OUTCOME AND PREDICTORS OF IN-HOSPITAL MORTALITY IN PATIENTS PRESENTING WITH ACUTE POISONING TO A TEACHING HOSPITAL

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Date Received: December 13, 2017
Date Revised: May 30, 2018
Date Accepted: June 06, 2018

ABSTRACT

Objective: To determine the outcome and predictors of in-hospital mortality in patients presenting with acute poisoning to a teaching hospital.

Methodology: This was a hospital based descriptive study. A total of 128 patients were enrolled from June 2015 to July 2017. Patients presenting with acute poisoning, of either gender and above 12 years were included by non-probability convenient sampling method. Patients were divided into the survivors and the expired group. Outcome, mortality and predictors of in-hospital mortality were studied. For data entry and analysis, SPSS version 21.0 was utilized.

Results: Out of 128 patients, there were 51 (39.8%) males and 77 (60.2%) females. Mean age of the patients was 25.79 ±11.23 years. A total of 15 (11.7%) patients expired. The highest number of deaths (7/16, 43.75%) were observed in the aluminium phosphide (wheat pill) poisoning patients which was followed by organophosphorus poisoning (4/40, 10%). Majority of the expired patients presented after 06 hours (73.3%), had respiratory distress (60%), shock (46.7%) and received delayed management in the form of gastric lavage (66.7%) and other supportive care (80%). Among the 15 expired patients, 08 (53.3%) were females and 13 (86.7%) were in the age group of below 40 years.

Conclusion: The overall mortality was 11.7% and the majority of expired patients were young individuals of less than 40 years of age. Late presentation, delayed management, GCS below 8/15, shock, respiratory distress and poisoning with aluminium phosphide or organophosphorus compounds were important predictors of in-hospital mortality in patients with acute poisoning.

Key Words: Poisoning, Mortality, Aluminium phosphide, Organophosphorus compounds

This article may be cited as: **Ali Z, Afridi MAR, Muhammad R, Rahim A, Rahman SKU, Ullah N, et al. Outcome and predictors of in-hospital mortality in patients presenting with acute poisoning to a teaching hospital. J Postgrad Med Inst 2018; 32(2): 155-61.**

INTRODUCTION

Acute poisoning continues to be a major health problem and a significant source of health care expenditure[1]. Globally, it is one of the leading causes of mortality[2]. It resulted in 193,460 deaths according to 2012 estimates of World Health Organization (WHO). Among these an estimated 84% deaths were in the less affluent countries[3].

Acute poisoning is an important clinical emergency. Prompt recognition and timely management are crucial. Early and aggressive therapy in the form of gastric lavage or decontamination, administration of specific antidote and other supportive measures are shown to reduce mortality in patients with acute poisoning[4].

A variety of factors are related to the clinical course, outcome and mortality in patients with acute poisoning. These include time interval since poisoning and arrival to healthcare facility; the admission vital signs; the nature and bio-chemical properties of toxic agent; the amount or dose ingested; victim's age and pre-existing co morbidities; facilities available in the treatment center; and the expertise of healthcare providers[5-7].

These factors which may help in predicting the overall outcome or mortality in poisoning patients have not been studied extensively by the researchers. Therefore, the present study was carried out to determine the outcome and predictors of in-hospital mortality in patients presenting with acute poisoning to a tertiary care hos-

pital. The findings of current study may provide baseline local data for future studies. It will help in guiding the physicians working in the emergency department as well as internists in recognition of at risk patients regarding poor prognosis and outcome. Prioritized management of such patients will ultimately help in decreasing mortality associated with acute poisoning. The information will be disseminated to policy makers for devising relevant strategies.

METHODOLOGY

This was a hospital based descriptive study. We have already published the etiological and clinical profile of patients with acute poisoning[8]. We extended the study duration to include more cases and determine the mortality and its predictors. A total of 128 patients were enrolled from June 2015 to July 2017, from the Emergency Department and Department of Medicine, Lady Reading Hospital, Peshawar. All patients with acute poisoning, of either gender and more than 12 years were included in the study. The data was collected prospectively. Patients with food poisoning and insect or snake bites or those who did not give the consent were excluded from the study. The sample was calculated by WHO sample size calculator. Considering 8.6% mortality of acute poisoning patients in the study by Desalew et al[9], at 95% confidence interval and 5% margin of error, the calculated sample size was 121; however, to cover for drop outs and contingency factor etc. a sample of 128 was included. Our research complied with the Declaration of Helsinki. The study was approved by the Institutional Ethical Review Board. The purpose of research was explained to the patients or their immediate relatives depending on the level of consciousness of patients. They were assured regarding confidentiality. An informed written consent in Urdu language was obtained accordingly.

Acute poisoning was operationally defined as intentional or accidental ingestion of a substance leading to self-harm. All deaths occurring during hospital stay were considered as in-hospital mortality. Following were definitions of key terms: Shock (systolic BP of <100 mmHg); respiratory distress (abnormal rate (<16 or >22),or depth (shallow or deep) or irregular and labored breathing); acidosis as blood pH <7.34; deranged liver function tests (serum bilirubin >1.3 mg/dl or alanine aminotransferase levels >40 u/l); deranged renal function tests (blood urea >40 u/l, serum creatinine of >1.2 mg/dl); and coma (<8/15 score on Glasgow Coma Scale).

Patients were admitted to the Department of Medicine, Lady Reading Hospital, Medical Teaching Institution, Peshawar from the Emergency Department. Those who fulfilled the inclusion criteria were enrolled by non-probability convenient sampling method. Patients were divided into the survivors and the expired group. Demographic and clinical data were collected which included gender, age, address, type of poison, time from exposure to presentation, time since gastric lavage and institution of care (antidote, and life support measures). A thorough history was taken from patients or their attendants followed by focused examination. Vital signs and GCS were recorded in the emergency department and on admission to medical units. Patients were assessed for the need for ICU referral. Relevant investigations including serum bilirubin, ALT, creatinine, blood urea, blood glucose level and arterial blood gases were carried out at Lady Reading Hospital, Peshawar. Toxicology screen was performed in selected cases. A structured questionnaire was used to record all the information.

Data entry and analysis were done through SPSS version 21.0. For numerical variables (e.g. age), mean ±SD was calculated; while for categorical variables (gender, type of poison, outcome and predictors of mortality) frequencies and percentages were calculated. The survivors and the expired group were then compared using Pearson chi-square test or student t-test for categorical and continuous variables accordingly. Statistical significance was considered at p value <0.05. All results were presented as tables.

RESULTS

There were 128 patients of acute poisoning in the present study. Among them, there were 51 (39.8%) males and 77 (60.2%) females. Male to female ratio was 1:1.5.

Age of the patients ranged from 13 to 70 years with mean age of 25.79 ±11.23 years. Majority of the cases were below 40 years of age (n=114, 89.1%). Baseline characteristics of patients with acute poisoning are shown in Table 1.

In the present study, 15 (11.7%) patients with acute poisoning expired. Outcome of patients is shown in Table 2.

The commonest poison ingested was organophosphorus compounds (OP) 40 (31.3%), followed by benzodiazepines 17 (13.3%) and aluminium phosphide poisoning 16 (12.5%). The highest number of deaths were observed in the aluminium phosphide (wheat pill) poisoning patients (7/16, 43.75%) which was followed by OP poisoning (4/40, 10%). Type of ingested poisons and outcome is shown in table 3.

Majority of the expired patients presented after 06 hours (73.3%), had respiratory distress (60%), shock (46.7%) and received delayed management in the form

of gastric lavage (66.7%) and other supportive care (80%). Among the 15 expired patients, 08 (53.3%) were females and 07 (46.7%) were males. Majority of the expired patients 13/15, 86.7% were in the age group of below 40 years. Factors of in-hospital mortality are shown in table 4.

Table 1: Baseline characteristics (n=128)

Characteristics		Frequency	Percentages
Gender	Male	51	39.8
	Female	77	60.2
Age (in years)	below 40	114	89.1
	40-60	9	7.0
	Above 60	5	3.9
Region	Peshawar	80	62.5
	Swabi	14	10.9
	Mardan	10	7.8
	Nowshera	7	5.5
	Kohat	3	2.3
	Others	14	11

Table 2: Outcome of patients with acute poisoning (n=128)

Outcome	Frequency	Percentages
Recovered	110	85.9
Expired	15	11.7
Not Fully Recovered	3	2.3
Total	128	100

Table 3: Type of poison and outcome (n=128)

Type of Poison	Outcome			Total
	Recovered	Expired	Not Fully Recovered	
Organophosphorus compounds	36	4	0	40
Wheat pill	9	7	0	16
Opioids	3	1	1	5
Corrosives	4	1	0	5
Benzodiazepines	17	0	0	17
Carbon Monoxide	1	1	1	3
Others	40	1	1	42
Total	110	15	3	128

Pearson chi-square 0.000

Table 4: Predictors of in-hospital mortality

Factors		Expired Group (n=15)	Survivors Group (n=113)	P Value
Time since Presentation & Institution of Care	Within 6 hours	04 (26.7%)	76 (67.3%)	0.001
	After 6 hours	11 (73.3%)	37 (32.7%)	0.001
Clinical Presentation	Shock, Hypotension	07 (46.7%)	28 (24.7%)	0.01
	Respiratory Distress, Acidosis	09 (60%)	21 (18.6%)	0.001
	GCS <8/15	08 (53.3%)	44 (38.9%)	0.01
	GCS >8/15	07 (46.7%)	69 (61.1%)	0.01
	Renal Function Derangements	13 (86.6%)	73 (64.6%)	0.01
	Liver Function Derangements	07 (46.7%)	60 (53.1%)	0.13
Time since Gastric Lavage	<6 hours	05 (33.3%)	77 (68.1%)	0.01
	>6 hours	10 (66.7%)	36 (31.9%)	0.01
Need for Referral to ICU	Yes	08 (53.3%)	19 (16.8%)	0.01
	No	07 (46.7%)	94 (83.2%)	0.01
Gender	Male	07 (46.7%)	44 (38.9%)	0.517
	Female	08 (53.3%)	69 (61.1%)	
Age Groups (years)	<40	13 (86.7%)	101 (89.4%)	0.073
	>40	02 (13.3%)	12 (10.6%)	

DISCUSSION

In the present study,11.7% patients with acute poisoning expired. The mortality rate of poisoning significantly differs in various countries and is related to a host of factors. In well-equipped and advanced centers, it ranges from 0.5-2.8%. However, in resource poor centers of developing countries it may be as high as 10-20%[10]. The reported mortality rates in different countries include Iran (1.2%), Zambia (2.6%), Greece (2.9%), Taiwan (5.7%), Sri Lanka (8%) and Ethiopia (8.6%)[9,11-15]. Similarly, other researchers have reported 4.2%, 6.7% and 7.5% mortality in patients with acute poisoning[3,11,16].

Our results were comparatively high to the above studies showing upto 8.6% mortality. However, our mortality was low compared to the study by Singh et al who reported 15% mortality in India[17]. The difference in mortality rates among these studies may be related to a multitude of factors ranging from lethal potential of available toxic agents, delayed presentation and institution of care to the scarce availability of health care workers and lack of specific antidotes or other facilities required for managing patients with acute poisoning[18].

In our study, majority of the expired patients presented after 06 hours (73.3%) and received delayed management in the form of gastric lavage (66.7%) and other supportive care (80%). They had respiratory distress and metabolic acidosis (60%), altered mental status with GCS below 8/15 (53.3%) and shock, hypotension & tachycardia in 46.7% of patients with acute poisoning. Presence of shock has been stated as an independent predictor of mortality[19]. Ku et al[20] reported that non-survivors had increased frequency of shock as compared to survivors. Moreover, there was a 9-fold increase in mortality of patients with carbon monoxide (CO) poisoning in the presence of shock. Similarly, altered conscious level and metabolic acidosis were reported as poor prognostic markers in these patients[21]. Hypotension, shock and respiratory failure were found to be mortality predictors in the study by Hu et al[5].

Abnormalities in triage vital signs (systolic BP <100 or >150 mmHg, heart rate <50 bpm or >120 bpm and respiratory rate <12 or >28) were shown to independently predict in-hospital mortality. On the other hand, mean age, suicide attempts and length of hospital stay were not found to be significantly different between the 02 groups[11,21,22]. Ku et al[20] showed that shock (P <0.001), re-

spiratory failure (P <0.001), renal impairment (P =0.003), hepatitis (P =0.016), and coma (P <0.001) were significantly more frequent in non-survivors. Panchal et al[23] reported altered level of consciousness in 52% of cases. In their study, GCS score was an important predictor of mortality. It was shown that patients with GCS score <7/15 had 100% mortality, while patients with GCS score between 7-10 had 46.8% mortality and those with GCS score between 11-15 had only 5.9% mortality.

In our study, the need for referral to ICU was present in 21.09% patients. However, it was 53.3% in the expired group while 16.8% in the survivors group. Acute poisoning requiring ICU admissions had been stated with variable frequency in different studies ranging from 3.4%-17.3%[24-26]. Similarly, the mortality varies and reported as 2.8%[4] to 26%[27] but more importantly, these poisoning patients may utilize considerable ICU resources[28].

The highest number of deaths were observed in the aluminium phosphide (wheat pill) poisoning patients (7/16, 43.75%) which was followed by OP poisoning (4/40, 10%). Our findings are in accordance with the study by Goel et al, who reported increased number of deaths in patients with organophosphates and aluminium phosphide poisoning[29]. In terms of the involved causative agents, paraquat was found to be the most common lethal agent (46.3%). Moreover, paraquat ingestion may even predict mortality better than the presence of abnormal vital signs in poisoning patients[11]. Pesticide-associated mortality ranges from 300,000[30] to 370,000[31]deaths annually. Pesticides may have case fatality as high as 50–70%, particularly in less affluent countries[32-34]. Respiratory failure is considered as the leading cause of death in these patients. It can result from the combination of bronchospasm, increased bronchial secretions, pulmonary edema, respiratory muscle weakness and central respiratory depression[23].

Wheat pill or aluminium phosphide is widely used as grain preservative. Previously there was almost 100% mortality associated with wheat pill poisoning but now due to improved management there is reduction in its mortality. However, it still exceeds 60%[35].

One of our patient with carbon monoxide poisoning expired and one did not fully recover. Other studies reported 2.6%, 3.9% and 7.3% mortality due to CO poisoning. In Taiwan, a significantly increased trend in mortality was observed over a 06 years' period in patients with CO poisoning[36-38].

Significant differences in mortality rates are reported among different age and gender groups. In our study, there were more females (60.2%) and slightly more expiries (53.3%) among them. However, other studies showed that number of deaths was high in males as compared to females[11,39]. It may be related to the differences pertaining to gender and culture in different countries and societies. Females in our region are more prone to negative cultural influences and domestic stress as compared to males. On the other hand, increased mortality in males might be attributed to the fact that males are more committed regarding successful means of self-harm and select more violent ways than females.

Mean age of our study participants was 25.79 ±11.23 years. Majority of the expired patients (13/15, 86.6%) were below 40 years of age. This may be due to the work related or financial stress, marital & relationship problems and increased impulsiveness in the young population. Other studies also showed similar results[16,40]. Moreover, in young patients, suicidal behavior was found with increased frequency in female gender[41]. Higher frequency of poisoning in this age group is of alarming concern as young adults are the bread earners and productive members of society in our set up. On the contrary, the proportion of deaths in the affected patients in the aging population is higher and it was reported that, in Taiwan, poisoning patients above 65 years of age had a mortality rate of 9.6%[42,43].

LIMITATIONS

This study was conducted in a single tertiary care hospital which may not be a true representative of the mortality rate of poisoning in the general population. It is essential for better policy making to observe the data from multiple centers with larger samples and for a longer time period. Moreover, diagnosis of poisoning and recognition of toxic agents were mostly based on history and clinical presentation while qualitative or quantitative laboratory confirmatory tests were done only in selected patients.

CONCLUSION

The overall mortality rate was 11.7% and the majority was observed in young individuals of less than 40 years of age. Late presentation, delayed management, GCS below 8/15, shock, respiratory distress and poisoning with aluminium phosphide or organophosphorus compounds were important predictors of in-hospital mortality in patients with acute poisoning.

RECOMMENDATIONS

Age and gender specific poisoning-prevention strategies are essential in reducing the mortality. Restricting the availability and access to the highly lethal poisons, such as aluminium phosphide, is of paramount importance. Prompt management is of crucial importance to improve the outcome of patients with abnormal vital signs or low GCS on admission.

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CONTRIBUTORS

ZA conceived the idea, planned the study, and drafted the manuscript. MARA and RM helped acquisition of data and did statistical analysis. AR, SKUR and NU helped acquisition of data. IA critically revised the manuscript and supervised the study. All authors contributed significantly to the submitted manuscript.