background: Globally, acute poisoning is an important cause of morbidity and mortality. **Aim of the work:** This study aimed to provide comprehensive data about trends and profiles of acute poisoning cases who attended Zagazig University Poisoning Treatment Unit (ZUPTU) from January to December 2023. **Patients and Methods:** Retrospective observational research was conducted using information gathered from electronic healthcare records and medical files of ZUPTU. 2294 poisoned patients were included in this study. **Results:** According to age, the cases of age <18 years old (ys.) presented the majority of cases. The female group was more prominent than the male group. Suicidal cases, oral ingestion, and rural residence represented the majority of cases. 42.28% of cases were admitted to ZUPTU and 15.92% of studied cases were admitted to ICU. The majority of cases were mild and received conservative treatment and decontamination. Poisoning by therapeutics and pesticides represented the main groups of poisoning. Analgesics, psychotropic drugs, and sedative-hypnotics were the main causes of therapeutic poisoning, while organophosphorus, zinc phosphide and aluminum phosphide represented the main causes of pesticide poisoning. 56.1% of studied cases were improved and discharged, while 40.76% were discharged on demand. 72 cases were died. 69.44% of died cases were from aluminum phosphide poisoning. **Conclusion and Recommendation:** Put guidelines and rules controlling the sale of medicines and pesticides. Awareness of the mothers on how to keep the home environment safe for their children. Public awareness about the magnitude of poisoning especially aluminum phosphide poisoning.

Keywords: *Poisoning Annual Report, Poison Center, Poisoned patients, Suicidal Poisoning*

Corresponding author: *Dr. Eman El-Sayed Khayal*
Email: emy_khayal@yahoo.com
ORCID: 0009-0001-1192-7368

INTRODUCTION

Poisoning is deemed a considerable public health issue in Egypt. The main contributing factors to the problem include widespread pesticide use, easy access to cleaning supplies and drugs, and ignorance of the risks associated with common household products ***(Seif et al., 2016)***.

Any country has a variety of intricate factors that contribute to the spread of this poisoning problem. The pattern of poisonings at Poison Treatment Centers is constantly evolving, closely mirroring shifts in the economy, industry, and social structures ***(Clark, 2004)***. The steadily rising levels of chemicals, medications, and natural poisons in global marketplaces and population concentrations are resulting in expanding poisoning exposure. Ingestion, injection, inhalation, or skin absorption of a hazardous material, whether deliberate or accidental, can result in poisoning ***(El Masry and Tawfik, 2013)***.

A variety of interconnected variables can influence both the intensity and result of poisoning in a patient. It is challenging to determine the exact yearly total number of poisoning incidents in Egypt since the majority of these incidents are unreported and previous epidemiological studies have fundamentally examined regional data ***(Tawfik and Khalifa, 2017)***.

It is essential to determine the attributes and scope of the problem to develop convenient management and prevention strategies. This involves recognizing the nature, severity, and result of instances of acute poisoning that are unique to every country. Different poisoning patterns with diverse hazardous substances are caused by variations in the socioeconomic and cultural contexts of various countries ***(Zhao et al., 2009)***.

Acute poisoning accounts for a substantial share of admissions to the intensive care unit, despite the potentially low overall death rate. Rapid diagnosis, supportive care, and, in certain situations, the provision of specialized antidotal medication are necessary for the management of poisoned patients in critical care units ***(Assaf and Hasb Elnabi, 2019)***.

Even with the constant updating of knowledge on poisons and intoxication, several issues remain unresolved, such as a lack of knowledge about the possible risks associated with poisoning. Additionally, clinical toxicology departments continue to provide physicians with inadequate training, and there is a lack of availability and clinical exposure data ***(Hoffman, 2007)***.

THE AIM OF THE WORK

This study aimed to provide comprehensive data about trends and profiles of acute poisoning cases attended to Zagazig University Poisoning Treatment Unit from January 2023 to December 2023.

PATIENTS AND METHODS

Study design:

This was a retrospective study conducted on all patients who were admitted to Zagazig University Poisoning Treatment Unit (ZUPTU), emergency department (ED), and intensive care unit (ICU) during the year 2023 (1st January 2023 to 31st December 2023) with a history of acute poisoning.

Study setting:

The ZUPTU's electronic database and medical records were the sources of the data. Demographics (age, sex, and place of residence) as well as the type, route, and mode of poisoning, severity, admission location and duration, management of poisoning, and result were among the study variables. Each case's clinical severity was ranked using the formerly published standards of ***Persson et al. (1998)***, who describe a standardized poisoning severity grading scale that offers a qualitative assessment of morbidity, improved identification of actual risks, and data comparability. Grading has been designated as follows: (0): None, no symptoms or signs related to poisoning, (1): Mild, transient and spontaneously resolving symptoms, (2): Moderate, pronounced, or prolonged symptoms, and (3): Severe or life-threatening symptoms and Death.

The relation between different categories of poisoning agents and age, sex, mode of poisoning, severity of poisoning, and outcome were statistically analyzed.

Inclusion Criteria:

From January to December 2023, all acutely poisoned patients- regardless of gender- who presented to ZUPTU, ED, or ICU and were at least one month old had their medical records incorporated. A positive history, clinical pictures, and initial laboratory tests tailored to the poison were used to diagnose acute poisoning.

Exclusion Criteria:

Acute intoxication cases that occurred prior to or after the end of 2023 were not included. Chronic intoxication cases were also disregarded.

Ethical considerations:

The Institutional Review Boards of Zagazig University's Faculty of Medicine gave their approval to the study under the number **ZU-IRB#248-17-March-2023**. Patient consent was not necessary because this was a retrospective study based on medical documents. The data was kept private and utilized exclusively for epidemiological analysis. Data was gathered from patient sheets and an electronic database while maintaining the privacy of these documents.

STATISTICAL ANALYSIS

SPSS 26.0 for Windows was used to collect, tabulate, and statistically analyze all of the data. The qualitative data were expressed as numbers and percentages. The Chi-square analysis was employed for comparing the percentages of categorical variables. Statistical significance was defined as a p-value <0.05 and high statistical significance as a p-value < 0.001.

RESULTS

This retrospective research involved 2294 poisoned patients presented to ZUPTU, ED, and ICU from January 2023 till December 2023. According to age, 1150 cases (50.13%) were in age <18 years old, 931 poisoned cases (40.58%) were in age ranging from 18 to 40 years old, and 213 cases were in the group with age > 40 years old (9.29%), **figure (1)**. Regarding sex distribution, 55.27% (n=1268)

of studied poisoned cases were females, while male cases represented 44.73% (n=1026), **figure (1).**

According to residence and educational status, 1547 poisoned patients were come from rural areas (67.43%), whilst, 747 patients (32.56%) were from urban areas. There were 765 studied cases (33.35%) with no literacy, 857 poisoned cases (37.36%) with some education up to a medium or high school degree, 572 cases (24.93%) with a university degree, and 100 cases (4.36%) with postgraduate study, **figure (2)**.

Distribution of cases of poisoning regarding the route of exposure was as follows: oral ingestion accounted for 85.57% followed by bite/sting exposure (6.41%), dermal exposure (4.36%), inhalation (3.4%), and injection (0.26%). According to the manner of poisoning, suicidal instances made up 51.35% of all cases, accidental exposure accounted for 39.93% of cases, and the mode of poisoning was unknown for 6.72% of cases, **figure (3)**.

Figure (4) revealed that 42.28% of poisoned individuals (n=970) were admitted to the Poisoning Treatment Unit, whereas 533 cases (23.23%) refused admission.

18.57% of poisoned individuals (n=426) were treated in the ED and 15.92% of poisoned cases (n=365) were admitted to ICU at Zagazig University Hospitals.

On applying the poisoning severity score system, it was detected that 51.18 % of poisoned cases were mild, 32.74% of cases were moderate, and 16.09% had severe toxicity, **figure (5)**. Concerning the duration of hospitalization, most poisoned cases stayed in the hospital for less than 12 hours (41.80%, n=959). 33.57% of patients (n= 770) were stayed for 12-48h, 20.05% of patients (n= 460) were stayed for 48-96h, and 4.58% of cases (n=105) were stayed for > 96 h, **figure (6)**.

Figure (7) revealed significant variations between various treatment modalities ($p<0.05$). Conservative treatment was applied in 528 cases (23.02%). Conservative treatment and decontamination were used for 1304 poisoned patients (56.84%), whereas 428 patients (18.66%) received conservative treatment and antidotes, and lastly, conservative treatment and elimination enhancement as hemodialysis was applied for 34 cases (1.48%).

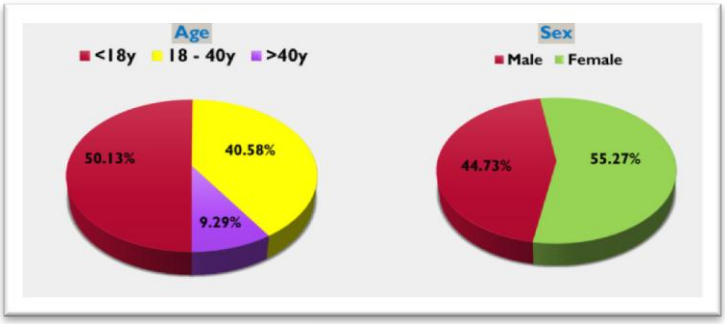

Figure (1): Distribution of the studied poisoned patients at Zagazig University Poisoning Treatment Unit from January 2023 till December 2023 (No=2294) according to age and sex.

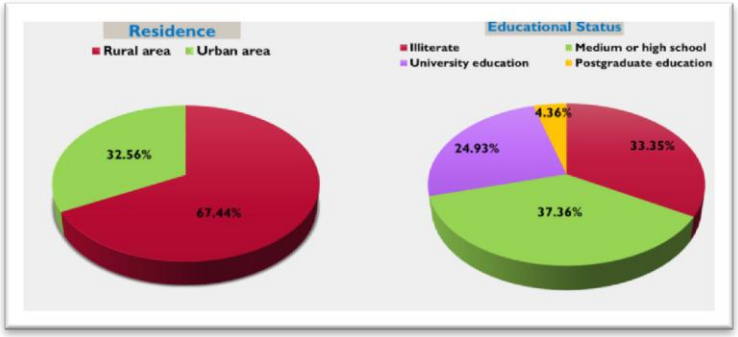

Figure (2): Distribution of the studied poisoned patients at Zagazig University Poisoning Treatment Unit from January 2023 till December 2023 (No=2294) according to residence and educational status.

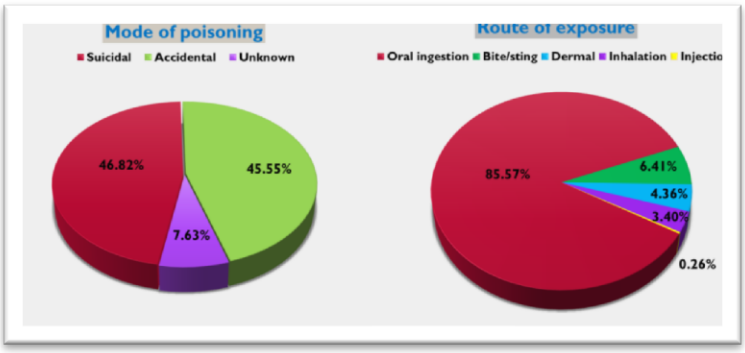

Figure (3): Distribution of the studied poisoned patients at Zagazig University Poisoning Treatment Unit from January 2023 till December 2023 (No=2294) according to mode of poisoning and route of exposure.

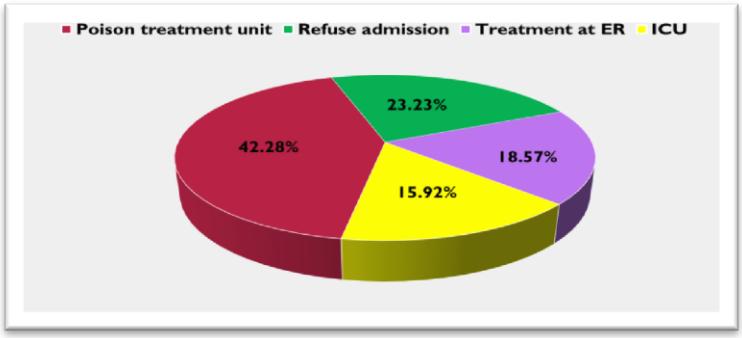

Figure (4): Distribution of the studied poisoned patients at Zagazig University Poisoning Treatment Unit from January 2023 till December 2023 (No=2294) according to the site of admission.

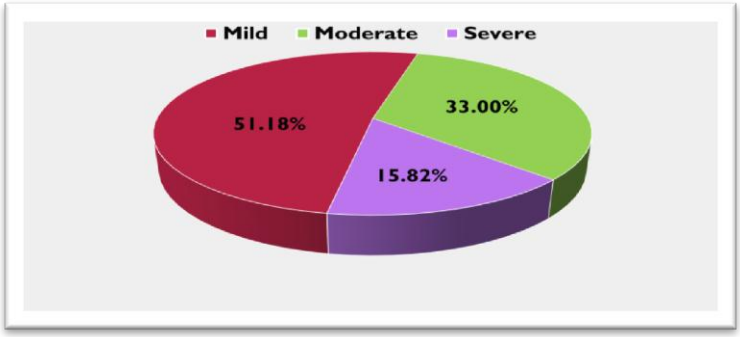

Figure (5): Severity grading of the studied poisoned patients at Zagazig University Poisoning Treatment Unit from January 2023 till December 2023 (No=2294) according to poisoning severity score (Persson et al., 1998).

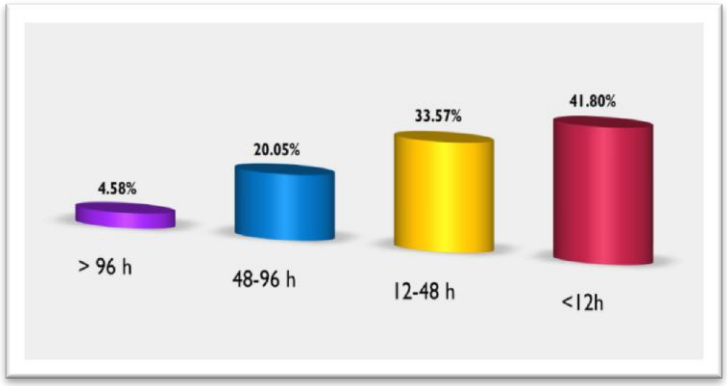

Figure (6): Distribution of the studied poisoned patients at Zagazig University Poisoning Treatment Unit from January 2023 till December 2023 (No=2294) according to duration of hospitalization.

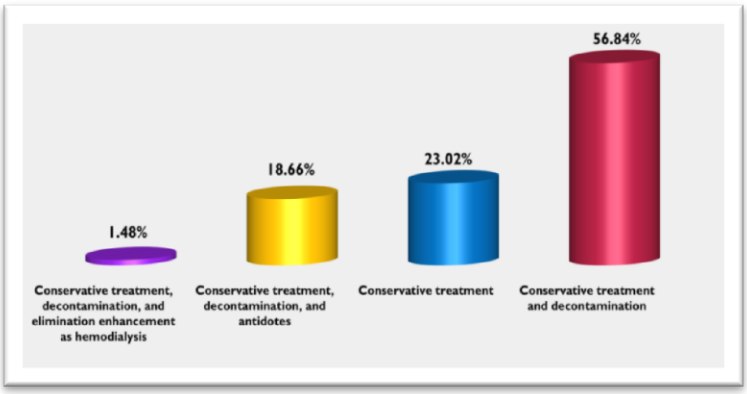

Figure (7): Distribution of the studied poisoned patients at Zagazig University Poisoning Treatment Unit from January 2023 till December 2023 (No=2294) according to lines of treatment.

Table (1) displays the distribution of poisoning agents among studied patients. Poisoning by therapeutic drugs was more common followed by pesticide poisoning than corrosives and animal poisoning (41.33%, 30.34%, 9.8%, and 6.41% respectively). Within the therapeutic poisoning category, the most prevalent toxicity was in analgesics, psychotropic drugs, and sedative-hypnotics categories (8.7%, 8.3, and 5.2% respectively). Poisoning by organophosphorus, zinc phosphide, or aluminum phosphide insecticides was common among pesticide-poisoned cases (11.2%, 7.5%, and 6.6% respectively). Snake bites represented the most prevalent among animal poisoning (4.80%)**.**

When researching the relationship between age and the source of poisoning, significant statistical differences were observed ($p<0.001$). Poisoning by therapeutics, pesticides, and corrosives was the most prevalent in patients below 18 years old (39.39%, 26.61%, and 15.04%, respectively). In the adult group (18 y - >40 y), poisoning by therapeutics, pesticides, and animals was the most prevalent (33.08%, 46.29%, and 7.20%, respectively). Among the patients aged > 40 y, poisoning by pesticides (38.50%), followed by therapeutics (30.05%), and animal poisoning (16.90%) were the most frequent, **table (2)**.

Table (3) showed significant differences regarding the relation between gender and poisoning gents ($p<0.001$). Both male and female groups showed frequent poisoning in the following order: by therapeutics (49.29% for females, 31.48% for males), pesticides (33.12% for females, 26.90% for males), corrosives (7.65% for females, 12.48% for males), then animals poisoning (3.23% for females, 10.33% for males).

Statistical analysis of the association between the manner of poisoning and the cause of toxicity revealed significant differences ($p<0.001$). Suicidal cases were more prominent in therapeutic poisoning (54.93%) and pesticide toxicity (39.29%). While accidental poisoning was more common in therapeutic poisoning (26.70%), corrosives (21.53%), pesticide toxicity (18.09%), and animal poisoning (14.07%), **table (4)**.

By using the chi-square test, significant differences were noticed between the severity of poisoning and different poisoning agents. Mild cases were more frequent in the following categories: therapeutics (36.88%), pesticides (29.56%), corrosives (12.01%), animal poisoning (7.16%), and substance of abuse (4.94%). While, moderate cases were common in therapeutics (44.34%), pesticides (26.63%), corrosives (10.65%), and animal poisoning (7.59%). The most prominent severe cases were in the therapeutics (49.32%) and pesticides (40.38%) categories, **table (5)**.

Table (6) displayed a significant relation between the outcome and various types of poisoning agents ($p<0.001$). Improvement was frequently observed in therapeutics (41.80%), pesticides (36.52%), animal poisoning (6.06%), and corrosives (4.97%). Discharge on demand was noticed in therapeutics (42.78%), pesticides (17.75%), corrosives (17.22%), animal poisoning

(7.38%), the substance of abuse (5.99%), and then hydrocarbon (4.28%). Death was noticed among pesticide-poisoned patients (n=60), therapeutics-poisoned cases (n=10), and CO poisoning (n=2).

Improvement with full recovery was observed in 56.10% of the studied group (n=1287). 40.76% of studied cases were discharged on demand without completing treatment, and 3.14% of poisoned individuals died, **figure (8)**.

Among mortality cases, 50 cases (69.44%) fell under the category of aluminum phosphide, 8 cases (11.11%) under the category of organophosphorus poisoning, 7 cases (9.72%) under the category of psychotropic drugs poisoning category, 3 cases (4.17%) under the category of cardiovascular drugs poisoning, and 2 cases (2.78%) among CO poisoning cases, **figure (9)**.

Table (1): Types of poisoning agents among studied poisoned patients at Zagazig University Poisoning Treatment Unit from January 2023 till December 2023(No=2294).

	Poisoning agent	No	%	Total No.	% Total
Pesticides	Organophosphorus	256	11.16%	696	30.34%
	Zinc phosphide	172	7.50%		
	Aluminum phosphide	152	6.63%		
	Carbamate	58	2.53%		
	Warfarin and other rodenticide	26	1.13%		
	Pyrethroid	32	1.39%		
Therapeutics	Psychotropic drugs	190	8.28%	948	41.33%
	Sedative hypnotics	120	5.23%		
	Anticonvulsant	20	0.87%		
	Cardiovascular drugs	62	2.70%		
	Analgesic	200	8.72%		
	Diabetic control agents	28	1.22%		
	Theophylline and other bronchodilators	46	2.01%		
	Vitamins	45	1.96%		
	Thyroid drugs	16	0.70%		
	Antimicrobial agents	32	1.39%		
	Multidrug	78	3.40%		
	Oral contraceptive pills	40	1.74%		
	Other therapeutic drugs	71	3.10%		
Corrosives		225	9.81%	225	9.8%
Animal poisoning	Snakebite	110	4.80%	147	6.41%
	Scorpion sting	4	0.17%		
	Spider bite	1	0.04%		
	Unknown bite	32	1.39%		
Food poisoning	Salted fish	4	0.17%	11	0.48%
	Toxic Mushroom	1	0.04%		
	Toxic fish	6	0.26%		
Hydrocarbon	(kerosene, benzene, tinner)	66	2.88%	66	2.9%
Toxic gases	CO poisoning	26	1.13%	26	1.1%
Substance of Abuse	Cannabis	47	2.05%	84	3.66%
	Nicotine	5	0.22%		
	Synthetic cannabis	15	0.65%		
	Tramadol	13	0.57%		
	Morphine and heroin	4	0.17%		
Toxic alcohols	Ethanol	24	1.05%	34	1.48%
	Methanol	10	0.44%		
Heavy metals	Iron	34	1.48%	38	1.66%
	Lead	2	0.09%		
	Mercury	2	0.09%		
Others	Black hair dye and black henna	6	0.26%	19	0.83%
	Castor oil seed	8	0.35%		
	Silica	1	0.04%		
	Button battery	1	0.04%		
	Paint	3	0.13%		
Total				2294	100

Data expressed as number and percent *No.= number* *%= percent*

Table (2): Relation between poisoning agents and age among studied poisoned patients at Zagazig University Poisoning Treatment Unit from January 2023 till December 2023(No=2294).

Poisoning agent	Age in years						Total No.	χ 2	P value
	<18y (No.=1150)		18-40y (No=931)		>40y (No=213)				
	No.	%	No	%	No	%			
Pesticides	306	26.61%	308	33.08%	82	38.50%	696	211.2	<0.0001**
Therapeutics	453	39.39%	431	46.29%	64	30.05%	948		
Corrosives	173	15.04%	39	4.19%	13	6.10%	225		
Animal poisoning	44	3.83%	67	7.20%	36	16.90%	147		
Food poisoning	3	0.26%	6	0.64%	2	0.94%	11		
Hydrocarbons	60	5.22%	6	0.64%	0	0.00%	66		
Toxic gases (CO poisoning)	16	1.39%	6	0.64%	4	1.88%	26		
Toxic alcohols	10	0.87%	20	2.15%	4	1.88%	34		
Substance of Abuse	43	3.74%	33	3.54%	8	3.76%	84		
Heavy metals	27	2.35%	11	1.18%	0	0.00%	38		
Others	15	1.30%	4	0.43%	0	0.00%	19		

*Data expressed as number and percent (%), No.= number , **= highly significant (p<0.001) χ 2: Chi-square test.*

Table (3): Relation between poisoning agents and sex among studied poisoned patients at Zagazig University Poisoning Treatment Unit from January 2023 till December 2023 (No=2294).

Poisoning agent	Sex				Total No.	χ 2	P-value
	Male (No.=1026)		Female (No=1268)				
	No	%	No	%			
Pesticides	276	26.90%	420	33.12%	696	192.4	<0.0001**
Therapeutics	323	31.48%	625	49.29%	948		
Corrosives	128	12.48%	97	7.65%	225		
Animal poisoning	106	10.33%	41	3.23%	147		
Food poisoning	3	0.29%	8	0.63%	11		
Hydrocarbon	54	5.26%	12	0.95%	66		
Toxic gases (CO poisoning)	14	1.36%	12	0.95%	26		
Toxic alcohols	24	2.34%	10	0.79%	34		
Substance of Abuse	60	5.85%	24	1.89%	84		
Heavy metals	26	2.53%	12	0.95%	38		
Others	12	1.17%	7	0.55%	19		

*Data expressed as number and percent (%), No.= number, **= highly significant (p<0.001), χ 2: Chi-square test.*

Table (4): Relation between poisoning agents and mode of poisoning among studied poisoned patients at Zagazig University Poisoning Treatment Unit from January 2023 till December 2023 (No=2294).

Poisoning agent	Mode of poisoning						Total No.	χ 2	P-value
	Suicidal (No.=1074)		Accidental (No.=1045)		Unknown (No.=175)				
	No	%	No	%	No	%			
Pesticides	422	39.29%	189	18.09%	85	48.57%	696	795.2	<0.0001**
Therapeutics	590	54.93%	279	26.70%	79	45.14%	948		
Corrosives	0	0.00%	225	21.53%	0	0.00%	225		
Animal poisoning	0	0.00%	147	14.07%	0	0.00%	147		
Food poisoning	0	0.00%	11	1.05%	0	0.00%	11		
Hydrocarbon	24	2.23%	40	3.83%	2	1.14%	66		
Toxic gases (CO poisoning)	0	0.00%	26	2.49%	0	0.00%	26		
Toxic alcohols	15	1.40%	15	1.44%	4	2.29%	34		
Substance of Abuse	11	1.02%	70	6.70%	3	1.71%	84		
Heavy metals	0	0.00%	38	3.64%	0	0.00%	38		
Others	12	1.12%	5	0.48%	2	1.14%	19		

*Data expressed as number and percent (%), No.= number, **= highly significant (p<0.001) χ 2: Chi-square test*

Table (5): Relation between poisoning agents and severity grading among studied poisoned patients at Zagazig University Poisoning Treatment Unit from January 2023 till December 2023(No=2294).

Poisoning agent	Severity grading						Total No.	χ 2	P-value
	Mild (No.=1174)		Moderate (No.=751)		Severe (No.=369)				
	No	%	No	%	No	%			
Pesticides	347	29.56%	200	26.63%	149	40.38%	696	127.2	<0.0001**
Therapeutics	433	36.88%	333	44.34%	182	49.32%	948		
Corrosives	141	12.01%	80	10.65%	4	1.08%	225		
Animal poisoning	84	7.16%	57	7.59%	6	1.63%	147		
Food poisoning	3	0.26%	2	0.27%	6	1.63%	11		
Hydrocarbon	47	4.00%	19	2.53%	0	0.00%	66		
Toxic gases (CO poisoning)	16	1.36%	6	0.80%	4	1.08%	26		
Toxic alcohols	19	1.62%	9	1.20%	6	1.63%	34		
Substance of Abuse	58	4.94%	20	2.66%	6	1.63%	84		
Heavy metals	19	1.62%	17	2.26%	2	0.54%	38		
Others	7	0.60%	8	1.07%	4	1.08%	19		

*Data expressed as number and percent (%), No.= number, **= highly significant (p<0.001) , χ 2: Chi-square test.*

Table (6): Relation between poisoning agents and outcome among studied poisoned patients at Zagazig University Poisoning Treatment Unit from January 2023 till December 2023 (No=2294).

Cause of toxicity	Outcome						Total No.	χ 2	P-value
	Improved (No.=1287)		Died (No.=72)		Discharge on demand (No.=935)				
	No	%	No	%	No	%			
Pesticides	470	36.52%	60	83.33%	166	17.75%	696	301.4	<0.0001**
Therapeutics	538	41.80%	10	13.89%	400	42.78%	948		
Corrosives	64	4.97%	0	0.00%	161	17.22%	225		
Animal poisoning	78	6.06%	0	0.00%	69	7.38%	147		
Food poisoning	7	0.54%	0	0.00%	4	0.43%	11		
Hydrocarbon	26	2.02%	0	0.00%	40	4.28%	66		
Toxic gases (CO poisoning)	24	1.86%	2	2.78%	0	0.00%	26		
Toxic alcohols	20	1.55%	0	0.00%	14	1.50%	34		
Substance of Abuse	28	2.18%	0	0.00%	56	5.99%	84		
Heavy metals	19	1.48%	0	0.00%	19	2.03%	38		
Others	13	1.01%	0	0.00%	6	0.64%	19		

Data expressed as number and percent (%), No=number,=Significant (p<0.05,**= highly significant (p<0.001), χ 2: Chi-square test.*

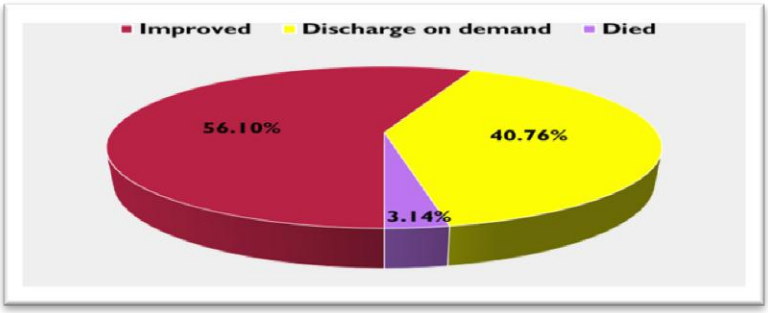

Figure (8): Distribution of the studied poisoned patients at Zagazig University Poisoning Treatment Unit from January 2023 till December 2023 (No=2294) according to outcome.

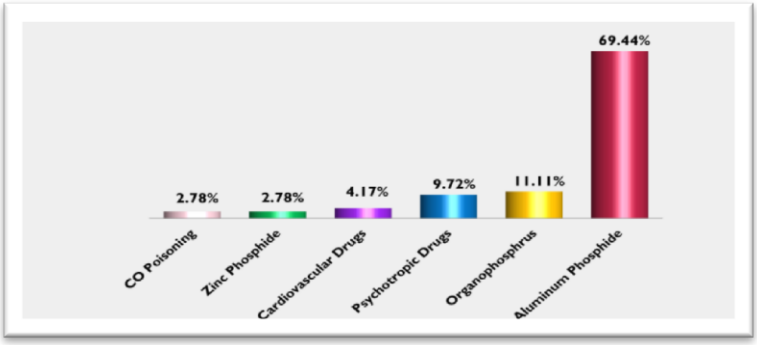

Figure (9): Relation between poisoning agents and mortality among studied poisoned patients at Zagazig University Poisoning Treatment Unit from January 2023 till December 2023 (No= 72).

DISCUSSION

Toxicological exposures continue to be a significant cause of morbidity and mortality in Egypt. The pattern of poisoning differs from one country to another within the same country and over time ***(El Gendy et al., 2018)***.

This study aimed to provide comprehensive data about trends and profiles of acutely poisoned patients who attended to Zagazig University Poisoning Treatment Unit from January 2023 to December 2023.

The present study was carried out on 2294 poisoned patients presented to the Zagazig University Poisoning Treatment Unit during the period starting from the first of January 2023 till the end of December 2023.

The results of the collected data revealed that patients at age less than 18 years old had the highest incidence followed by the group aged from 18 to 40 years, and the least incidence in group aged > 40 years old.

These findings coincided with ***Kivisto et al. (2008); Mutlu et al. (2010); Bronstein et al. (2012)*** who found that poison exposures are more frequent in children. These results aligned with ***Abu El-Naga et al. (2022)*** who showed that the high incidence in young children is owing to oral exploration and curiosity. Adolescence is also linked to instability, a propensity to try new substances in order to have novel experiences, along with social, political, and economic difficulties in Egypt ***(El-Masry and Tawfik, 2013)***.

Conversely, research by ***Halawa et al. (2013)*** and ***Tawfik* and *ElHelaly (2015)*** showed that groups aged 15–40 y had the greatest frequency of poisoning instances, followed by children aged 7–15 y, and children younger than 7 y. The least poisoning exposure was observed in patients over 40 years old that was consistent with our findings, which showed that the age group of over 40 had the lowest incidence of poisoning.

In this study, there were more female patients than male patients regarding sex. These were compared to findings from research done at the Banha Poisoning Center and Kasr Al-Aini National Environmental and Clinical Toxicology and Research Center in Egypt, which showed that women made up 60.7% and 63.20% of the studied cases ***(El-Gendy et al., 2018; Elbasha et al., 2023)***. Furthermore, these findings corroborate with the outcomes of ***Hitti et al. (2020)*** and ***Rageh et al. (2023)*** which showed that women accounted for 60.2% and 55.9% of the studied cases respectively.

Additional research conducted in developing countries showed that acute poisoning is more likely among women who have a higher suicide rate because of social prejudice against them ***(Chelkeba et al., 2018)*** and women have higher levels of stress, societal pressures, marital discord, and financial challenges ***(El-Sarnagawy, 2017)***.

Distribution of studied cases according to residence showed that patients who came from rural areas were more frequent than those who came from urban areas. This is compatible with other studies done in Egypt. A study done by ***El Gendy et al. (2018)*** at Kafr El-Sheikh Governorate hospitals and another study done by ***Morsi et al. (2023)*** at Zagazig Poison Control Center denoted that most of the attended poisoned patients were from rural regions.

In accordance with the findings of ***Batra et al. (2003)*** study on the Indian population, which showed that poisoning was more common in rural than in urban areas. Also, ***Benavides et al. (2023)*** noticed a high number of instances of poisoning that came from rural areas in Colombia.

However, a study conducted at Ain Shams Poison Control Center and another one conducted at Kasr Al-Aini National Environmental and Clinical Toxicology and Research Center demonstrated that the majority of the cases had their origins in urban areas ***(Halawa et al., 2013; Elbasha et al., 2023)***. This is not because of the greater severity of the poisoning health issue, but rather because of these areas' nearness to the poison center ***(Abd El Al et al., 2016)***.

According to educational levels, patients with some education up to a medium or high school degree presented the highest percentage followed by those with no literacy, university degree, and postgraduate study respectively. This concurs with the findings of ***Mathew et al. (2019)*** and ***Elbasha et al. (2023)*** where patients with some degree of education were represented in the majority of cases.

Concerning the route of exposure, the present study identified that oral ingestion was the main route of exposure afterward bite/sting exposure then dermal exposure and inhalation. The least route of exposure was injection. This is closely related to the outcomes of ***Hegazy and Elfiky (2016); Asawari et al. (2017); Abdelhamid (2021)*** where the main way of exposure was ingestion due to its simple, self-explanatory mode of exposure. The oral route may be indicative of the higher risk of suicide attempts or exposure in the home, as well as the lower risk of toxicities in the workplace and the environment in our study.

The WHO estimates that each year, around 800,000 people die by suicide and that roughly 20 times as many individuals attempt suicide ***(WHO, 2019)***. In this study, suicidal incidents were more prevalent than unintentional ones and unknown modes of poisoning. These in agreement with ***Morsi et al. (2023)*** that the suicidal poisoning group had a significant increase from 45% in 2019 to 50% in 2020 and up to 55% in 2021. Likewise, numerous studies corroborated the widespread incidence of intentional poisoning in various regions of the globe, such as Egypt, India, Ethiopia, and China ***(Desalew et al., 2011; Hegazy and Elfiky; 2016; Maheswari et al., 2016; Zhang et al., 2018; Elbasha et al., 2023)***.

Regarding the site of admission, the current study revealed that the majority of poisoning instances were admitted to ZUPTU, then cases that were refused admission and treated at the ER, and finally cases that were admitted to the ICU. These results coincide with ***Abu El-Naga et al. (2022)*** and ***Sawad et al. (2022)*** who established that 69.4% and 74.31% of the studied patients respectively were admitted to an inpatient department and 30.6% and 24.14% respectively needed an intensive care unit. In addition, a study conducted in Lebanon revealed that patients were admitted to the hospital in 70.3% of cases, the intensive care unit in 23.7% of cases, and the general medical ward in 5.3% of cases **(*El-Majzoub et al., 2018)***.

Using the ***Persson et al. (1998)*** poisoning severity score method, it was discovered that mild cases outnumbered moderate cases and severe cases, which accounted for the lowest percentage. These results are similar to the results of ***El Masry and Tawfik (2013); Tawfik and ElHelaly (2015); Tawfik and Khalifa (2017); Morsi et al. (2023)*** where a small percentage of cases are severe and the majority of cases are mild.

Regarding the length of stay, since most of the cases were mild, less time was spent in the hospital. For this reason, the majority of poisoning patients spent less than 12 hours in the hospital followed by patients who stayed for 12-48 hours (33.57%). Additionally, 20.05% of patients stayed for 48–96 hours, whereas 4.58% of cases stayed for more than 96 hours. These findings agree with ***Abdelhamid (2021)*** who reported that, 5.8% were admitted for one to seven days, 14.5% stayed for six hours to one day, and 79.4% were observed for no more than six hours. Merely 0.3% of the patients had admissions longer than seven days. Also, there were about 30.06% of patients spent less than 8 hours, while 40.22% of patients remained for less than 24 hours in the hospital which was contributed by ***Neumann et al. (2020)***.

The most often used treatments for poisoning cases were decontamination and activated charcoal, with antidote administration coming in second ***(Halawa et al., 2013; Mowry et al., 2015; Tawfik and Khalifa, 2017; Abdelhamid, 2021)***. These results are in line with our results where conservative treatment and decontamination represented the highest percentage followed by conservative treatment only, conservative treatment and antidotes, and lastly conservative treatment and elimination enhancement as hemodialysis.

Among the causes of poisoning, therapeutic drugs were more common followed by pesticides then corrosives and animal poisoning. Within the therapeutic poisoning category, the most prevalent toxicity was in the analgesics, psychotropic drugs, and sedative-hypnotics categories. Poisoning by organophosphorus, zinc phosphide, and aluminum phosphide insecticides was common among pesticide-poisoned cases. Snake bites represented the most prevalent animal poisoning.

Abdelhamid et al. (2022) demonstrated that the main cause of poisoning was pharmaceutical drugs. Furthermore, the results are not shocking because various studies from third-world countries corroborate our findings, and organophosphates are frequently utilized in these countries to boost agricultural yield ***(George et al., 2015; Chelkebaet al., 2018)***. Also, our findings were consistent with a Malaysian study that found the highest frequency of pharmaceutical drugs, pesticides, and household products across various age groups ***(Tangiisuran et al., 2018)***.

This could be because drugs, especially over-the-counter drugs, are more easily obtained, less expensive, and simpler to use than other methods of poisoning. This research highlights how important it is to keep medications prescribed to family members locked up if they have the potential to be fatal in overdose ***(Miller et al., 2020)***.

According to ***Barrag and Farahat (2011)*** study, Saudi Arabia has the highest paracetamol levels. According to ***Mowry et al. (2015)***, analgesics were the most commonly reported drug ingestion types in the US by poison centers in 2014. Additionally, ***Tawfik and ElHelaly (2015)*** demonstrated that benzodiazepines, cannabis, opiates, and heroin poisoning accounted for 10.8% of drug abuse-related poisoning cases. Other psychotropics, however, made up 6% of the total. Moreover, 7.6% of cases involved acute analgesics, paracetamol, non-steroidal anti-inflammatory drugs (NSAIDs), and salicylate intoxication.

In a study done by ***Assaf et al. (2019)***, poisoning by organophosphorus compounds poisoning represented 15.3% of cases, and 2.2% of cases had animal stings and bites.

Several studies evaluated the increased magnitude of intoxication with aluminum phosphide in Egypt ***(Saleh and Makhlof, 2018; Mwaheb and Hassan, 2021; Deraz et al., 2022)***.

In our study, therapeutic poisoning was most common in children, adolescents, young adults, and middle age, with pesticides coming in second. This agreed with ***Bari et al. (2014)*** who identified that an organophosphorus compound was the second most prevalent toxicant used to cause poisoning. Also, in our data corrosive was in high percent in children than animal poisoning in adults. Similarly, ***Farag et al. (2020)*** and ***Rageh et al. (2023)*** showed that household chemicals and pharmaceutical drugs have the highest frequency among children.

It is known that children are naturally interested and are always attempting to taste or consume any chemicals or drugs to better understand their surroundings. They come across may help to explain the high frequency of poisoning at such young ages. They might also mimic adult behaviors, such as taking medication, but they are incapable of understanding the consequences of their actions. Mothers might not buy candies that resemble medications or describe them as such ***(Sobeeh et al., 2018)***. Families should also be taught health precautions like keeping prescription medications out of the hands of young children at home.

Our study found that among patients over 40 years old, the most frequent was pesticide poisoning, which was followed by medication poisoning and animal poisoning. These findings coincided with an Egyptian study that found pesticides, particularly aluminum phosphides, to be the most common reason for poisoning ***(Kasemy et al., 2022)***.

An interesting trend is the Females' predominance in therapeutics, pesticides, and corrosives. That agreed with what was noted by ***Kesapli et al. (2018)*** and ***Kaka et al. (2022)***. The high frequency of family disputes, home abuse, and sentimental vulnerability among young women, which may result in psychological strain, could be the reason for the preponderance of poisoning instances in females. Young women are more likely to favor suicide attempts that use various drugs or poisons as a means of escaping from reality ***(Albert, 2015)***.

As previously stated, among all age groups, therapeutics accounted for the largest percentage of poisoning agents. Consequently, suicidal and accidental poisoning were more common as a result of therapeutic poisoning. This may be related to the fact that drugs are freely available on the market, free from regulations, and that

government-funded programs are prohibited. Conversely, insecticides especially aluminum phosphide were ranked second in cases of suicide. ***Deraz et al. (2022)*** concurred with these results. Due in large part to increased public awareness of its immediate fatality, the availability of the substance and the ease with which its sale was carried out have ultimately resulted in both misuse and abuse as a means of suicide ***(Soltaninejad et al., 2012)***.

Suicidal attempts were more common than unintentional poisoning, despite potent religious morals that forbid intentional self-killing and self-destruction ***(Abdelhamid et al., 2021)***. According to ***Prayag et al. (2016)***, many social factors may contribute to suicide attempts, including poverty, unemployment, stress from raising a family, major health issues, substance abuse, educational challenges (such as failing exams or receiving insufficient funding), and disappointment in romantic relationships.

As was previously mentioned, the high rate of corrosives among young children helped to explain our findings regarding the high rate of accidental poisoning. This relationship was similar to that of ***Tawfik and ElHelaly (2015)***. One way to understand this is by the unique behaviors of this age group, which include immaturity in taste and smell, oral identification, curiosity, and easy access to household agents.

About the relationship between the various poisoning agents and the severity of poisoning. There are three different levels of severity for medications and pesticides: mild, moderate, and severe. The high prevalence of medicinal and pesticide poisoning agents was the cause for these. Several reports cited free medical care, simple accessibility to prescription drugs in the absence of a prescription, and negligent storing of drugs within homes as reasons why drugs were a major issue ***(Barrag and Farahat, 2011)***.

Regarding the outcome, full recovery was observed in the majority of poisoned patients followed by cases who were discharged on demand, and the lowest percentage of patients died. These results matched with other studies conducted in Egypt, Lebanon, and China where complete recovery represented the main outcome for poisoned cases, and death occurred in the lowest percentage of cases ***(Mostafa et al., 2014; Hegazy and Elfiky, 2016; El Majzoub et al., 2018; Parekh and Gupta 2019; El-Farouny and Helmy, 2021).***

According to the mortality rate, the most frequent fatal poisons were pesticides. Aluminum phosphide was the prominent cause of death, followed by organophosphorus poisoning. This is consistent with the research results of ***Hegazy and Elfiky (2016)***, who found that death due to poisoning with aluminum and zinc phosphide in 60% of their deceased patients followed by organophosphates. Also, concerning rodenticide, ***Morsi et al. (2023)*** noticed a sharp increase from 19% in 2019 to 30.39% in 2020, then 20.1% in 2021. These correlated with the high rate of suicide due to aluminum phosphide usage. The research of ***Behera et al. (2022); El Sarnagawy et al. (2022); Deraz et al. (2022)*** correlated with present study findings and explained that the widespread accessibility owing to unrestrained sales of aluminum phosphide in agricultural areas. Besides, there is no precise antidote existing for aluminum phosphide making it the way of choice for suicide.

On the contrary, ***Tawfik and ElHelaly (2015)*** and ***Elfeky et al. (2024)*** showed that the most frequent reason for death was organophosphates 40.5% and 23.8% respectively. The Ain Shams Poison Control Center's annual reports from 2011 to 2015 showed that for several years, organophosphates were the leading cause of poisoning-related deaths in Egypt.

The mortality rate from aluminum phosphide poisoning can exceed 60% and range from 37 to 100% even in the presence of well-equipped hospitals. The kind of compound ingested determines how severe the aluminum phosphide poisoning is. The heart, lungs, gastrointestinal tract, and kidneys are frequently affected by fresh and active compounds (tablets), which can result in severe metabolic acidosis and a high death rate. Because the compound has less activity, broken or granular forms of tablets result in mild metabolic acidosis, mild hypotension, and ECG abnormalities, but low mortality ***(Wahab et al., 2009)***.

CONCLUSION

Acute poisoning is a major health issue. Based on the findings of the present study, patients under the age of 18, females, and people living in rural areas made up the bulk of cases. A large percentage of cases had a medium to high school education, with illiteracy following closely behind. The most common cases were those of oral ingestion and suicide. The majority of cases were mild in severity and admitted to ZUPTU, followed by cases who refused admission and were released. Conservative treatment with decontamination takes the upper hand as a line of treatment for poisoned instances. Poisoning by therapeutics, pesticides, corrosives, and animal poisoning represented the main causes of poisoning, in that order. Most of the studied cases were improved and the lowest percentage died. Mortality rates were high in aluminum phosphide poisoning.

RECOMMENDATIONS

- Strict rules that regulate the sale of therapeutics and pesticides, especially aluminum phosphide should be applied.
- Public awareness about the magnitude of poisoning among the different groups of society particularly school students at different educational levels.
- Awareness of the mothers on how to keep the home environment safe for their children.
- Psychiatric consultation is recommended for patients who have attempted suicide to reduce the likelihood of repeating the behavior.
- Further clinical researches are required to identify various acute poisoning risk factors.

Acknowledgments: The authors would like to extend their sincere thanks to the physicians and nurses at ZUPTU and the patient affairs authority at ZUH for their valuable help and assistance.

REFRENCES

1. **Abd El AL, A. A.; Fawzi, M. M.; AL Khafif, M. A. et al. (2016):** Epidemiological study of organophosphorus compounds insecticide types related to acutely intoxicated patients presented to Poison Control Center (PCC-ASU)–Egypt. *IOSR J. Environ. Sci. Toxicol. and Food Technol., 10(6): 72-78.*
2. **Abdelhamid, W. (2021):** Evaluation of severity of poisoning exposures among patients presented to Poison Control Center, Ain Shams university hospitals, Egypt during 2019. *Ain Shams J. Forensic Med. Clin. Toxicol., 36(1): 106-122.*
3. **Abdelhamid, W. G.; Wahdan, M. M. and Zaafar, D. (2022):** Acute toxic exposures in Egypt population: analysis of a five-year registry from 2015 to 2019. *Toxicol. Environ. Health Sci., 14(3): 235-244.*
4. **Abu El-Naga, M.; Ali, S.; Ali, M. et al. (2022):** Pattern of acute poisoning among pediatric patients admitted to poison control center of Ain Shams university hospitals. *Ain Shams J. Forensic Med. Clin. Toxicol., 39(2): 1-11.*
5. **Albert, P.R. (2015):** Why is depression more prevalent in women? *J. Psychiatry Neurosci., 40(4):219-221.*
6. **Asawari, R.; Atmaram, P.; Bhagwan, K. etal. (2017):** Toxicological Pattern of Poisoning in Urban Hospitals of Western India. *J. Young Pharm., 9(3):315-320.*
7. **Assaf, A.; Abd El Kareem, M. and Hasb Elnabi, M. (2019):** Outcome prediction in acutely intoxicated patients admitted to intensive care unit. *Ain Shams J. Forensic Med. Clin. Toxicol., 33(2), 16-23.*
8. **Bari, M. S.; Chakraborty, S. R.; Alam, M. M. J. et al. (2014):** Four-year study on acute poisoning cases admitted to a tertiary hospital in Bangladesh: emerging trend of poisoning in commuters. *Asia. Pac. J. Med. Toxicol., 3(4), 152-156.*
9. **Barraq, A. and Farahat, F. (2011):** Pattern and determinants of poisoning in a teaching hospital in Riyadh, Saudi Arabia. *Saudi Pharma. J., 19(1):57-63.*
10. **Batra, A. K.; Keoliya, A. N. and Jadhav, G. U. (2003):** Poisoning: An Unnatural Cause of Morbidity and Mortality in Rural India. *JAPI., 51: 955-9.*
11. **Behera, A.; Singla, N.; Sharma, N. et al. (2022):** Paradigm shift in pattern and prevalence of poisoning during COVID-19 pandemic. *J. Family Med. Prim. Care., 11(1): 208.*
12. **Benavides, J. A.; Malagón-Rojas, J. N.; Lagos, L.F. et al. (2023):** Acute pesticide poisoning: Comparison of epidemiological characteristics between the rural and urban population. *Rev. Fac. Nac. Salud Pública.,41(3): e351613.*
13. **Bronstein, A.C.; Spyker, D.A.; Cantilena, L.R. et al. (2012):** "2011Annual Report of the American Association of Poison Control Centers' National Poison Data System (NPDS), 29th Annual Report". *Clin. Toxicol., 50: 911–1164.*
14. **Chelkeba, L.; Mulatu, A.; Feyissa, D. et al. (2018):** Patterns and epidemiology of acute

poisoning in Ethiopia: a systematic review of observational studies. *Arch. Public Health., 76(1): 34.*

15. **Clark, R. (2004):** The practice of medical toxicology. In: Dart RC, ed. Medical Toxicology. 3rd edn.Philadelphia: *Lippincott Williams and Wilkins: 3–6.*
16. **Deraz, R. H.; Elrafey, D. S. and Mesallam, D. I. A. (2022**): Acute aluminium phosphide poisoning in East Delta, Egypt: a growing public health problem over the last five years. *ESCTJ., 10(1): 49-61.*
17. **Desalew, M.; Aklilu, A.; Amanuel, A. et al. (2011):** Pattern of acute adult poisoning at TikurAnbessa specialized teaching hospital, a retrospective study, Ethiopia. *Hum. Exp. Toxicol., 30(7):523–527.*
18. **El Gendy, M. A.; Alfadaly, N. and Mohamed, I. N. (2018):** Retrospective and statistical study of pattern of acute poisoning among cases presented to emergency department of Kafr El-sheikh Governorate hospitals. *Egypt. J. Hos. Medi., 73(3): 6272-6282.*
19. **El Majzoub, I.; El Khuri, C.; Hajjar, K. et al. (2018):** Characteristics of patients presenting post-suicide attempt to an Academic Medical Center Emergency Department in Lebanon. *Annal. Gen. Psych., 17(21):1-10.*
20. **El Masry, M. and Tawfik, H. (2013):** 2011 Annual report of the poison control centre of Ain Shams university hospital, Cairo, Egypt. *Ain Shams J. Forensic Med. Clin. Toxicol., 20(1): 10-17.*
21. **Elbasha, M. S.; Attiaa, A. A. M.; Shebaba A. M. et al. (2023):** Assessment of the pattern of acute poisoning in adults admitted to Kasr Al-Aini national environmental and clinical toxicology and research center in 6 months. *Egypt J. Forensic Sci. Appli. Toxicol., 23 (1):69:77.*
22. **El-Farouny, R.H. and Helmy, M.S. (2021):** Suicidal self-poisoning and Its relation with personality traits among admitted cases to Menoufia poisoning control center. *The Egypt. J. Forensic Sci. Appl. Toxicol., 21(1):13–30.*
23. **Elfeky, A. K. E.; Elgamal, A. S.; Etman, M. A. et al. (2024**). Assessment of the pattern, management, and outcomes of acute unstable poisoning patients in emergency department of Menoufia university hospitals. *Menoufia Medical J., 37(1): 1.*
24. **El-Sarnagawy, G. (2017):** Predictive factors of mortality in acute aluminum phosphide poisoning: 5 years retrospective study in Tanta poison control unit. A. *S. J. F. Med. Clin. Toxicol.,29(2): 70-79.*
25. **El-Sarnagawy, G.; Hafez, A. and Amer, R. (2022):** Characteristics of suicidal poisoned patients admitted to tertiary care center during COVID-19 pandemic. The Egyptian *J. Neurol. Psych.Neurosur., 58(1): 1-11.*
26. **Farag, A.A.; Said, E. and Fakher, H.M. (2020):** Pattern of Acute Pediatric Poisoning at Banha Poisoning Control Center, Egypt: One-Year Prospective Study. *Asia. Pac. J. Med. Toxicol., 9(2):44–51.*
27. **George, E. J.; Jeyaraj, K. and Manjaly, J. J. (2015):** Clinical profile and outcome of organophosphate poisoning cases in a tertiary care hospital in Central Kerala. *Int. J. Recent. Trends. Sci. Technol., 14(2):338–343.*
28. **Halawa, H.; Nageeb, S. and El Guindi, M. (2013):** Annual report of the poison control centre, Ain Shams university hospitals, Cairo, Egypt, 2012. *Ain Shams J. Forensic Med. Clin. Toxicol.,21(2): 27-34.*
29. **Hegazy, M. M. and Elfiky, A. K. (2016):** Pattern of acute poisoning cases admitted to Menoufia poisoning and addiction control center: A prospective study. *Ain Shams J. Forensic Med. Clin. Toxicol., 26: 35-43.*
30. **Hitti, E.; El Zahran, T.; Hamade, H. et al. (2020):** Toxicological exposures reported to a telephonic consultation service at a tertiary care hospital in Lebanon. *Clin. Toxicol., 58(9): 1-7.*
31. **Hoffman, R. (2007):** Understanding the limitations of retrospective analyses of poison center data. *Clin. Toxicol.,45(8):943.*
32. **Kaka, R. A.; Ghanem, M. A. A.; Sigairon, M. E. E. et al. (2022):** A retrospective Analysis of acute poisoning cases admitted to Alexandria poison center: Pattern and outcome. *Asia Pacific J. Med. Toxicol., 11(2).*
33. **Kasemy, Z. A.; Sharif, A. F.; Amin, S. A. et al. (2022):** Trend and epidemiology of suicide attempts by self-poisoning among Egyptians. *PLoS One., 17(6): e0270026.*
34. **Kesapli, M.; Celik, A. and Isik, I. (2018):** Characteristic features of childhood and adolescent poisonings, in the Mediterranean region over 6 Years. *Iran. J. Public Health., 47(11):1667–1674.*
35. **Kivisto, J. E.; Mattila, V. M.; Arvola, T. et al. (2008):** Secular trends in poisonings leading to hospital admission among Finnish children and adolescents between 1971 and 2005. *J. Pediatr., 153: 820-824.*
36. **Maheswari, E.; Abraham, L.; Chacko, C. S. et al. (2016):** Assessment of pattern, severity, and outcome of poisoning in emergency care unit. *J. Appl. Pharm. Sci., 6(12):178–183.*

37. **Mathew, R.; Jamshed, N.; Aggarwal, P. et al. (2019):** Profile of acute poisoning cases and their outcome in a teaching hospital of north India. *J. Fam. Med. Prim. Care, 8(12): 3935–3939.*
38. **Miller, T. R.; Swedler, D. I.; Lawrence, B. A. et al. (2020):** Incidence and lethality of suicidal overdoses by drug class. *JAMA Network Open, 3(3):1-3.*
39. **Morsi, A.; Atef, M., and Mesallam, D. I. A. (2023):** Pattern of acute poisoning exposure before, during and after the COVID-19 Pandemic: A retrospective study at poison control centre-Zagazig university hospitals. *ESCTJ., 11(2): 24-37.*
40. **Mostafa, H.; Rezk, N.; Khater, A. et al. (2014):** Pattern and severity of acute poisoning among adolescents: A Six-Months prospective study in poison control center-Ain Shams university hospitals. *Ain Shams J. Forensic Med. Clin. Toxicol.,23(2): 160-172.*
41. **Mowry, J. B.; Spyker, D. A.; Brooks, D. E. et al. (2015):** 2014 Annual report of the American association of poison control centers' national poison data system (NPDS): 32nd annual report. *Clin. Toxicol.(Phila)., 53(10):962-1147.*
42. **Mutlu, M.; Cansu, A.; Karakas, T. et al. (2010):** Pattern of pediatric poisoning in the east Karadeniz region between 2002 and 2006: increased suicide poisoning. *Hum. Exp. Toxicol., 29 (2): 131–136,*
43. **Mwaheb, M. A. and Hassan, S.K. (2021):** Fatal Aluminium Phosphide Poisoning in Fayoum Governorate Egypt (2012-2019). *E.J.F.S.A.T., 21(2): 47- 58.*
44. **Neumann, N. R.; Chai, P. R.; Wood, D. M. et al. (2020):** Medical toxicology and COVID-19: Our role in a pandemic. *J. Med. Toxicol., 16(3):245-247.*
45. **Parekh, U. and Gupta, S. (2019):** Epidemio-toxicological profile of poisoning cases – A five years retrospective study. *J. Forensic Leg. Med., 65:124–132.*
46. **Persson, H.; Sjöberg, G.; Haines, J. et al. (1998):** Poisoning severity score. Grading of acute poisoning. *J. Toxicol. Clin. Toxicol., 36(3):205.*
47. **Prayag, A.; Ashtagi, G. S. and Mallapur, M. D. (2016):** Pattern of poisoning cases at a tertiary health-care center, Belagavi. *International J. Med. Sci. and Pub. Health, 5(18):1698-1701.*
48. **Rageh, O. E. S.; Sabra, H. K.; Alammar, A. A. et al. (2023):** Profile and outcomes of acute poisoning in the toxicology treatment and control center at Tanta University Hospital, Egypt. *BMC pharm. Toxicol., 24(1):6.*
49. **Saleh, A. and Makhlof, M. (2018):** Outcome of toxicity and mortality predictors of aluminum phosphide poisoning in Fayoum Governorate Egypt. Z*JF Med. Toxicol., 16(2): 40-52.*
50. **Sawad, S.; Mostafa, H. and Salem, H. (2022):** Medico legal aspects of suicidal attempts by drugs in cases admitted to poison control center of Ain Shams university hospitals (2019-2020). *Ain Shams J. Forensic Med. and Clin. Toxicol., 39(2), 12-20.*
51. **Seif, E.; Gomaa, R. and Eisa, M. (2016):** A retrospective study of acute poisoning in children under 5 years old admitted to Alexandria poison center in Egypt. *World J. Prev. Medi., 4(2): 32-39.*
52. **Sobeeh, F.; El-Hay, N.; Draz, E. and Saad, K. (2018):** Pattern of acute pediatric poisoning in Middle Delta Poison Control Centers. *Tanta Med. J., 46: 215.*
53. **Soltaninejad, K.; Nelson, L. S.; Bahreini, S. A. et al. (2012):** Fatal aluminum phosphide poisoning in Tehran-Iran from 2007 to 2010. *Ind. J. Med. Sci., 66(3-4): 66–70.*
54. **Tangiisuran, B.; Jiva, M.; Ariff, A. M. et al. (2018):** Evaluation of types of poisoning exposure calls managed by the Malaysia national poison centre (2006–2015): A retrospective review. *BMJ Open, 8(12): 1–7.*
55. **Tawfik, H. and ElHelaly, H. (2015**): Toxicological profile of acutely poisoned cases admitted to poison control center, Ain-Shams university hospitals during year 2013. *Ain Shams J. Forensic Med. Clin. Toxicol., 24(1): 154-163.*
56. **Tawfik, H. and Khalifa, E. (2017):** Evaluation of poisoning and drug overdose among cases presented to poison control centre, Ain Shams university hospital during the year 2015. *Ain Shams J. Forensic Med. Clin. Toxicol., 29(2):100-112.*
57. **Wahab, A.; Rabbani, M. U.; Wahab, S. et al. (2009):** Spontaneous Self-Ignition in a case of acute aluminium phosphide poisoning. *Am. J. Emerg. Med.,27:752-e5.*
58. **World Health Organization (2019):** Suicide-Key Facts. *Available from: https://wwww hoint/news-room/fact-sheets/detail/ suicide* .
59. **Zhang, Y.; Yu, B.; Wang, N. et al. (2018):** Acute poisoning in Shenyang, China: a retrospective and descriptive study from 2012 to 2016. *BMJ Open., 8(8):e021881.*
60. **Zhao, M.; Ji, X. P.; Wang, N. N. et al. (2009):** Study of poisoning pattern at China medical university from 1997 to 2007. *Public Health., 123(6):454-455.*