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A Study of Acute Poisoning Cases Admitted to the National Poisoning Center

Eman Abdel Monem Abdel Rasheed, Nashwa M. El Mahdy, Ahmed Salah Gouda and Sayed M. Badawy*

National Center for Clinical and Environmental Toxicology, NECTR, Faculty of Medicine, Cairo University, Cairo, Egypt; sayedbadawy@hotmail.com

Abstract

Objectives: There is a necessity to study the pattern of poisoning of patients who visited national poisoning centers to take up appropriate management and prevention techniques. **Methods**: This study includes all cases of human poisoning exposures (11181 poisoning cases) presenting to the national poisoning center, Cairo, from 1 January 2016 to 31 December 2016. The data were statistically analyzed to assess a correlation for a gender, age, agents and poisoning type. **Results:** It was found that 24% of patients were younger than 4 years. The female-to-male ratio was 1.6:1. Therapeutic drugs (68%) were the most common cause of poisoning followed by a household product (13%), pesticides (9%), and abuse agents (5%), bites of snakes and scorpions (3%) and food poisoning (1%). Detailed information on groups of pharmaceuticals and the most frequent agents causing poisonings was presented. Analgesics (24%) and central nervous system agents (21%) were the most common therapeutic pharmaceutical poisons. Synthetic opioid; tramadol (45%) was the most common abuse agent. Accidental poisoning of abuse agents in children younger than 4 years represented 20.4 % of the abuse agents poisoning cases. The mortality rate for the patients was 0.3% (32 patients). **Conclusion**: The prevention of medicinal poisoning should merit high priority in the education interventions and preventive efforts. An important concern toward drugs and abuse agents' availability at homes within the reach of children should be raised. The most risk factors of poisoning are female gender and young age patients.

Keywords: Acute Poisoning, Epidemiology, Poisoning Center

1. Introduction

Poisoning is a considerable public health problem attracting considerable concern. World Health Organization (WHO) data in 2012 shows that about 193,460 people died worldwide from deliberating of poisoning. It is a severe problem, where the majority of deaths occur due to poisoning[1,2]. Million people dies as a result of intentional poisoning each year especially by chemicals. The intentional pesticides ingestion causes nearly 370,000 deaths per year[2]. WHO reported that 50% of poisonings by pesticides take place in developing countries despite only 15% of the worldwide use of pesticides is the developing countries[3,4].

Acute poisoning following ingestion of medications constitute a significant source of mortality and health care cost worldwide[5,6]. Pharmaceutical poisoning is a major cause of mortality and morbidity worldwide[7–9]. Snake-bite is a largely public health problem with significant medical management challenges. It has been found that about five million snake-bites take place each year, causes permanent disabilities and at least 100,000 deaths[2].

Food poisonings are the result of ingestion of contaminated foodstuffs or water. The most common foodborne disease shows a gastrointestinal symptom[10]. The antimicrobial resistance due to food-borne pathogens has prevailed in the last years[11].

Household chemicals are the most frequently ingested substances by children in the world[12]. Few studies have investigated the poisoning pattern in our country. There is a necessity to investigate the agents involved in poisoning and epidemiologic information of poisonings, to take up

*Author for correspondence

appropriate management and prevention techniques. This study was aimed to determine the pattern of poisoning of patients who visited Kasraleiny Teaching Hospital, Cairo in 2016 in comparison with other countries.

2. Materials and Methods

A retrospective study was conducted on all cases of human poisoning presenting to the National Center for Clinical and Environmental Toxicology (NECTR) from 1 January 2016 to 31 December 2016. NECTR is a national poisoning center located in Kasralainy Teaching Hospital, Cairo University, overlooking the Nile River. NECTR is one of the two main national poisoning centers in Cairo city and its surrounding rural areas (Greater Cairo). The population of Greater Cairo in 2016 has about 20 million people. Cases either presented directly at the poisoning center or referred from other hospitals of Greater Cairo.

All types of poisoning were included with a total sample of 11181 poisoning cases. Data were taken from the charts retrospectively and included age, gender, date, types of poisoning, agents for poisoning, severity and final outcomes (complete recovery, death). The data were analyzed statistical to show if their statistical significance differences between groups.

All cases diagnosed of acute poisoning due to house-hold, therapeutic drugs, food poisoning, snake and scorpions bite, abuse substances and pesticides poisoning were included. Therapeutic drugs were categorized into central nervous system agents, cardiovascular system agents, respiratory system agents, analgesics, Anti-biotic agents, Anti-diabetics, contraceptives, gastrointestinal agents and others medicinal drugs.

Analysis and display of collected data has been done by use of Excel spreadsheet software. Comparison between groups was made using Yate's corrected chi-square tests of Med Calc software. Statistical P-values less than 0.05 were considered significant.

The guidelines on patient consent have been met. The study follows ethical principles of the Declaration of Helsinki for medical research of human subjects.

3. Results

The present study was conducted on 11181 patients with different poisonings presented to the emergency department of NECTR from 1 January 2016 to 31 December 2016. For all poisoning cases, sex was distributed as 6886 females (62% of 11181) and 4295 males (38% of 11181). There were more female patients than males, the female to male ratio was 1.6:1 (X^2 = 11.462, P = 0.0007). It was found that 50% of the patients were adults followed by 24% patients were children (younger than 4 years), 18% patients were adolescents (between 13-18 years) and 8% patients were childhoods (between 4-12 years) (X^2 = 39.826, P <0.0001) as shown in Table 1.

Table 1. Clinical features of poisoning cases

Characteristics	n, Percentage %		(95% CI)	Chi-square (df), *p*
Gender				
Females	6886	62%	61.09- 62.9	11.462(1) 0.0007
Males	4295	38%	37.1- 38.9	
Age group				
Childs (< 4 years)	2693	24%	23.21 - 24.8	39.826(4) <0.0001
Childhoods (4 - 12 years)	914	8%	7.50 -8.52	
Adolescents (12 - 18 years)	2039	18%	17.29 - 18.72	
Adults (> 18 years)	5674	50%	49.07-50.93	
Reasons for poison exposure				
Accidental	4374	39%	38.09- 39.91	4.840 (1) 0.0278
Intentional	6946	61%	60.09- 61.91	
Types of poisoning				
Therapeutic drugs	7282	68%	67.13- 68.86	198.515 (5) <0.0001
Household agents	1487	13%	12.38- 13.64	

Pesticides	993	9%	8.48- 9.55	
Abuse agents	626	5%	4.6-5.42	
Snakes and scorpions	336	3%	2.69- 3.33	
Food poisoning	159	1 %	0.82-1.2	
Hospitalization				
Outpatient	9059	81%	80.26- 81.72	38.440 (1) <0.0001
Inpatient	2086	19%	18.28- 19.74	
Mortality	32	0.3%	0.207- 0.42	96.040(1) <0.0001
Alive	11149	99.7%		

Figure 1 shows the types of poisoning distribution. In the total poisoning cases (11181), therapeutic drugs (68%) were the most common cause of poisoning followed by a household agent (13%), pesticides (9%), and abuse agents (5%), bites of snakes and scorpions (3%) and food poisoning (1 %) (X^2 = 198.515, P < 0.0001). Substances of 4% poisoning cases were unidentified drugs. In the medicinal poisoning, the adults were the most poisoning groups and accounted for 53% of all medicinal poisoning, followed by the age younger than 4 years (20%), age between 13–18 (19%) and age between 4-12 (8%) (Figure 2).

Detailed information on groups of pharmaceuticals and the most frequent agents causing the poisonings was presented. Therapeutic drugs were categorized into analgesics (24%), central nervous system agents (21%), cardiovascular system agents (7%), respiratory system agents (6%), anti-biotics (8%), contraceptives (8%), anti-diabetics (5%) and gastrointestinal agents (6%). Table 2 shows detailed information of pharmaceuticals causing the poisonings. Central nervous system agents were subcategorized into sedative/ hypnotics (51%), anti-psychotic (20%), anti-epileptic (18%) and anti-depressant (12%) (X^2= 36.386, P < 0.0001).

In the household poisoning (Figure 3), age less than 4 was the most poisoning groups and accounted for 59% of all household poisoning, followed by the adult group (22%).

In the abuse agents poisoning (Figure 4), the adults were the most poisoning groups and accounted for 66% of all abuse agents poisoning cases, followed by entirely accidental poisoning for children (20%), then the remaining age between 4–18 (14%).

All types of poisoning exposures were compared by age groups (Table 3). The medicinal poisoning was the most poisoning type in all age groups (X^2 = 2.738, P = 0.4338). The household poisoning proportion in children (32.2%) and childhood (21.1%) groups were significantly more common than in adolescents (4.7%) and adults (5.7%) (X^2 = 31.375, P < 0.0001).

The proportions of abuse agents poisoning among the age groups were 7.2%, 4.7%, 3.2% and 2.7% for adults, children, adolescents and childhood, respectively (X^2 = 2.444, P = 0.4854). The pesticides

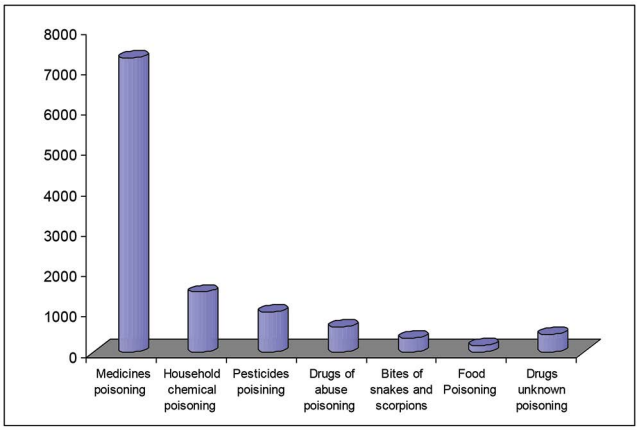


Figure 1. Type of poisoning distribution.

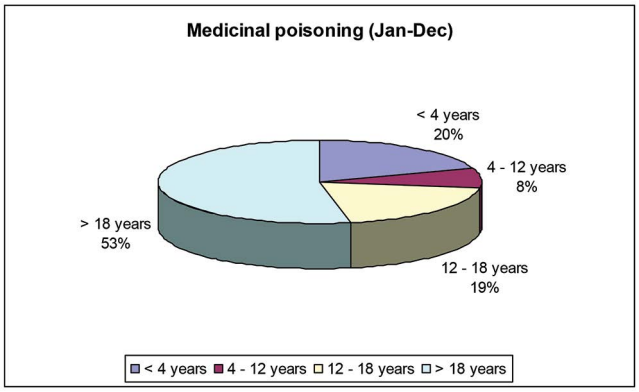


Figure 2. Medicinal poisoning – Age distribution.

Table 2. Categories, subcategories and the most frequent agents causing the studied poisonings

Categories & subcategories	X^2 (df), p	Total Percent	Most frequent agents
Analgesics		24%	
Paracetamol (40%)			Paracetamol
NSAID (40%)	15.677(2)		Diclofenac, Ibuprofen
Asprin (13%)	0.0004		Asprin
Central nervous system agents		21%	
Sedatives/ hypnotics (51%)			Eszopiclone, Benzodiazepine
Anti-psychotic (20%)	36.386 (3)		Clozapine
Anti-epileptic (18%)	<0.0001		Tegratol, Depakine
Anti-depressant (12%)			Amitriptyline
Anti-biotics	-	8%	Amoxicillin
Contraceptives	-	8%	Gynera
Cardiovascular system agents		7%	
Anti-hypertension agents (49%)			Amlodipine,
Anticoagulant (16%)	56.305 (5)		Warfarin
β-blockers (13%)	<0.0001		Propranolol/Atenolol
Cardiotonic agent (11%)			Digeoxin
Anti-hypotension (9%)			Furosemide
Respiratory system agents		6%	
Bronchodilator [thiophylline] (71%)	30.044 (1)		Thiophylline
Asthma agents (19%)	<0.0001		
Gastrointestinal agents		6%	
Antiparasitic (42%)			Metronidazole
Antiemetic (18%)	26.837 (3)		
Anticholinergic (13%)	<0.0001		
Antiacids (13%)			
Anti-diabetics	-	5%	Metformin
Others medicinal drugs	-	15%	Antihistamine

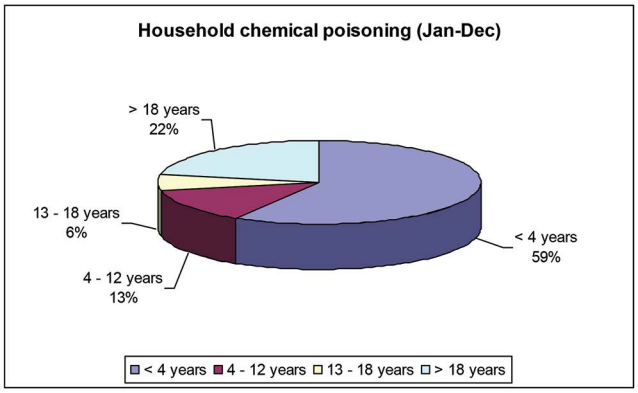


Figure 3. Houshold poisoning – Age distribution.

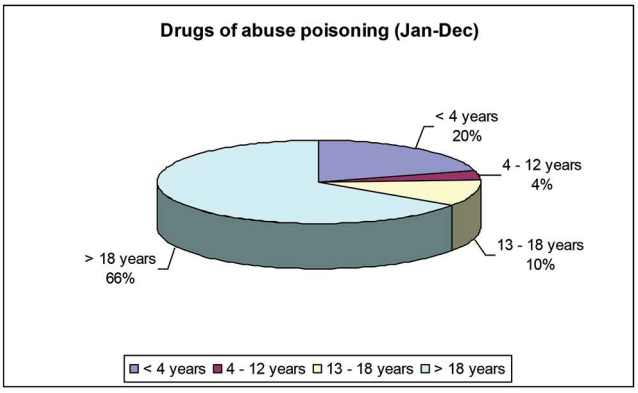


Figure 4. Drugs of abuse poisoning – Age distribution.

Table 3. Type of poisoning among age groups

Types of poisoning	Childs < 4 years N: 2693 n (%)	Childhoods 4 - 12 years N : 914 n (%)	Adolescents 12 - 18 years N: 2039 n (%)	Adults > 18 years N: 5674 n (%)	Statistics Chi-square (df), p
Therapeutic drugs	1528 (56.7%)	586 (64.1%)	1501 (73.6%)	4108 (72.4%)	2.738(3) 0.4338
Household agents	870 (32.2%)	193 (21.1%)	95 (4.7%)	325 (5.7%)	31.375(3) <0.0001
Pesticides	128 (4.75%)	57 (6.2%)	302 (14.8%)	506 (8.9%)	6.943 (3) 0.0737
Abuse agents	128 (4.75%)	25 (2.7%)	65 (3.2%)	408 (7.2%)	2.444 (3) 0.4854
Snakes and scorpions	27 (1%)	38 (4.2%)	38 (1.9%)	233 (4.1%)	2.455 (3) 0.4836
Food poisoning	12 (0.45%)	15 (1.6%)	38 (1.9%)	94 (1.7%)	0.429 (3) 0.9343

poisoning was more likely to occur in adolescents group (14.8%) than in other age groups (X^2 = 6.943, P = 0.0737) as shown in Table 3.

The poisoning due to food and bites of snakes and scorpions were the least cause of poisoning which occurred with similar frequency among the age groups (P= 0.4836 and P = 0.9343, respectively).

Poisoned cases of 19% were admitted in Critical Care Unit (CCU) for follow up and treatment where 81% of cases were outpatients (X^2 = 38.440, P < 0.0001). The average hospital stay duration was 48 hours. The outpatients were treated in less than 24 hours and discharged after management.

Accidental poisoning comprised about 39 % whereas intentional comprised about 61% (X^2 = 4.840, P = 0.0278). The mortality rate for the patients was 0.3% (32 patients) (X^2 = 96.040, P < 0.0001).

Intentional poisoning was most commonly caused by therapeutic drugs (77%), followed by pesticides poisoning (11 %) and abuse agents poisoning (6%) (X^2 = 100.234, P < 0.0001).

Gender types of suicidal and accidental cases were missing. Since, the higher incidence of poisoning in females (62%) than in males (38%), the authors tend to classify men rather to accidents than to suicides where the woman is the most suicide cases.

4. Discussion

Poisoning is one of the main considerations of health care system and public health problem. In this study, poisoning exposure was grouped into 7 toxic groups including therapeutic drugs, pesticides, food poisoning, narcotics, and household agents, bites of snakes and scorpions and unknown drugs.

The most common poisoning type was medicinal poisoning (68% of 11181). In agreement with other studies, medicinal drugs are the main toxic agents (13-16). There were no significance differences in medicinal poisoning by age groups (P = 0.4338). Analgesics (24%) and central nervous system agents (21%) were the most common medicinal poisons which distributed as females (74%) and males (26%) (P < 0.0001). The female has more risk of medicinal poisoning than male by analgesics and central nervous system agents.

The most frequently involved analgesics were acetaminophen (40%), Nonsteroid Anti-Inflammatory Drugs (NSAID) (40%), and acetylsalicylic acid (13%) (P = 0.0004). The high ratio of analgesic in poisonings is due to its easy availability without prescription. Acetaminophen is the most frequent poisons among all poisoning agents. This is similar to previous study reported that paracetamol remains the most common drug poisoning in the United Kingdom (UK), followed by NSAID and psychoactive drugs[17]. Legislation by UK to reduce pack sizes of analgesics and limitations on the number of paracetamol which can be obtained without assessment by a health professional were followed by a reduction in analgesic overdose deaths, and a few liver transplantation cases during the 11 years[18].

Sedatives/ hypnotics (51%) were the most common among central nervous system agents, followed by anti-psychotic (20%), anti-epileptic (18%) and anti-depressant (12%) (P < 0.0001).

The most frequently involved cardiovascular system drugs were anti-hypertension agents (49%),

anticoagulants [Warfarin] (16%) and β-blockers (13%) (P <0.0001). Bronchodilator [Theophylline] (71%) was found to be the most frequently respiratory system agent followed by asthma agents (19%) (P < 0.0001). Metformin is the most frequently anti-diabetics in Egypt (Table 2).

There are several causes of medicinal poisoning including using of wrong medicines by low education level of patients, medicines store in an unsafe place and their easy availability at homes within the reach of children and mostly due to suicide attempts of adults. The prevention of medicinal poisoning should merit high priority in the education interventions and preventive efforts. The most common age group affected was adults group similar to most of the other studies conducted[19–22]. The persons of this age suffer from failure to get a job, life stress, failure in love, family problems, etc. Types of interventions and preventive efforts are recommended to reduce medicinal poisoning including education, enhanced labeling, a change in the maximum daily dose, a change in tablet strength and store the drugs at homes far from the reach of children.

Poisoning by household agents accounted for 13% of the all poisoning cases. There were marked significance differences in the household agents at the age groups (P < 0.0001). The adolescents and adults were significantly less involved, whereas children and childhoods are significantly more involved to household agents poisoning. Similar to other studies household products were common among children due to easy availability of household /domestic poisons as these tend to be kept in easily opened bottles such as cosmetics, cleaning products, hydrocarbons, and insecticides[23,24]. It is found that the most prevalence of household poisoning (58%) took place in children under 4 years old by accident or mistake. American Poison Control Centers (AAPCC) reported that about 55% of pediatric and children exposures are household agents; whereas about 45% are pharmaceutics agents[25,26]. These substances are not necessarily the most dangerous, but they are often the most accessible[26,27].

Among the abuse agents (Table 4), Tramadol, a synthetic opioid (45%) was the most common abuse agents recorded in our study followed by alcohols (35%), cannabinoids (15%), and unidentifiable abuse agents (5%). Unlike the analgesics and central nervous system agents, the abuse agents were significantly more often involved in poisoning cases by males (79%) than females (21%; P < 0.0001). Tramadol abuse has remarkable increased since 2008 in Egypt. It is reported that tramadol is the most common drugs abused in Egypt. These agents were the most common abuse agents in Egypt due to its cheap price, wide availability, and illegal smuggling[28].

The adults were the most poisoning groups (65%) of abuse agents poisoning cases, followed by poisoning of children of the age younger than 4 (20%). Abuse agents poisoning in children was entirely accidental due to easy availability of abuse agents of family members. A considerable concern should be raised toward abuse agents at homes within the reach of children.

In the present study, pesticide poisoning recorded for only 9% of all the cases, as the fact that main population of Cairo is an urban area. The majority of pesticides poisoning was due to organophosphate, carbamate and aluminum/zinc phosphide.

Animal poisoning due to snake and scorpions bite were 3% of the poisoning cases. Most of the animal poisoning cases admitted from rural Cairo suburbs. The adults were the most poisoning groups and accounted for 69% of the bites poisoning cases. The high rate of animals bites in adult victims was explained on the basis that most stings occurred during work where this age category is associated with most outdoor activities[22]. There was a significantly lower frequency of animals and pesticides poisoning than reported from rural areas[17,29,30].

Food poisoning was the least cause of poisoning and represented 1% of the total poisoning. Bacteria are the most common causes of food poisoning. Food poisoning bacteria involves *Clostridium perfringens*, *Staphylococcus aureus*, *Campylobacter Salmonella*, *Shigella*, *Bacillus cereus*, *E. coli* and *Clostridium botulinum*[31].

There is a remarkable correlation between the gender and causes of poisoning exposure. It is found that a higher incidence of poisoning in females (62%) than in males. Similar results were found in other studies[13,28] indicating that the female is exposed to more stress or strain as compared with males. It is reported that women in the country are often subjected to violence and discrimination from community members and family members[32].

The results of our study illustrate that 19% of the patients were hospitalized as inpatients due to acute poisoning. Most poisoned patients were treated with supportive care during the period of observation. Only 31 deaths of 11181 with total mortality rate 0.3% were observed in this current study. Patients are

well managed when they came to the hospital early and when ingested agents were frequently non-lethal agents.

5. Limitations

This study may not be representative of poisonings in the population, since NECTR is one of the two main poisoning centers in Great Cairo. The study excluded recorded calls data concerning out-of-hospital poisoned patients who seek the advice from Emergency Medical Information Center. There are some limitations as missing data concerning the treatment of acute and severe poisoning and complications of the patients. The percentage of suicidal patients due to medicinal, pesticides and abuse agents poisoning may be not including all suicidal patients. Most self-poisoning patients were uncooperative to give reliable history.

6. Conclusion

The prevention of medicinal poisoning should merit high priority in the education interventions and preventive efforts. An important concern toward drugs and abuse agents' availability at homes within the reach of children should be raised. The most risk factors of poisoning are female gender and young age. The following conclusions were reached: (1) higher incidence of poisoning in females than in males, (2) the majority of poisonings is intentional poisoning in adults, (3) The most common type of poisoning was medicinal poisoning, (4) the household poisoning was the most common among children, (5) analgesics and central nervous system agents were the most common medicinal poisons which distributed as females (74%) and males (26%), (6) Paracetamol is the most frequent poisons and (7) Tramadol was the most common poisoning of abuse agent followed by alcohols and cannabinoids. The abuse agents were more often involved in poisoning cases by males (79%) than females (21%).

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