Patterns of acute poisoning- Five year study from National Poison Control Centre, Karachi, Pakistan

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Abstract

Objective: To identify patterns in cases of acute toxicity reported at an urban poison control centre.

Method: The cross-sectional, retrospective study was conducted at the National Poison Control Centre, Karachi, and comprised data from January 1, 2017, to December 31, 2021. Data was collected from the institutional database which is part of the Jinnah Postgraduate Medical Centre, Karachi. Data of all patients diagnosed with acute poisoning was included. Data was analysed using SPSS 22.

Results: Of the 4,936 cases reported, 2,449(49.6%) were males and 2,487(50.3%) were females. Pesticide was the most common cause of toxicity 1254(25.4%). Regarding outcomes, 351(7.1%) patients expired, 3,585(72.6%) were discharged after appropriate treatment, 366(7.4%) were given outpatient and psychiatric referrals, and 634(12.8%) patients left against medical advice.

Conclusion: The most common agent causing toxicity was pesticides, and overall mortality across the study period was 7.1%.

Key Words: Poisoning, Toxicology, Pesticides, Forensic toxicology.

Introduction

Acute toxicity is a major medical emergency resulting in morbidity and mortality in all age groups[1,2]. According to the World Health Organisation (WHO), poisoning results in an annual loss of 7.4 million years of healthy life globally. Acute poisoning cases have been categorised as the second largest cause of morbidity after road traffic accidents (RTAs)[3].

Acute poisoning can be intentional or unintentional, the former being more common in adults, while the latter is mostly seen in younger age groups[4]. Data from the American Association of Poison Control Centres (AAPCC) suggests that most common toxicological agents causing poisoning are analgesics, cosmetics, household cleaners, and sedatives/hypnotics/antipsychotics, while European data cites sedatives/hypnotics/antipsychotics, alcohol and carbon monoxide as the most common agents causing poisoning. In underdeveloped and agricultural countries of Asia and Africa, pesticides are most common poisonous substances, followed by medications and household products[5]. In underdeveloped regions of the world, increased incidence of poisoning is the reason for many hospitalisations, and also has an impact on

healthcare resources and financial distribution.[6] There are many variations in patterns and causes of poisoning in different geographical regions even within the same country. Recognising these trends and patterns can identify the risk factors and play a vital part in saving lives and reducing the burden on healthcare resources[7].

Death due to poisoning is regarded as an unnatural death, and requires medicolegal investigation and detailed postmortem examination. Limited work and research has been done in this domain in Pakistan[8].

The current study was planned to identify patterns in cases of acute toxicity reported at an urban poison control centre.

Materials and Methods

The cross-sectional, retrospective study was conducted at the National Poison Control Centre (NPCC), Karachi, and comprised data from January 1, 2017, to December 31, 2021. After approval from the ethics review board of the Jinnah Postgraduate Medical Centre (JPMC), Karachi, data was retrieved using consecutive sampling technique. Record of all the patients presenting to NPCC with diagnosis of acute poisoning was included, while data of those with any other diagnosis or those with incomplete record was excluded. The diagnosis was based on presenting complaints, history, clinical picture and laboratory findings. The data was anonymised at the time of collection, and only relevant details like age, gender,

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causative agent of poisoning, date of reporting and outcomes were recorded.

With respect to age, data was divided into four groups; children aged 1-10 years, adolescents aged 11-19 years, adults aged 20-59 years, and elderly aged 60 years or more. Each year was divided into four quarters; 1st quarter from January to March, 2nd quarter from April to June, 3rd quarter from July to September, and fourth quarter from October to December. This was done to asses any seasonal variation.

Data was analysed using SPSS 22. Numerical data was expressed as mean and standard deviation, while the rest was expressed as frequencies and percentages. For categorical data, associations were recorded using chi–square test. P<0.05 was taken as significant.

Results

Of the 4,936 cases reported, 2,449(49.6%) were males and 2,487(50.3%) were females. Pesticide was the most common cause of toxicity 1254(25.4%), while the cause was unknown in 971(19.6%) cases (Table 1). According to age, 26(0.52%) patients were aged <10 years, 1,199(24.2%) were adolescents, 3,582(72.5%) were adults, and 129(2.6%) were elderly. There were 1,057(21.4%) cases of acute toxicity in 2017, 1,082(21.9%) in 2018,

1,331(26.9%) in 2019, 821(16.6%) in 2020 and 645(13%) in 2021 (Table 2).

Regarding outcomes, 351(7.1%) patients expired, 3,585(72.6%) were discharged after appropriate treatment, 366(7.4%) were given outpatient department (OPD) and psychiatric referrals, and 634(12.8%) patients left against medical advice (LAMA). In terms of mortality, 38(10.8%) cases related to paraphenylenediamine (PPD), which is locally known as Kala pathar. The best recovery rate was noted in 506(10.3%) cases of snakebites among whom 440(87%) were discharged after treatment.

Significant differences were found when data was analysed with respect to patients' gender (Table 3) and age group (Table 4). Among male patients, 7(0.3%) were aged <10 years, 612(25%) were adolescents, 1,760(71.9%) were adults and 70(2.9%) were elderly. Among the female patients, the corresponding values were 19(0.7%), 586(23.5%), 1,823(73.3%) and 59(2.3%) respectively.

Among children, cases of snakebite and benzodiazepines were the highest 7(26.9%) each, while in adolescents, adults and the elderly, pesticide was the most common cause in 306(25.5%), 900(25.1%) and 43(33.3%) subjects, respectively.

Table-1: Cases attributed to different poisonous substances.

Poisonous Substance	Number of Cases	Percentage (%)
Benzodiazepines	838	17
Paracetamol	662	13.4
Snake bite	506	10.3
Kala pathar, (Paraphenylenediamine-PPD)	321	6.5
Alcohol	203	4.1
Antiepileptics	123	2.5
Cannabis	58	1.2
Unknown	971	19.6

Table-3: Poisoning agents used in gender terms.

Poisonous Substance*	Gender				P- value
	Male		Female		
	No. of Cases	%	No. of Cases	%	
Pesticides	591	47.1	663	52.8	
Benzodiazepines	401	47.8	437	52.1	
Paracetamol	318	48	344	51.9	
Snake bite	311	61.4	195	38.5	
Kala pathar, (Paraphenylenediamine -PPD)	145	45.1	176	54.8	<0.001
Alcohol	115	56.6	88	43.3	
Antiepileptics	55	44.7	68	55.2	
Cannabis	35	60.3	23	39.6	
Unknown	478	49.2	493	50.7	

In terms of association between gender and outcome, 172(7%) males expired, while 82(3.3%) were discharged and referred to OPD, 88(3.6%) were referred to psychiatric care, 1,796(73.3%) were discharged after treatment and 311(12.7%) were

Table-2: Poisoning agents used across the years.

Poisonous Substance*	2017		2018		2019		2020		2021		P -Value
	N	%	n	%	n	%	n	%	n	%)	
Pesticides	264	24.9	278	25.6	401	30.1	169	20.5	142	22.0	
Benzodiazepines	186	17.5	191	17.6	234	17.5	95	11.5	132	20.4	
Paracetamol	94	8.8	115	10.6	178	13.3	158	19.2	117	18.1	
Snake bite	114	10.7	161	14.8	115	8.6	98	11.9	18	2.7	<0.001
Kala pathar, (Paraphenylenediamine-PPD)	96	9.0	34	3.1	48	3.6	118	14.3	25	3.8	
Alcohol	47	4.4	67	6.1	57	4.2	12	1.4	20	3.1	
Antiepileptics	29	2.7	22	2.0	61	4.5	06	0.7	05	0.7	
Cannabis	10	0.9	13	1.2	24	1.8	05	0.6	06	0.9	
Unknown	217	20.5	201	18.5	213	16	160	19.4	180	27.9	

Table-4: Poisoning agents used and their age-related distribution.

Poisonous Substance *	Age Groups								P-Value
	Children		Adolescents		Adults		Old age		
	N	%	n	%	n	%	n	%	
Pesticides	05	19.2	306	25.5	900	25.1	43	33.3	
Benzodiazepines	07	26.9	200	16.6	615	17.1	16	12.4	
Paracetamol	05	19.2	172	14.3	466	13.0	19	14.7	
Snakebite	07	26.9	130	10.8	360	10.0	09	6.9	
Kala pathar, (Paraphenylenediamine-PPD)	00	0.0	99	8.2	215	6.0	07	5.4	<0.001
Alcohol	00	0.0	45	3.7	153	4.2	05	3.8	
Antiepileptics	00	0.0	34	2.8	85	2.3	04	3.1	
Cannabis	00	0.0	14	1.1	42	1.1	02	1.5	
Unknown	02	7.6	199	16.5	746	20.8	24	18.6	

Table-5: Poisoning agents used and their association with the time of the year.

Poisonous Substance *	January To March		April To June		July To September		October To December		P-Value
	N	%	n	%	n	%	n	%	
Pesticides	249	19.8	412	32.8	317	25.2	276	22	
Benzodiazepines	165	19.7	275	32.8	202	24.1	196	23.4	
Paracetamol	112	16.9	209	31.6	195	29.5	146	22.1	
Snake bite	51	10.1	229	45.3	154	30.4	72	14.2	
Kala pathar, (Paraphenylenediamine- PPD)	69	21.5	116	36.1	93	29	43	13.4	<0.001
Alcohol	24	11.8	66	32.5	66	32.5	47	23.2	
Antiepileptics	35	28.5	35	28.5	26	21.1	27	22	
Cannabis	7	12.1	27	46.6	12	20.7	12	20.7	
Unknown	186	19.1	316	32.5	239	24.6	230	23.6	

LAMA cases. Among the females, 179(7.1%) died, 102(4.1%) were referred to OPD, 94(3.7%) were referred to psychiatric care, 1,791(72%) were discharged after treatment and 321(12.9%) were LAMA cases (p<0.001).

The maximum number of patients 1,684(34.1%) required medical assistance in the second quarter of the year, while the least number of patients 896(18.1%) reported in the first quarter (Table 5).

Discussion

The study showed a decline in the number of cases of poisoning compared to the first three years, from 2017 to 2019, of the five-year period, which is a finding in contrast to most studies done previously around the world[9]. This decline may be further explored to find out the factors that may be at play. One thing that may also be considered in relation to this finding is that the lockdowns as a result of the coronavirus disease-2019 (COVID-19) were imposed nationwide intermittently since March 2020, and that could have caused hindrance in reporting to the hospital[10]. Also, there was fear, anxiety and depression instilled in the general population[11]. Aversion

to hospital visits owing to the fear of contracting the disease[12] may have played its role in making many healthcare issues, including acute toxicity, to be underreported.

On the other hand, a steady increase in the number of cases was noted from 2017 to 2019. As far as different times of the years are considered, most of the cases were reported between April and June when the climate in the city is mostly warm, a fact also observed in a research conducted in India where maximum number of cases were seen in summers during the months of May, June and July[13]. One of the reasons may be the fact that higher serotonin during summer encourages impulsivity and aggressive behaviour that may influence the decision-making capacity and promote suicidal actions within the general population[13]. However, the finding is in contrast with a study done in Ethiopia where most patients reported in December, January and February, which is the winter season[6].

The male-to-female ratio observed in the current study was almost equal, with female cases being negligibly higher than males and ratio being 1:1. This is a very distinct finding that contrasts with most studies done previously not in Pakistan[14] as well as in Nepal[15] and China[16]. Studies in Bangladesh[17] and India[18] showed greater number of male patients compared to the females. Similarly, in cases of snakebite, alcohol, and cannabis-related toxicity, the number of male patients was higher compared to the females. This can be attributed to cultural practices. like males being more involved in outdoor activities and being more independent within society. Most cases reporting to the NPCC were middle-aged, which is in line with studies in Ethiopia[19], India[18] and China[16]. This age group is particularly vulnerable due to the fact that people experience greater level of stress while going through the most active part of human life.

Pesticides, benzodiazepines, paracetamol, snakebites, kala PPD, which is an ingredient in locally produced hair dyes, alcohol, cannabis and antiepileptics were the substances causing acute toxicity, while many cases had unknown reasons for the toxicity. Maximum number of patients reported with complaints of poisoning by

pesticides in the current study. Such substances have been identified as the top most poisonous agents causing toxicity in most studies in Pakistan[8], Nepal[15] and India[20]. In contrast, therapeutic drugs were identified as being responsible for most poisoning cases in northern Pakistan[14] and China[16].

One distinct significant finding regarding outcomes in the current study was that when different toxic substances were analysed, maximum number of deaths were found to have resulted due to PPD poisoning. It is becoming an emerging trend in Pakistan to use this substance with the intent of self-harm[21].

Karachi is by far denser than any other city with an urban population of >10 million preceded by Dhaka in Bangladesh and Mumbai in India in this aspect[22]. The current study was conducted at an established public-sector poison control centre at a tertiary care hospital in Karachi, the only facility in the city addressing the needs of poison victims where most patients with poisoning complaints report. The sample size along with five-year duration and the poison centre being the main centre of the city managing such cases add to the strength of the study, and provide substantial ground for assessment of patterns of poisoning in the city making the results and the deductions more reliable.

However, the current study has limitations due to its cross-sectional design as selection bias cannot be ruled out. Besides, inclusion of other private- and public-sector hospitals would have provided a more accurate picture of the scenario prevailing in the city in relation to the issue of acute toxicity. Also, the matter could have been explored more accurately by including routes of poisoning.

Conclusion

The most common agent causing toxicity was pesticides, the number of cases were high in the April–June quarter, the highest number of cases were reported in 2019, and mortality was 7.1% across 5 years, with the highest percentage of deaths being in PPD cases and in individuals aged 20-59 years.

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