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ORIGINAL ARTICLE

CORROSIVE INJURY TO ESOPHAGUS: A RUINOUS CURSE TO THE AFFECTED PATIENTS

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Abstract

Background: *Corrosive, a harmful chemical substance, causes devastating tissue injury when contacts with body surface or ingested, is a common cause of poisoning in developing world. Prevention and early initiation of therapy after ingestion can reduce the morbidity and mortality. The aim of the study was to evaluate the demographic features, clinical presentations, endoscopic findings, complications, and the outcome of esophageal injury in corrosive ingestion.* ***Methods:*** *The cross-sectional study followed by prospective observation was carried out from 05/08/2019 and 15/03/2022 in the Department of Gastroenterology in Sir Salimullah Medical College Mitford Hospital.* ***Results:*** *Our study showed that from 105 patients, the dominating patients were female [n = 75 patients (71.4 %), p < 0.001] and significant number of the patients 84 (80%) were unemployed [p < 0.001]. In this series 37 (35.2%), 40 (38.1%) and 14 (13.3%) were students, housewives and service holders respectively. Of these only one (1%) and five (4.8%) were illiterate and graduate respectively. Most of the patients had monthly income ≤20,000 BDT [n = 81 (77.1%), p < 0.001] and total 91 (86.7%) cases were suicidal and 11 (10.5%) were accidental ingestion of corrosive [p < 0.001]. The most common ingested corrosive in our series was Harpic 91 (86.7%) [p < 0.001]. Most common clinical feature was dysphagia 72.4% (n=76). Endoscopy of upper GIT revealed injury 55 (52.4%) and 44 (41.9%) in esophagus and stomach respectively with significant difference of finding with age (p < 0.05). Follow up endoscopy showed 13.3%(n=14) patients developed complication like esophageal stricture and gastric outlet obstruction and significant number of patients [n=91(86.7%)] didn't develop any complication. Out of these 14 patients 57.1%(n=8) were managed by esophageal dilatation and 42.9%(n=6) were referred to surgery.* ***Conclusion:*** *Corrosive poisoning is a predominant and preventable condition in the developing countries. Preventive strategies should include regulation and packaging of corrosive substances, effective awareness program and strict legal action, decent psychosocial support system and counselling and proper education.*

Keywords: *Corrosive injury, Esophagus, Endoscopy*

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Introduction:

Corrosive poisoning, often referred to as caustic ingestion, is a significant public health concern worldwide, encompassing the ingestion of substances capable of causing severe damage to tissues upon contact. It results in potentially life-threatening immediate complication like perforation within few hours and late complication like stricture formation in the gastrointestinal tract. The utmost commonly affected body parts are the face, eyes, mouth, tongue, pharynx, epiglottis, larynx, upper gastrointestinal tract and extremities.[1,2] Acids and alkalis are two primary categories of corrosive substances causing caustic injuries. Substances with pH values falling within the extreme acidic (less than 3) or extreme basic (greater than 11) ranges are particularly corrosive and pose a high risk of causing severe tissue damage upon ingestion or contact.[3–6] Alkalis and acids cause tissue

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damage through distinct mechanisms. Alkalis induce liquefactive necrosis and saponification upon contact with tissues. They tend to cause more severe and penetrating injuries compared to acids due to their ability to dissolve lipids and proteins.[6,7] Common alkalis include household bleaches, toilet cleaners, dishwashing agents, detergents. On the contrary, acidic substances donate protons (H+) to tissues, leading to disruption of cellular membranes, generation of free radicals, and activation of inflammatory cascades. This results in localized tissue destruction, edema, and inflammation, which can progress to ulceration, perforation, and stricture formation.[2,6,7] Common acids include toilet cleaners, vinegar, formic acid etc. The most frequently ingested substance was Harpic in our country as it is cheap and easily available. Most of the corrosive ingestion are suicidal and commonly occur at second and third decade of age group among young adolescents.[8] There are very limited epidemiological data worldwide because of under-reporting of corrosive ingestion.[9] The prevalence of corrosive poisoning may vary across different regions and demographic groups. In some low- and middle-income countries, where access to safe storage and handling of corrosive substances may be limited, the prevalence of corrosive poisoning may be relatively higher compared to high-income countries with stricter regulations and better infrastructure for chemical safety. The prevalence of corrosive ingestion is decreasing gradually in developed world due to effective awareness program and strict legal action.[10-13] Along with Indian data, popular ingestions were acids as these were cheaper and easily accessible. Corrosive ingestions are mostly under-reported so it is difficult to estimate their prevalence rate.[14] Some recent study shows that prevalence of corrosive ingestion is 2.5–5% whereas the morbidity and the mortality are above 50% and 13% respectively.[15] The intention corrosive ingestion may cause serious injuries in oropharynx, proximal part of the esophagus while it is taken as solid form, but in liquid form it may pass through the oropharynx and proximal part causing more injury to the middle and distal segments of the esophagus and stomach.[16-18] Clinical features depend on how much corrosive was taken and type of corrosive agents. Most common acute complications of corrosive ingestion are pain, bleeding, stridor, dyspnea and perforation. Long term complication developed among the patients who survived from acute stage. Delayed complications of corrosive injury are esophageal stricture, bronco-esophageal fistula, gastric outlet obstruction, increased risk of cancer from which most common are esophageal stricture and gastric outlet obstruction.[19] After history taking and relevant clinical evaluation, esophageal complications are best assessed by upper GI endoscopy and CT esophagogram but upper GI endoscopy is more helpful because direct visualization is possible by this as well as dilation of stricture when indicated.[19,20]

There is very limited study on corrosive injury to esophagus in our country. The purpose of this study was to evaluate the demographic features, clinical presentations, endoscopic findings, complications, and the outcome corrosive injury.

Methods:

One hundred and five patients over 12 years of age who were admitted to Sir Salimullah Medical College Mitford Hospital with the complaint of corrosive substance intake between the dates 05/08/2019 and 15/03/2022 were included in this study. Formal ethical approval was taken before starting the study. All patients were briefed about the purpose of the study and after their informed written consent data collection was started. The demographic characteristics of the patients included in the study, complaints while appearing to the emergency service, physical examination findings, the purpose of caustic intake, characteristics of corrosive substance taken were obtained from the patients and their attendants. Patients lacking information were excluded from the study. Upper gastro-intestinal (GI) endoscopy was performed by a single experienced endoscopist who had 10 years' experience in this field.

Endoscopy findings was graded according to Zargar classification were as follows-

Grade 0: Normal

Grade 1: Superficial mucosal edema and erythema

Grade 2a: Superficial ulcerations, erosions, exudates

Grade 2b: Deep discrete or circumferential ulcerations

Grade 3a: Focal necrosis

Grade 3b: Extensive necrosis

Data were analyzed using IBMSPSS Statistics Base 22.0 package program. Descriptive statistical methods (mean, standard deviation, frequency distributions) were used to evaluate the data.

Results:

Demographic findings: Demographic data have been showed in table 1. Total 105 patients, age from 13 years to 48 years (mean 21.51) were included and of these 30 (28.6% with mean age 27.5 years) and 75 (71.4% with mean age 18.54 years) were male and female respectively. Significantly greater number of females were observed ($p < 0.001$). In this series 51 (48.6%) were within 13-20 years age group. There is no significant difference concerning marriage; sixty (57.1%) were married, 45 (42.9%) were unmarried. Most of the patients 84 (80%) were unemployed [p <

0.001]. In this series 37 (35.2%), 40 (38.1%) and 14 (13.3%) were students, housewives and service holders respectively. Of these only one (1%) and five (4.8%) were illiterate and graduate respectively. Most of the patients in this series 81 (77.1%) had monthly income d"20,000 BDT [p < 0.001]. In this series 91 cases (86.7%) were suicidal and 11 (10.5%) were accidental ingestion of corrosive [p < 0.001]. The most common ingested corrosive in our series was Harpic 91 (86.7%) [p < 0.001].

Common underlying factors for corrosive ingestion were familial disharmony in 51 (48.6%) and Conflicts with parents 27(25.7%).

Table-I

Variables	Number	Percentage	p-value
Sex			
Male	30	28.6	< 0.05
Female	75	71.4	
Marital status			
Married	60	57.1	> 0.05
Unmarried	45	42.9	
Occupation			
Unemployed	84	80	< 0.05
Service holder	21	20	
Address			
Rural	49	46.7	> 0.05
Urban	56	53.3	
Income			
<20000tk	81	77.1	< 0.05
>20000tk	24	22.9	
Nature of ingestion			
Suicidal	91	86.6	< 0.05
Accidental	11	10.5	
Homicidal	3	2.9	
Band of poison			
Harpic	91	86.6	< 0.05
Savlon	7	6.7	
Dettol	2	1.9	
Battery water	1	1.0	
Spirit	4	3.8	
Education			
Primary	76	72.4	< 0.05
Intermediate	23	21.8	
Graduate	5	4.8	
Illiterate	1	1.0	

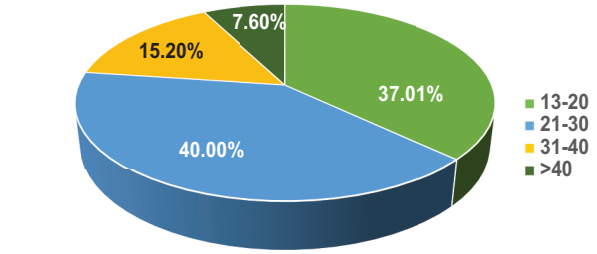
Table-II

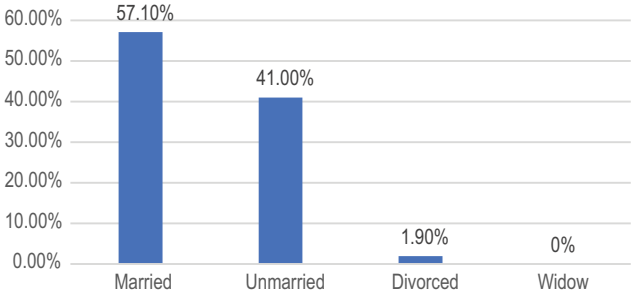
	Number of cases	Percentage
1st Endoscopy done		
<48hrs	68	64.8
48-96hrs	24	22.9
>3weeks	13	12.3
Presentation		
Dysphagia	76	72.4
Odynophagia	21	20
Hoarseness of voice	5	4.8
Vomiting	46	43.8
Hematemesis	6	5.7
Chest pain	19	18.1
Abdominal pain	14	13.1
Respiratory distress	5	4.8
Esophageal endoscopic findings		
Grade 0	50	47.6
Grade 1	6	5.7
Grade 2A	28	26.7
Grade 2B	21	20
Gastric endoscopic Findings		
Grade 0	61	58.1
Grade 1	5	4.8
Grade 2A	14	13.3
Grade 2B	18	17.1
Grade 3A	3	2.9
Grade 3B	4	3.8

Most common clinical feature was dysphagia 72.4% (n:76). Other clinical features were vomiting (43.8%), odynophagia (20%), chest pain (18.1%), abdominal pain (13.3%), hematemesis (5.7%), hoarseness of voice (4.8%) and respiratory distress (4.8%).

Endoscopy of upper GIT revealed injury 55 (52.4%) and 44 (41.9%) in esophagus and stomach respectively with significant difference of finding with age (p < 0.05).

Age group





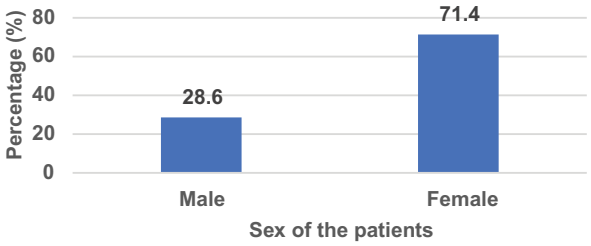


Table-III

Parameters	Esophageal findings		P-value
	Normal	Abnormal	
Sex			
Male	12	18	.239
Female	38	37	
Age group			
13-20	27	24	.03
21-30	23	22	
31-40	0	7	
>40	0	2	
Brand of poison			
Harpic	39	52	.170
Savlon	6	1	
Dettol	2	0	
Battery water	1	0	
Spirit	2	2	
Nature			
Suicide	42	49	.761
Accidental	6	5	
Homicidal	2	1	

Table-IV

Parameters	Gastric findings		P-value
	Normal	Abnormal	
Sex			
Male	17	13	.851
Female	44	31	
Age group	13-20	34	17
.003			
21-30	27	18	
31-40	0	7	
>40	0	2	
Band of poison			
Harpic	50	41	.305
Savlon	6	1	
Dettol	2	0	
Battery water	1	0	
Spirit	2	2	
Nature			
Suicide	52	39	.415
Accidental	8	3	
Homicidal	1	2	

Frequencies and percentage of complication are shown in table V.

Follow up endoscopy showed 13.3%(n=14) patients developed esophageal stricture and among them 5 patients were associated gastric outlet obstruction and 86.7%(n=91) patients didn't develop any complication.

Table-V

Stricture	Number	Percentage
Present	14	13.3%
Absent	91	86.7%

Out of these 14 patients 57.1%(n=8) were managed by esophageal dilatation and 42.9%(n=6) were referred to surgery.

Discussion:

Previous studies showed the most common age group for corrosive substance intake is 18–25 years of age.[21,22] In our study, the mean age of the patients was 21.51 years, with the majority belonging to the age group of 13-20 years with 48.6% that was compatible with previous studies and shows the vulnerability of adolescents and young adults to

corrosive ingestion. So targeted preventive measures and intervention is necessary. The higher prevalence of females (71.4%) compared to males (28.6%) in our study raises questions about potential gender-specific factors influencing the incidence of corrosive ingestion. While this gender disproportion aligns with some previous studies, it may warrant further investigation into underlying socio-cultural, psychological, or access-to-care factors contributing to this trend.[23] Different studies showed that corrosive ingestion is common in poor socioeconomic conditions and among the unemployed people.[13,14,21] In our study we also found the same association. Eighty-one (77.1%) patients had monthly income ≤20,000 BDT and 84 (80%) participants was unemployed. These poor socioeconomic condition and unemployment create a vulnerable environment for corrosive induced suicidal intent. This underscores the importance of addressing social determinants like education, employment and economic stability to reduce such incidence. Suicidal intent accounted for the majority of cases (86.7%), emphasizing the need for psychological assessment and intervention in such cases. The high proportion of cases with suicidal intent points up the gravity of mental health issues and the need for comprehensive psychiatric assessments and interventions in individuals presenting with corrosive ingestion. Addressing underlying mental health concerns and providing appropriate support and counseling services are crucial components of holistic care for such patients. Some previous studies showed the similar results where one of the studies found suicidal intention of corrosive ingestion was 92%.[22,24] Accidental corrosive ingestion occurs because of the mis-preservation of this substances. Corrosive injuries developing after accidental corrosive substance is preventable. In advanced countries, while accidental poisonings are declining, but in underdeveloped countries with low socioeconomic condition and illiteracy, the number of accidental ingestions is rising.[10,25] In this study, the primary reason for suicidal corrosive ingestion was familial disharmony (48.6%), followed by conflicts with parents (25.7%) The association suggests the influence of interpersonal relationships on mental health outcomes. The association between corrosive ingestion and familial conflicts has been documented in previous research, highlighting the need for family-centered approaches in prevention programs.[26] Corrosive substances intake is an important problem, especially among uneducated persons with low socioeconomic position. Moreover, this education must ensure an awareness of the hazards of these substances. Another important observation of our study that suicidal ingestion of caustic substances causes more grave health problems, and therefore, a decent psychosocial support system and counselling are needed to help for relieving of the anxieties or stresses that lead to suicidal tendencies.

The presence and intensity of symptoms can vary depending on factors such as the type and concentration of the ingested corrosive agent, the amount consumed, and the duration of contact with mucosal surfaces, so sometimes clinical presentation cannot predict gastrointestinal damage.[4,13] Studies have found that despite burns or injury occurring in the oropharyngeal area, a portion of patients (up to 70%) did not exhibit significant damage to the esophagus and the severity of esophageal or gastric injuries observed in patients with lip and oropharyngeal damage tends to be relatively mild, typically not exceeding grade 1.[4,27] In our study, we did not find any significant association between clinical presentation and degree of injury. So clinical symptoms should be interpreted in conjunction with other factors such as endoscopic findings, patients' history, and individual variability to ensure accurate diagnosis and appropriate management. Endoscopic evaluation plays a crucial role in assessing the extent and severity of mucosal injury in patients with corrosive ingestion. Esophageal injury was observed in 52.4% of cases, while gastric injury was seen in 41.9%. The findings of esophageal and gastric injuries in a significant proportion of cases indicates the need for early endoscopic intervention to guide therapeutic decision-making and prognostication. The correlation between advancing age and the severity of esophageal and gastric injuries highlights age as a potential risk factor for adverse outcomes in corrosive poisoning. This finding emphasizes the importance of age-specific risk stratification and management protocols in optimizing clinical outcomes for affected patients.

Follow up endoscopy showed 13.3%(n=14) patients developed complication like esophageal stricture and gastric outlet obstruction and significant number of patients [n=91(86.7%)] didn't develop any complication. Out of these 14 patients 57.1%(n=8) were managed by esophageal dilatation and 42.9%(n=6) were referred to surgery department. While another study carried out at Guangzhou, China concluded that out of 168 esophageal dilatation procedures done on patients of esophageal stricture, 26(60.5%) patients were categorized as in positive success rate and 17(39.5%) patients failed and referred for stent placement and/or surgery.[28]

Future research directions may include multicenterd longitudinal studies to assess long-term outcomes and

complications of corrosive poisoning, investigations into the efficacy of novel therapeutic interventions, and exploration of predictive factors for adverse outcomes in affected individuals.

Conflict of Interest:
The authors stated that there is no conflict of interest in this study

Funding:
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Ethical consideration:
The study was conducted after approval from the ethical review committee of Sir Salimullah Medical College. The confidentiality and anonymity of the study participant was maintained.

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