Gravity of Poisoning Cases in Shaheed Benazirabad Sindh, Pakistan: A Prospective Study

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Authors' contributions

This work was carried out in collaboration among all authors. Author SM presented study design and concept. Authors NK and RT did the literature search and drafting. Authors YQ and GK did data analysis. Authors JA and RS designed the questionnaire. Authors MS and AA did the data collection, authors JJ and SM did the data interpretation and drafting. All authors read and approved the final manuscript.

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ABSTRACT

Aim: It is estimated that more than half a million of people die worldwide due to various incidences of intentional and unintentional poisoning and of them 84% occur in low- and middle-income countries. The clinical presentation of poisoning cases differs by age group, reason of poisoning, geographic region, substances involved and economic development of the country. The aim of present research was to estimate the incidence of poisoning in Shaheed Benazirabad based on above reasons.

Study Design: Cross-sectional prospective study.

Place and Duration of Study: Over a period of 6 months between July to December 2019 in a tertiary care hospital in Sindh, Pakistan.

Methodology: Study was carried out by enrolling poisoned patients admitted in a tertiary care hospital. A standardized questionnaire was designed based on different variables in surveys conducted by American Association of Poison Control Centers. In total 263 poisoning cases were presented during the study period. The data obtained was coded, entered and analyzed using SPSS 24.

Results: It was found that poisoning was more common in male (58.9%) in the age group of 16 to 30 years (48.7%) and single individuals (56.3%) with uneducated (55.1%) and jobless (54%) background. The common reasons of poisoning were suicide (36.5%) and substance involved in poisoning cases were pesticides (42.6%). Of the total cases reported during study period, 17.5% were admitted in Intensive Care Unit and death was reported in 5.3% of cases.

Conclusion: It was found that improved regulatory controls for hazardous chemicals, establishing poison control centers and decreasing exposure and reporting time can decrease poisoning cases.

Keywords: Antidotes; intentional; poisoning; suicide; unintentional key words.

1. INTRODUCTION

Poisoning may occur when people encounter a significant amount of dangerous substances (poison) by ingesting, inhaling, injecting or applying, leading to serious illness or even death [1]. Depending upon the potency of intoxicating agents, a very small amount of toxic exposure can be harmful or lethal. The exposure of the poisoning material can cause either acute poisoning or delayed poisoning. Former one develops immediately after exposure, whereas later one occurs after exposure with poisonous substance for a longer period [2].

In 2012, the World Health Organization (WHO) estimated that 193,460 people died due to various incidences of accidental poisoning globally and 84% of them were from lower- and middle-income countries (LMICs). It was also assessed that about 370,000 people died due to deliberate self-intake of poisons (intentional poisoning) [3]. Chemical exposure and suicidal attempts account for a number of deaths per year globally and pesticides being the major cause of these deaths[3, 4]. In broader view, poisoning can be categorized as intentional and unintentional. Most of the poisoning cases occurred in developing or under-developed countries with limited resources are intentional

and these are linked with a high degree of morbidity and mortality. However, most of these poisoning cases occurred in developed countries were because of unintentional exposure [5].

The variation in the clinical presentation has also been found in poisoning cases and is complexed by the fact that different substances involved in the poisoning variably affect the patients depending upon, age group, reason of poisoning (intentional or unintentional), the geographic region and economic development of the country [6].

The American Association of Poison Control Centers has reported that there are five major classes of human poisoning including antipsychotics/hypnotics/sedatives, analgesics, cosmetics, foreign bodies and household cleaning substances [7]. However, the data collected in Europe presented a different pattern. In Europe, most of the patients affected with poisoning were adults with suicidal intention and the substances involved in exposure included illegal drugs containing benzodiazepines, antipsychotics, hypnotics, sedatives, carbon monoxide and alcohol.

Although, limited studies are available on poisoning cases in Pakistan, but poisoning has

been a significant cause of morbidity and mortality among different cities of Pakistan including Nawabshah. The most common substances involved in poisoning include insecticides (endrin), pesticides (organophosphates), batrachotoxin, benzodiazepines, snake poison, hydrocarbons, cocaine, iron, heavy metals, amantadine, OTC cough and cold medicines, quinine and chloroquine, isoniazid, and local anesthetics [8]. It was observed that the early recognition and proper management of the poisoned patients has proven significant improvement during the treatment, [9] while the delay in recognition and suboptimal management had led to increased morbidity and mortality [10, 11]. The cases of morbidity and mortality vary by type of poison and geographical region. In Asia and Africa, it has been found that most of the fatalities are due to the pesticides, while the medications and household products come next to it [6].

Developed countries have established Poison Control Centers (PCCs), aiding emergency physicians in handling of the poisoned patients. These centers also provide real time expert opinion from toxicologists. So, in the developed countries, PCCs help in the quick identification of the poisoning and better management and outcome of poisoned patients [12]. Unfortunately, there are not any properly functioning government funded PCCs in Sindh province, especially in rural areas of Sindh. Recognition of poisoning cases will decrease the morbidity and mortality through knowledge and education.

So, we aimed to determine the prevalence and management of poisoned patients admitted in the different units of one of the largest tertiary care hospitals of Sindh, Pakistan. It was hoped that this work will help in prevention, control and better management of the poisoning cases and reduce the morbidity and mortality due to poisoning.

2. MATERIAL AND METHODS

2.1 Study Design and Participants

Cross-sectional prospective study was carried out by enrolling poisoned patients admitted at Peoples Medical College Hospital, Shaheed Benazirabad. Peoples Medical College Hospital (PMCH) is a 1000 bed tertiary care hospital attached with People University of Medical and Health Sciences for Women, Nawabshah Shaheed Benazirabad. The hospital serves

patients from Shaheed Benazirabad and its surroundings. It provides supervision and teaching to the undergraduate and post-graduate students in the field of medical and allied health sciences.

2.2 Study Instrument

A standardized questionnaire was designed based on different variables in the surveys conducted by American Association of Poison Control Centers (AAPCC) [13]. Demography included gender, marital status, the level of education, residential area, age groups, employment status, and the time of year. Variables included the number of cases of poisoning based on cause of poisoning, either intentional or unintentional, the reason of poisoning, either suicide or self-harm (Suicide is killing of oneself while self-harm is defined as non-fatal act of injuring oneself due to various intentions) [13, 14], snake bite, general, adverse drug reaction (ADR) and others, substance involved, and the route of exposure (ingestion, snake bite, dermal, parenteral and unknown) of poisoning substance [13]. Variables also included medical management and availability of facilities in the hospital, the referral of the case, time lapse between poisoning and reporting, first aid, management at the hospital, availability of the antidote, and referral to Hyderabad or Karachi.

In the outcome of poisoning exposure, patients who were discharged after giving treatment in emergency area were considered patients with minor ailment, patients who were where admitted in hospital wards were considered with moderate ailment and those who were admitted in Intensive Care Unit (ICU) were considered in major ailment group while rest were those who could not survive [15].

Before going through full scale study, a training session was conducted on the questionnaire for attending physicians in the PMCH to define the variables and a pilot study was also conducted to rationalize the questionnaire.

2.3 Data Collection

Study was conducted over a period of 6 months between July to December 2019 and data was collected on a 24-hour basis and 7 days a week. In total, 263 poisoning cases were presented during the study period. All these suspected poisoning cases were admitted and enrolled to PMCH and the attending physician determined

the suspicion of poisoning based on clinical features of the patient, any traces of poisoning substance, wrappers, strips or packets of drugs or chemicals, patient's and/or attendant's interview.

2.4 Data Analysis

The data obtained was coded and entered and analyzed using SPSS 24. Descriptive Statistics was used to determine the frequencies and percentages. Chi-square test was used to determine the relationship between different variables.

3. RESULTS

Table 1 represents the demographics of study participants. It was found that poisoning was more common in male (58.9%) as compared to female (41.1%). Poisoning cases were more prevalent among study participants aged 16 to 30 years (48.7%) followed by 1 to 15 years old (31.2%), 31 to 45 years old (11.8%) and 46 years old and above 46 years of age (8.4%). The majority of participants were unmarried (56.3%) followed by married (43.0%)

and widowed (0.8%). Moreover, the majority of study participants were uneducated (55.1%) followed by those who studied up to the primary level (28.1%), intermediate level (15.6%) and only a few were graduates (1.1%). In our study, a higher number of participants were from rural areas (98.5%) and only 1.5% were from urban areas. Furthermore, more than half of the participants were not working (jobless: 54% or retired:1.5%), while only a quarter were working full time (25.1%) and 19.4% were doing a part-time job. Moreover, it was found that most of the poisoning cases were reported during the month of September (24.7%), followed by November (18.3%) and December (16.7%), while least number of cases were reported in the month of August (12.9%). Table 1 shows the number of cases by month.

Table 2 shows pattern of poisoning cases encountered. It was found that frequency of intentional and unintentional poisoning cases was approximately equal, i.e. 50.6% vs. 47.9% and for 1.5% of cases, the reason of poisoning was unknown. The common reasons of poisoning found in our study were;

Table 1. **Study participants' demographics**

Variables	Groups	No. (and %)	P-value
Gender	Male	155 (58.9)	<0.01
	Female	108 (41.1)	<0.01
Age Groups (years)	1-15	82 (31.2)	<0.01
	16-30	128 (48.7)	<0.01
	31-45	31 (11.8)	<0.01
	46 and above	22 (8.4)	<0.01
Marital Status	Single	148 (56.3)	0.05
	Married	113 (43.0)	0.05
	Widowed	2 (0.8)	0.06
Level of Education	Graduated	3 (1.1)	0.05
	Intermediate	41 (15.6)	0.04
	Primary	74 (28.1)	<0.01
	Uneducated	145 (55.1)	<0.01
Residential area	Rural	259 (98.5)	0.06
	Urban	4 (1.5)	0.07
Employment Status	Full Time	66 (25.1)	0.05
	Part Time	51 (19.4)	0.06
	Retired	4 (1.5)	0.04
	Never worked	142 (54.0)	0.03
Month of Admission	July	36 (13.7)	0.04
	August	34 (12.9)	0.02
	September	65 (24.7)	0.02
	October	36 (13.7)	0.01
	November	48 (18.3)	0.01
	December	44 (16.7)	0.01

suicidal (36.5%), snake bite (31.2%), self-harm (13.3%), general (5.7%), ADR (2.7%) and others [environmental (1.9%), homicide (1.9%), occupational (1.5%), insect Bite (1.1%), addiction (0.8%) and scorpion sting (0.4%)], while in 3.0% of the poisoning cases the cause was not known.

In our study, the variety of substance involved in poisoning were: pesticide (42.6%), snake venom (31.2%), black stone (9.1%), kerosene Oil (2.7%) and others [sedative (1.9%), acid (1.5%), illicit drug (1.5%), rodenticide (1.5%), alcohol (0.8%), anti-lice shampoo (0.4%), cardiovascular agent (0.4%), cough syrup (0.4%), detergent (0.4%), OTC drug (0.4%) and scorpion sting (0.4%)]. However, among 4.9% of poisoning cases the substance involved remained unidentified. Illicit drugs involved in the poisoning included morphine and heroin.

The major route of exposure of poisoning found in our study was ingestion (59.7%) followed by snake bite (31.2%), dermal (4.2%) and parenteral (1.5%). However, among 3.4% of the cases the route of exposure remained unidentifiable.

Table 3 represents reporting, management, and the outcome of poisoning cases. It was revealed that the majority of cases were directly coming from the patient's home (52.9%) while 8.4% were referred from Basic Healthcare Unit (BHU), 6.5% from District Headquarter Hospital (DHQ), 4.6% from the Rural Healthcare Unit (RHU) and 27.8% from Taluka Headquarter Hospital (THQ). Moreover, the time lapsed after exposure to poisoning and hospitalization was found to be 1-2 hours in 59.3% of cases, 24 hours or more in 9.1% of cases, 3-6 hours in 24.3% of cases and in 7-24 hours in 7.2% of cases. However, the treatment provided at the hospital was: antidote and symptomatic in 60.5% of cases, followed by symptomatic treatment in 14.4% of cases, antidote+symptomatic treatment and ventilator support was provided to 12.2% of cases, symptomatic treatment and ventilator support was provided to 6.8% of cases, antidote+symptomatictreatment+ventilator support and tracheostomy was carried out in 3.4% of cases and symptomatic treatment+ventilator support and tracheostomy was done in 2.7% of cases. Furthermore, it was revealed that antidote was available in 76.4% of poisoning cases. However, the outcome in most of the poisoning led to the moderate ailment.

Table 2. **The pattern of poisoning cases encountered**

Variables	Groups	No. (and %)
Cause of poisoning	Intentional	133 (50.6%)
	Unintentional	126 (47.9%)
	Unknown	4 (1.5%)
Reason of poisoning	Suicidal	96 (36.5%)
	Snake Bite	82 (31.2%)
	Self-harm	35 (13.3%)
	Others	20 (7.6%)
	General	15 (5.7%)
	ADR	7 (2.7%)
	Unknown	8 (3.0%)
Substance involved	Pesticide	112 (42.6%)
	Snake Venome	82 (31.2%)
	Others	25 (9.6%)
	Black Stone	24 (9.1%)
	Unknown	13 (4.9%)
	Kerosene Oil	7 (2.7%)
Route of exposure	Ingestion	157 (59.7%)
	Snake Bite	82 (31.2%)
	Dermal	11 (4.2%)
	Unknown	9 (3.4%)
	Parenteral	4 (1.5%)

Table 3. Reporting, management and the outcome of poisoning cases

Variables	Groups	No. (and %)
Referral From	Patient's Home	139 (52.9%)
	THQ	73 (27.8%)
	BHU	22 (8.4%)
	DHQ	17 (6.5%)
	RHU	12 (4.6%)
Exposure to Reporting Time	1-2 hours	156 (59.3%)
	3-6 hours	63 (24.3%)
	7-24 hours	19 (7.2%)
	24 hours or more	24 (9.1%)
Hospital management	Antidote and Symptomatic	159 (60.5%)
	Symptomatic	38 (14.4%)
	Antidote, Symptomatic and Ventilator	32 (12.2%)
	Symptomatic and Ventilator	18 (6.8%)
	Antidote, Symptomatic, Ventilator and Tracheostomy	9 (3.4%)
	Symptomatic, Ventilator and Tracheostomy	7 (2.7%)
Antidote Availability	Yes	201 (76.4%)
	No	62 (23.6%)
Medical Outcome	Death	14 (5.3%)
	Major Injury	46 (17.5%)
	Minor Injury	33 (12.5%)
	Moderate Injury	170 (64.6%)
Referred to other Hospital	Yes	0
	No	263 (100%)

(64.6%) followed by major ailment (17.5%), minor ailment (12.5%) and death (5.3%). Out of 14 (5.3%) deaths pesticides were involved in 08, blackstone in 03, snake venom in 01, and unknown substances in 02 cases. Moreover, no patients were referred to another health facility.

4. DISCUSSION

In this study, the prevalence of poisoning in Shaheed Benazirabad was assessed in detail first time. The incidence of 263 poisoning cases in a single hospital setting over the time period of 6 months is alarming and highlights the significance of the issue of poisoning in Shaheed Benazirabad. We observed that there was precedence in the percentage of males with poisoning than females (58.9% vs. 41.1% respectively). The above observation is in accordance with study, which detected male preponderance in Karachi city of Sindh province [16]. However, the studies from other cities of Sindh like Hyderabad [17] and other tertiary care hospitals of Karachi [18, 19] reported predominance of females. The incidence of high prevalence of poisoning in males is may be due

of the higher level of exposure to stressful situations or may be due to the improper handling of insecticide [20].

Studies conducted in Sindh province of Pakistan, showed that in 2nd and 3rd decade of people's life, there are maximum number of poisoning cases [16-19, 21]. Similarly, studies from other provinces also reported that most vulnerable age to poisoning is 2nd and 3rd decade of life [22, 23]. In present study, we also observed that the most affected age group was 16 to 30 years (48.7%) tailed by 1 to 15 years old (31.2%). The reasons for poisoning in this early age are may be insecurity of personal feelings, lack of education, unstable life, difficulty in accepting failure, pressure of peers, etc [20].

Moreover, it has been found that the majority of poisoning cases were among singles as compared to married (56.3% vs. 43%). This is consistent with studies conducted in other cities of Pakistan [16, 17]. Similarly, the proportion of poisoning was most common among the uneducated people and residents of rural areas, which is consistent with published studies [17,

24]. Patient's educational status has link with poisoning as reported in a study where a statistically meaningful relationship was observed between self-poisoning to commit suicide and absence of academic education [25]. Furthermore, in LMICs, particularly in rural areas, the majority of poison were pesticides which were easily available and extremely dangerous with high mortality rates such as aluminium phosphide, carbamate, organophosphate, paraquat and organochlorine whereas, in urban areas, mostly medicines were used as poisoning agents, which are preferably less toxic with lower mortality rates [23].

A great number of our study participants were rather actually unemployed, and it has been linked more with intentional poisoning [25]. Unemployment and lower educational level are two important risk factors associated with most suicidal attempts related with social disadvantages [26]. It was observed in one of the case-control study of 100 suicides done in Karachi, in which, 39% of cases were jobless or were going through financial hardships as compared to 17% of controls [27]. Consistent with published study [23], the rate of intentional and unintentional poisoning was approximately equal i.e. 50.6% vs. 47.9%. Most of the intentional or deliberated poisoning cases are self-imposed [23]. It was estimated by one of the study that globally, 23% of intentional injuries were due to deliberate usage of pesticides [28]. But, in every region there was a different type of poison was used. However, the mortality rate in LMICs by self-poisoning is much greater (10-20%) than in high-income countries (0.5-1%) due to lack of proper emergency services and availability of high toxicity poisoning agents [5].

The leading reason of poisoning in our study was suicidal (36.5%), snake bite (31.2%), self-harm (13.3%). A review has been conducted for exploring causes, leading factors and other determinants of suicidal cases in Pakistan [29] and it was observed that use of firearm, poison ingestion and hanging are three most common ways for suicide in Pakistan. Moreover, it has been found that the majority of victims used pesticides or insecticides (containing organophosphate compounds), which were easily obtainable in many households in rural as well as urban areas. It was also observed that medications were not commonly used for suicide, even though these medications (psychotropics or analgesics) are easily available over-the-counter [29]. However, benzodiazepines containing medicines were mostly in urban areas for suicide. Furthermore, in rural or semi-rural areas, self-harming and self-poisoning is more common. Whereas, snake bite is major cause of death in rural areas due to unavailability of basic emergency health facilities and it has been reported as our 2nd leading case of poisoning [30, 31]. But, accessibility of anti-venom and proper transportation at primary healthcare facilities, may reduce the morbidity due to snakebites [31]. The major substance involved in poisoning were pesticide followed by snake venom and black stone. Other studies from Pakistan have also reported organophosphates, benzodiazepines, corrosive intake and aluminium phosphide as a frequent substance involved in poisoning [32, 33]. Similarly, the major route of exposure for poisoning was ingestion followed by snake bite, dermal and parenteral.

It has been reported that time lapse had a significant role on the mortality in cases of acute poisoning [10, 34]. However, it was found in our study that the time elapsed after exposure to poisoning and hospitalization was found to be 1-2 hours in 59.3% of cases, 3-6 hours in 24.3% of cases, 7-24 hours in 7.2% of cases and 24 hours or more in 9.1% of cases. Moreover, among majority of cases i.e. 52.9% were reported from patient's home while rest were referred from other healthcare facilities. It has been reported that referral cases may increase time lapsed because of transportation [35]. Decontamination procedures by charcoal or gastric lavage or are only effective if done within an hour of poisoning [36]. It could be done during pre-hospital care provided by ambulances, but that one hour window is lost because of unavailability of these services in our country [37]. Establishing a PCC can play an essential role in providing necessary information regarding the first aid treatment as well as management of poisoning [38].

A study done in Pakistan, described the factors relating to deliberate and unintentional poisoning. It was observed that most of the patients presented in emergency units were safely discharged, 11% were admitted in an observation unit, one patient was kept in ICU, 11% were transferred to the ward, 12 patients died due to poisoning and 2 were already dead on arrival [23]. While in this study, outcome in the majority of poisoning led to a moderate ailment (64.6%) followed by major ailment (17.5%), minor ailment (12.5%) and death (5.3%).

Antidotes are used to reverse poisoning by irreversibly binding to it or displacing poison from a receptor site [39]. The availability of specific antidote can reduce the rate of mortality, morbidity, hospitalization as well as medical interventions. Antidotes are lifesaving pharmaceuticals and necessity for the countries with high poisoning rates [40]. It has been observed in studies conducted in hospitals of Pakistan, that hospitals do not stock an adequate supply of antidotes [41-44]. It was reported in our study that antidotes were available in majority of poisoning cases i.e. 76.4%.

5. CONCLUSION

Both intentional and unintentional poisoning cases were prevalent and reason for admission in the hospital. Moreover, the major reason of poisoning cases was suicidal, snake bite and self-harm and frequently involved substance was organophosphate, snake venom and black stone. Some of the approaches to limit the exposure to lethal chemicals involve enhanced regulatory controls for accessibility of hazardous chemicals and establishing information poison control centers such as a telephonic or online guiding service which can assist in providing the necessary information regarding first aid as well as management of poisoning.

CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the authors.

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the authors.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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