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Original Research Article

In-Hospital Mortality in Patients with Corrosive Ingestion at A Tertiary Care Hospital

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Abstract: *Corrosive substance ingestion is a critical medical emergency that can lead to serious complications, including in-hospital mortality. The clinical outcomes often depend on the intent of ingestion, socioeconomic factors, and timely management. In developing countries, the burden of corrosive intake-related morbidity and mortality remains significant, yet underreported.* ***Objective:*** *To evaluate the frequency of in-hospital mortality among patients with corrosive ingestion at a tertiary care hospital in Pakistan.* ***Methods:*** *This descriptive case-series study was conducted at the Department of Thoracic Surgery, Nishtar Hospital, Multan, from June 4, 2023, to June 3, 2024. A total of 276 patients hospitalised with corrosive ingestion were enrolled using non-probability consecutive sampling. Patients were followed from admission until discharge to determine in-hospital mortality. A structured proforma was used to collect data on demographics (age, gender, marital status, residential status, education), socioeconomic status, and cause of ingestion (accidental, suicidal, or homicidal). Statistical analysis was performed using SPSS version 25.0. The Chi-square test was applied to determine associations, with a 95% confidence interval and p-value <0.05 considered statistically significant.* ***Results:*** *Out of 276 patients, 117 (42.4%) were male and 159 (57.6%) were female. The most common cause of ingestion was suicidal (87.0%), followed by accidental (10.5%) and homicidal (2.5%). In-hospital mortality was recorded in 19 patients (6.9%). A statistically significant association was observed between socioeconomic status and mortality, with 73.7% of deaths occurring in the low-income group and 22.3% in the lower-middle-income group (p = 0.003). Mortality was noted in 15.8% of accidental cases, 68.4% of suicidal cases, and 15.8% of homicidal instances, though this association was not statistically significant (p = 0.618).* ***Conclusion:*** *Although the overall in-hospital mortality rate from corrosive ingestion was not exceedingly high, it was significantly associated with lower socioeconomic status. Effective and timely management, multidisciplinary care, and psychological intervention remain essential to improve clinical outcomes in these patients.*

Keywords: Corrosive Injuries, Frequency, Hospital Mortality, Pakistan, Socioeconomic Factors, Tertiary Care

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Introduction

Corrosive ingestion (CI) is a serious public health problem all over the world (1,2). It is a commonly observed problem in underdeveloped countries, but it is also present in developed countries (3) . In the USA, almost 5000 to 15000 cases of corrosive ingestion are observed annually. CI is an emergency with various types of clinical presentations. CI is associated with a very complex clinical course. Lips, oral cavity, pharynx, upper airway and upper GI tract are significantly injured following CI. Further complications include substantial haemorrhage, perforation of the GI tract, tracheal stenosis and trachea-oesophagal, gastro-colic and aorto-enteric fistulas. Corrosive agents can severely damage the oesophagus, leading to perforation or stricture formation, which can further develop into a cancerous condition of the oesophagus. These complications are estimated to have an incidence rate of 23.6%- 89.3% (4).

Factors determining the severity of corrosive injury include the time of exposure, the nature of the caustic substance, the amount, and the concentration of the ingested chemical. Usually, powerful acids with a pH < 3 and very strong alkalis with a pH > 11 lead to extensive tissue injury following their ingestion. The most frequently used corrosive substances include sulfuric acid, phosphoric acid, nitric acid, hydrochloric acid, oxalic acid, potassium hydroxide, sodium hydroxide, and bleach. These chemicals are used in dishwasher detergents, cleaning materials, disk batteries, and drain cleaners (5-7).

Acute caustic poisoning presents a considerable health problem in clinical toxicology, as the most frequently affected consists of the young population with psychiatric illness, alcohol addiction or the intent of suicide. Treatment of acute corrosive intoxication is to neutralise the caustic material ingested, administer antibiotics, nutritional support, anti-secretory therapy, collagen synthesis inhibitor, oesophageal dilatation, oesophageal stenting and surgery (8). Although adverse outcomes have also been documented in all stages of poisoning, intoxication can cause death, especially in the acute phase. A study conducted in Taiwan has reported 4.7% in-hospital mortality in the cases of corrosive ingestion (9). Another study conducted in Pakistan showed mortality of 7.4% (10).

Corrosive ingestion is a pretty common phenomenon in our region, owing to easy availability, and has a significant effect on the suffering families, as the majority of the victims are young persons. The results of this study are expected to provide a baseline database for our local population, as local data are scarce regarding this topic, despite such patients being routinely treated in daily practice. The results will help us take evidence-based corrective and preventive measures, thereby enhancing our surgical expertise and reducing in-hospital mortality.

Methodology

This descriptive case series was conducted following ethical approval from the Institutional Ethical Review Board (IERB) of Nishtar Medical University, Multan. The study was conducted in the Department of Thoracic Surgery at Nishtar Hospital, Multan, over 12 months from June 4, 2023, to June 3, 2024. A total of 276 patients aged 18 to 50 years, admitted with a confirmed history of corrosive substance ingestion (acid or alkali) within the previous three weeks, were enrolled using a non-probability consecutive sampling technique. Written informed consent

was obtained from all participants before their inclusion, after they were informed of the study's objectives and ensured the confidentiality of their data. Patients who declined to participate or did not provide informed consent were excluded from the study.

Eligible participants included both male and female patients presenting with corrosive ingestion. Clinical and demographic data including age (in years), gender, residential status (urban/rural), educational attainment, marital status, socioeconomic status, and cause of ingestion (classified as accidental, suicidal, or homicidal) were collected through patient interviews or via their accompanying attendants, and documented on a pre-designed data collection proforma. The cause of ingestion was determined based on the self-reported history or that of the caregiver, and classified accordingly. The primary outcome measure was in-hospital mortality, defined as death occurring due to complications arising from corrosive intake during the hospital stay.

All data were entered and analysed using SPSS version 20. Descriptive statistics were computed for both continuous and categorical variables. Mean and standard deviation were calculated for quantitative variables, such as age. Categorical variables, including gender, education level, residence, marital status, socioeconomic status, cause of ingestion, and mortality outcomes, were presented as frequencies and percentages. To address potential confounding, stratification was performed for key demographic and clinical variables, including age, gender, education, residential status, marital status, socioeconomic status, and type of ingestion. Post-stratification, the Chi-square test was applied to assess statistical significance between categorical variables and in-hospital mortality. A p-value of less than 0.05 was considered statistically significant, with a 95% confidence interval and a statistical power set at 80%.

Results

The mean age of 276 patients was 30.08±8.84 years. The study population consisted of 117 males (42.4%) and 159 females (57.6%). Upon evaluation of income, 96 (34.8%) had a low socioeconomic status, 128 (46.4%) were from the lower middle class, 43 (15.6%) were from the upper middle class, and 9 (3.3%) belonged to the higher class. Mortality was observed in 19 (6.9%) patients in our study.

Of all the patients, 161 (58.3%) were between 18 and 30 years old, 101 (36.6%) were between 21 and 45 years old, and 14 (5.1%) were between 46 and 60 years old. There were 82 (29.7%) patients who were residents of urban areas, and 194 (70.3%) patients were residents of rural areas. The educational status of the patients was as follows: 54 (19.6%) were illiterate, 37 (13.4%) had primary level education, 13 (4.7%) has secondary level education, 63 (22.8%) had higher secondary level education, 82 (29.7%) had intermediate level education, and 27 (9.8%) had completed graduation. Of all the patients, 166 (60.1%) were married and 110 (39.9%) were unmarried.

The cause of corrosive ingestion was accidental in 29 (10.5%), suicidal in 240 (87.0%) and homicidal in 7 (2.5%). (Table 1)

Regarding mortality classification among various age groups, 68.4% of the total mortality rate was observed in the 18-30 year age group, 21.1% in the 31-45 year age group, and 10.5% in the 46-60 year age group. Mortality rates were not significantly different among the various age groups (p = 0.235). Regarding mortality classification by gender, 26.3% of the total mortality rate was observed in males, while 73.7% was observed in females (p = 0.142). Regarding mortality classification between residential groups, 21.1% of the total mortality rate was observed in the urban population. In comparison, 78.9% was observed in the rural population, with no statistically significant difference between the two populations (p = 0.392). Regarding mortality classification among various socioeconomic status groups, 73.7% of the total mortality rate was observed in the low class, 22.3% in the lower middle class, and no mortality was observed in the upper middle and high classes; the difference was statistically significant (p = 0.003). (Table 2)

On mortality classification among various literacy groups, 31.6% of total mortality rate was observed in illiterate patients, 5.3% in primary education group, 5.3% in secondary education group, 31.6% in higher secondary education group, 15.8% in intermediate education group and 10.5% in the graduates; and the difference among the groups was not statistically significant (p=0.473). Regarding mortality classification by marital status, a total mortality rate of 26.3% was observed in married individuals, while 73.7% was observed in unmarried individuals (p=0.002).

On mortality classification according to different causes behind corrosive ingestion, 15.8% of the total mortality rate was observed in the accidental ingestion groups, 84.2% was observed in the suicidal ingestion group, and no mortality was observed in the homicidal ingestion groups. The difference among the three groups was not statistically significant (p = 0.584). (Table 3)

Table 1: Demographic Characteristics of Patients with Corrosive Ingestion (n = 276)

Variable	Category	Frequency (n)	Percentage (%)
Age (Mean ± SD)	—	30.08 ± 8.84	—
Age Groups (years)	18–30	161	58.3%
	31–45	101	36.6%
	46–60	14	5.1%
Gender	Male	117	42.4%
	Female	159	57.6%
Residence	Urban	82	29.7%
	Rural	194	70.3%
Educational Status	Illiterate	54	19.6%
	Primary Education	37	13.4%
	Secondary Education	13	4.7%
	Higher Secondary Education	63	22.8%
	Intermediate	82	29.7%
	Graduate	27	9.8%
Socioeconomic Status	Low	96	34.8%
	Lower Middle Class	128	46.4%
	Upper Middle Class	43	15.6%
	Higher Class	9	3.3%
Marital Status	Married	166	60.1%
	Unmarried	110	39.9%
Cause of Ingestion	Accidental	29	10.5%

	Suicidal	240	87.0%
	Homicidal	7	2.5%
Mortality	Yes	19	6.9%
	No	257	93.1%

Table 2: Classification of In-Hospital Mortality According to Demographic and Socioeconomic Variables (n = 276)

Variable	Category	Deaths (n)	Percentage of Total Mortality (n = 19)	p-value
Age Group (years)	18–30	13	68.4%	0.235
	31–45	4	21.1%	
	46–60	2	10.5%	
Gender	Male	5	26.3%	0.142
	Female	14	73.7%	
Residence	Urban	4	21.1%	0.392
	Rural	15	78.9%	
Socioeconomic Status	Low	14	73.7%	0.003
	Lower Middle	5	26.3%	
	Upper Middle	0	0.0%	
	High	0	0.0%	

Table 3: Classification of In-Hospital Mortality According to Literacy Level, Marital Status, and Cause of Ingestion (n=276)

Variable	Category	Total Deaths (n=19)	Percentage of Total Mortality (%)	p-value
Literacy Level	Illiterate	6	31.6%	0.473
	Primary Education	1	5.3%	
	Secondary Education	1	5.3%	
	Higher Secondary Education	6	31.6%	
	Intermediate	3	15.8%	
	Graduate	2	10.5%	
Marital Status	Married	5	26.3%	0.002
	Unmarried	14	73.7%	
Cause of Ingestion	Accidental	3	15.8%	0.584
	Suicidal	16	84.2%	
	Homicidal	0	0.0%	

Discussion

In the current study, the mean age of the patients was 30.08 ± 8.84 years. Almost 58% patients were young adults, aged 18-30 years. Nearly 70% patients belonged to rural areas, and 60% of the patients were married. Of all the patients included in the study, 87% had ingested corrosive materials with the intent of suicide. We observed a mortality rate of 6.9%. The majority of the patients belonged to the low and lower middle class, and 100% mortalities occurred in this group. A significantly high rate of mortality was observed among the unmarried patients, and it was 74% of the total mortality. As we observed a very high rate of mortality in the very young, unmarried patients, the adverse outcomes of the corrosive ingestion strongly depend upon the amount of corrosive ingested. Almost 68% of the total mortalities were among the young patients.

A study was conducted in Taiwan, involving 16,001 patients over a 15-year period, and the mortality incidence was 4.7%, with a mean age of 44.6 ± 20 years. Overall, 71.2% of patients were young adults. Morality was higher among the patients who ingested caustic substances with suicidal intent as compared to those with no suicidal intentions 9. Similar results were observed in the current study (9). Poley et al. observed in their research that the mortality rate was 14% among patients who ingested alkalis and 2% among those who ingested acids (11).

Ertekin et al. conducted a study on corrosive intake patients, and the observed mortality rate was 11%. They observed more severe injuries among patients with suicidal intent and acid ingestion. Timely hospital admission with clinical as well as endoscopic evaluation and urgent surgical intervention when indicated can help decrease the morbidity and mortality (12).

Rigo et al. conducted a study on 210 patients who presented within 12 hours of corrosive ingestion. They observed that 25 patients (11.9 %) died during their hospital stay, which included eight out of 86 male patients and 17 out of 124 female patients (13). Their observed results were similar to those in the current study, in that the higher proportion was of female patients, and mortality was also higher in the female group. In short, despite ICU care and urgent surgery, considerable morbidity and mortality are associated with corrosive intake (11).

Qureshi U et al. conducted a study on 70 patients at Holy Family Hospital, Rawalpindi, Pakistan, and observed that the majority of patients with corrosive ingestion were females (48, 68.6%). These results are similar to those of the current study, i.e., 57.6%. Their results showed that 70% of patients were from the income group, compared to the current research, which found that 81% of patients were from low- and lower-middle-income groups (14).

Bharath Kumar C et al. included 82 patients with corrosive ingestion in the study, and a total of 7 (8.5%) died due to corrosive injuries (15). An Egyptian study of 92 patients observed a mortality rate of 6.5% while a Moroccan study reported a 7.1% mortality rate with corrosive ingestion (16,17). In a French study which included 3544 patients of corrosive ingestion, the mortality rate was 8% (18). All the results mentioned above are comparable to those of the current study, i.e., a 6.9% mortality rate.

However, a case series of twenty-eight patients reported an 18% mortality rate (19). Datta A et al. conducted a study of formic acid consumption in India, and 66.7% of 42 cases died within 24 hours (20). This indicates that the type and strength of the corrosive material are highly associated with the mortality rate.

Conclusion

In-hospital mortality in corrosive ingestion patients is not very high in tertiary care hospitals. However, effective management requires experience, patience, and psychological support. Suicidal ingestion of corrosives is widespread in Pakistani youth, mainly due to the easy availability of the agents. Accidental ingestion of corrosives occurs every day in very young and elderly individuals. Many patients require repeated surgical interventions.

Declarations

Data Availability statement
All data generated or analysed during the study are included in the manuscript.
Ethics approval and consent to participate
Approved by the department concerned. (IRBEC-23)
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Not applicable

Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

MR (Consultant Thoracic Surgeon)
Manuscript drafting, Study Design,
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Review of Literature, Data entry, Data analysis, and drafting articles.
MM (SR, Thoracic Surgery)
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Study Design, manuscript review, critical input.

All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

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