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# SPECTRUM OF INJURY TO UPPER GASTROINTESTINAL TRACT DUE TO CORROSIVE INGESTION.10 YEAR EXPERIENCE.

Gastroenterology

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## ABSTRACT

**AIMS:** The objective of this study was to understand the demographic features, clinical findings, role of endoscopy and acute complications of caustic ingestion in our population.

**MATERIALS & METHODS:** In this single center retrospective study, records of patients with history of caustic ingestion for the past 10 years were reviewed and analysed.

**RESULTS:** Out of total 62 cases of corrosive ingestion, 33 (53.2%) were males and 29 (46.8%) were females, with mean age of 19.4±11.7 years. Most common mucosal injury on early endoscopy was Grade II (72.5%), followed by Grade I (17.6%) and Grade III (9.8%). Esophagus was involved in 100% patients, stomach in 88.23%, duodenum in 33.33% and oropharynx in 82.5%. Severe mucosal injury (≥ grade IIb) seen in 43.13 %, was the predictor of acute complications which included UGI Bleed(3), ICU admission(8), Multiorgan failure(3) and death(3).

**CONCLUSION:** Early endoscopy is safe, helps in assessing the severity and extent of injury, in planning proper management and predicting outcome.

## KEYWORDS

Corrosive, Endoscopy, Complications

## INTRODUCTION:

Corrosive ingestion is a common public health problem across the globe seen in both developed as well as developing countries[1]. In United States, about 5,000 to 15,000 and in United Kingdom, more than 40,000 corrosive ingestions are reported per year[2-5]. Corrosive ingestion is a medical emergency and may cause extensive injury to the lips, oral cavity, pharynx, upper airway, esophagus, stomach and duodenum. Children ingest corrosive agents accidentally and adults can ingest either accidentally or with suicidal intent[3,5,6]. The most commonly used corrosive agents include sulphuric acid, nitric acid, phosphoric acid, hydrochloric acid, oxalic acid, sodium hydroxide, potassium hydroxide and bleaches[7]. Alkali produces liquefaction necrosis and acid induces coagulation necrosis with eschar formation[8]. In India, acid ingestion is more common than in the West because acids are cheaper and easily available here[9]. The extent of corrosive injuries is mainly dependent upon the exposure time, nature, amount and concentration of the corrosive agent[10]. Endoscopy done soon after the corrosive ingestion is considered safe and is helpful to assess the severity and extent of injury. Endoscopy also helps to plan proper management and to predict the outcome[11]. Acute complications of corrosive ingestion may be laryngeal edema, aspiration pneumonia, upper gastrointestinal bleeding, perforation, and death[3,9,12]. The objective of this study was to understand the circumstances, demographic features, clinical and endoscopic findings and acute complications of caustic ingestion in our population.

## MATERIAL AND METHODS:

We conducted a retrospective cohort study in the department of Gastroenterology in our tertiary care hospital. We reviewed the medical records of patients with history of caustic ingestion for the past 10 years. Parameters examined included age at presentation, gender, demographic status, nature of the caustic substance ingested, amount of substance, circumstance of the event, prominent symptoms, past history of any psychiatric ailments, diagnostic tools, degree of injury, and anatomic distribution of the injury and complications. This information was recorded in a proforma.

All patients who presented acutely and were stable were subjected to early endoscopic evaluation with 48 hours of corrosive ingestion, after ruling out perforation to grade the severity of injury. Mucosal injury was graded as per the modified endoscopic classification by Zargar et al[11]. Nasoenteric tube was placed routinely in all patients with severe injury at the time of initial endoscopic evaluation, for feeding purposes and to maintain the lumen of esophagus.

All statistical analysis was done in IBM SPSS Statistics for Windows, Version 19.0. $P<0.05$ was considered significant.

## RESULTS:

Total of 62 cases of corrosive ingestion were identified / recorded during a period of 10 years. Admission to hospital occurred in 52 cases

within 48 hours and 10 cases presented after development of UGI obstructive symptoms with duration of presentation ranging from 4 weeks to 1 year. 33 patients (53.2%) were males and 29 patients (46.8%) were females (M:F= 1.13:1), with age ranging from 2-45 years and mean age of 19.4±11.7 years. Demographic characteristics have been described in Table 1.

**Table 1. Demographic characteristics of patients**

| Patients (n=62) | | Frequency (n) | Percentage (%) |
|---|---|---|---|
| **Gender** | | | |
| Male | | 33 | 53.2 |
| Female | | 29 | 46.8 |
| **Age** | | | |
| Mean age (Total) | 19.4±11.7y | | |
| Mean age of males | 18.54±12.8 y | | |
| Mean age of females | 20.6±10.5y | | |
| Range | ( 2-45y) | | |
| ≤ 5years of age | | 13 | 21 |
| ≤18 years of age | | 26 | 42 |
| **Reason for ingestion** | | | |
| Suicidal | | 23 | 37 |
| Male | | 4 | 17.6 |
| Female | | 19 | 82.4 |
| Accidental | | 39 | 63 |
| Male | | 29 | 74.4 |
| Female | | 10 | 25.6 |
| **Ingested agent** | | | |
| Acid | | 39 | 363.0 |
| Alkali | | 17 | 27.2 |
| Unknown | | 6 | 9.8 |
| **Type of corrosive** | | | |
| $H_2SO_4$ | | 24 | 38.7 |
| $NH_4Cl$ | | 10 | 16.1 |
| Caustic soda | | 12 | 19.4 |
| **Amount ingested** | | | |
| < 15ml | | 36 | 58 |
| > 15ml | | 26 | 42 |

**Amount and Nature of Corrosive Ingested:**

The amount of corrosive agent ingested ranged from 5ml-80ml and was estimated based on history given by patient or family members. 36 patients (58%) had ingested > 15ml of corrosive agent, with average amount of 15-20ml.Various corrosive substance ingested are mentioned in Table 2.

**Table 2. Percentage ingestion of various corrosive agents and comparison of type of corrosive ingestion with intention.**

| Agent ingested | Intention | | Total (%) |
|---|---|---|---|
| | Suicidal n(%) | Accidental n(%) | |
| Toilet cleaner* | **8 (32.0)** | 2(5.4) | 10 (16.1) |
| Battery acid@ | 4(16.0) | **20 (54.0)** | 24 (38.7) |
| Drain cleaner# | 3(12.0) | 0 | 3 (4.8) |
| Glass cleaner! | 2(8.0) | 0 | 2 (3.2) |
| Carbolic acid@ | 1(4.0) | 0 | 1 (1.6) |
| Caustic soda# | 3(12.0) | 9 | 12 (19.3) |
| Acetic acid* | 0 | 1(2.7) | 1 (1.6) |
| Nitric acid@ | 1(4.0) | 0 | 1 (1.6) |
| Hydrochloric acid@ | 1(4.0) | 1 (2.7) | 2 (3.2) |
| Unknown | 2 (8.0) | 4 (9.8) | 6 (9.6) |
| Total | 25 | 37 | 62 |

* weak acid, @ strong acid, # strong alkali, !weak alkali.

**Symptoms:**

The most common presenting symptoms were local pain in 46 cases (88.5%) (oropharyngeal/retrosternal and less frequently abdominal pain), followed by excessive salivary secretions in 42 (80.76%) cases, acute dysphagia /odynophagia in 23 cases (44.3%), nausea and vomiting in 20 cases (38.46%). 7 patients had respiratory distress with laryngeal edema seen in 2 patients. 5 patients had shock on admission.

**Endoscopic evaluation(Table 3 & 4)**

Initial endoscopic evaluation (≤ 48 hours) after patient was stabilized was possible in 51 patients out of total 52 patients, as one patient was not stable for the procedure. Esophagus was involved in all patients who underwent initial endoscopic evaluation (n=51, 100%), stomach in 45 patients (88.23%), duodenum in 17 patients (33.33%) and pharynx involved in 41 patients (80.39%). Pattern of UGI tract injury due to corrosives have been described in Table 3&4.

**Table 3. Percentage involvement of UGI tract with different grades of injury.**

| Distribution of injury | Number (%) | Grades of injury | | | | |
|---|---|---|---|---|---|---|
| | | Grade 0 | Grade I | Grade IIa | Grade IIib | Grade III |
| Oropharynx | 41 (80.39) | 9(17.6) | 30(58.9) | 12(23.5) | -- | -- |
| Esophagus | 51 (100) | -- | 12(23.4) | 19(37.2) | 17(33.3) | 3(5.8) |
| Stomach | 45 (88.23) | 6(11.8) | 31(60.8) | 10(19.6) | 1(1.9) | 3(5.8) |
| Duodenum | 17 (33.33) | 34(66.7) | 9(17.6) | 2(3.9) | 6(11.8) | – |

**Table 4: Relationship of severity of injury with amount of corrosive, type of agent ingested, reason of ingestion and gender.**

| Severity of Injury | Number | Type of agent | | Intention | | Gender | | Amount | |
|---|---|---|---|---|---|---|---|---|---|
| | | A# | B* | Ac@ | S! | M | F | ≤15ml | ≥15ml |
| **Esophagus(20)** | | | | | | | | | |
| Grade IIb | 17(85) | 12(70.5) | 4(23.5) | 11(64.7) | 6(35.3) | 9(53) | 8(47) | 3(21.7) | 15(82.3) |
| Grade IIIa | 3(15) | 3(100) | -- | -- | 3(100) | 1(33.3) | 2(66.6) | -- | 3(100) |
| Grade IIIb | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Stomach(4) | | | | | | | | | |
| Grade IIb | 1(25) | 1(100) | -- | -- | 1(100) | -- | 1(100) | -- | 1(100) |
| Grade IIIa | 2(50) | 2(100) | -- | 2(100) | -- | 2(100) | -- | -- | 2(100) |
| Grade IIIb | 1(25) | 1(100) | -- | -- | 1(100) | 1(100) | -- | -- | 1(100) |
| Duodenum(6) | | | | | | | | | |
| Grade IIb | 6(100) | 5(83.3) | 1(16.6) | 4(66.6) | 2(33.3) | 4(66.6) | 2(33.3) | -- | 6(100) |
| Grade IIIa | -- | -- | -- | -- | -- | -- | -- | -- | -- |

#Acid *alkali @Accidental !Suicidal

Table 4 illustrates that severe injury is directly related to amount and type of corrosive agent ingested. Large amount of acidic corrosive ingestion are associated with more severe injury. Acidic corrosives involved esophagus more frequently and severely.

**Complications(Table 5&6).**

Corrosive ingestion is associated with acute and chronic complications. Only those patients with grade IIb injury or higher had acute complications, reflecting the prognostic use of early endoscopy in predicting the outcome (Table 5).Ingestion of large amount of acid(>15ml) with suicidal intention were associated with majority of acute complications (Table 6). 70.0% of patients with grade II esophageal injury developed esophageal stricture, and 33.4% of Grade III (out of 3 with grade III mucosal injury 1 developed stricture and 2 died).

**Table 5. Relationship of acute complications with the severity of injury.**

| Acute Complication | Severity of Injury | | | | | |
|---|---|---|---|---|---|---|
| | (n) | Grade I | Grade IIa | Grade IIb | Grade IIIa | Grade IIIb |
| ICU admission | 8 | -- | -- | 5 | 2 | 1 |
| Multiorgan failure | 3 | -- | -- | -- | 1 | 2 |
| Respiratory distress | 7 | -- | -- | 3 | 2 | 2 |
| Aspiration pneumonia | 4 | -- | -- | 2 | 1 | 1 |
| GI Bleed | 3 | -- | -- | -- | 2 | 1 |
| Laryngeal edema | 2 | -- | -- | 2 | -- | -- |
| Mortality | 3 | -- | -- | -- | 1 | 2 |

**Table 6. Relationship of acute complications after corrosive injury with amount ingested, type of corrosive substance ingested, intention of ingestion and gender.**

| Acute Complications | Number | Type of agent | | Intention | | Gender | | Amount | |
|---|---|---|---|---|---|---|---|---|---|
| | | A# | B* | Ac@ | S! | M | F | ≤15ml | ≥15ml |
| Systemic | | | | | | | | | |
| Aspiration pneumonia | 4 | 3 | 1 | 1 | 3 | 2 | 2 | -- | 4 |
| Respiratory Distress | 7 | 4 | 3 | 1 | 6 | 2 | 5 | -- | 7 |
| Multiorgan failure | 3 | 3 | -- | -- | 3 | 1 | 2 | -- | 3 |
| Gastrointestinal | | | | | | | | | |
| GI Bleed | 3 | 3 | -- | -- | 3 | 1 | 2 | -- | 3 |
| Perforation | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| ICU admission | 8 | 5 | 3 | 2 | 6 | 3 | 5 | -- | 8 |
| Mortality | 3 | 3 | -- | -- | 3 | 1 | 2 | -- | 3 |

#Acid *alkali @Accidental !Suicidal

## DISCUSSION

Corrosive injury to the UGI tract is a common problem worldwide, especially in our country, India. Our present study was retrospective analysis of 62 cases of corrosive ingestion over a period of 10 years. We observed that corrosive ingestion is common in all age groups with almost equal frequency in males and females. Ingestion of corrosive agent was accidental in 39 patients (63%) and attempted suicide in 23 patients (37%). 60% of accidental cases had happened in age group ≤ 18 years and suicidal cases predominantly occurred in adult age group ≥ 18 years. Similar findings have been observed in majority of the previous studies[4,13-16].

In our study, acidic agents were the most common corrosive agent ingested and that esophagus was involved more frequently and severely by acid caustic agents. Esophagus showed ≥ grade II injury in 27 cases out of 39(69.23%), who ingested acid (strong: 20, weak:19) and stomach had ≥ grade II injury in 10 cases out of 39 cases who ingested acid (25.64%). We observed that severity of mucosal injury was more pronounced and mortality was significantly higher in those who had ingested acid in large amounts. Out of 62 patients, 3 had expired and all have ingested strong acid. Similar observation was made by Jan-Werner et al[17] and Zargar et al[9].

Earlier studies had questioned the recommendation of routine endoscopic evaluation in all patients with caustic ingestion, on the basis that in absence of symptoms following un-intentional ingestion, severe injury is unlikely.[18,19] In our study, 4 patients who presented acutely had no symptoms on presentation, but on EGD, 2 cases had grade II injury and 2 had grade I injury. Gaudreault P et al also reported that signs and symptoms do not adequately predict the severity of lesion[20]. 42 patients had burns in both oropharynx and UGI tract, whereas the remaining 9 patients who showed UGI tract involvement had normal oropharynx. Similar findings of poor correlation between severities of injury to oropharynx and injury of UGI tract was observed by Gaudreault P et al[20] and Zargar et al[21].

In our study all patients of corrosive ingestion who presented acutely were subjected to early endoscopic evaluation within 48 hours of corrosive ingestion, after ruling out perforation, to grade the severity of injury. Endoscopic grading of corrosive burn was done by using modified endoscopic classification by Zargar et al[11]. Most common mucosal injury observed was Grade II (72.5%), followed by Grade I (17.6%) and Grade III (9.8%). Severe mucosal injury was seen in 43.13 % (n=22). Esophagus showed involvement in 100% patients (n=51), stomach was involved in 45 cases (88.23%), duodenum in 17 cases (33.33%) and oropharynx in 42 cases (82.35%). We observed that severe mucosal injury, defined by ≥ grade IIb was predictor of acute complications, both systemic and related to GI tract. All the patients who required ICU admission, suffered from acute complications and died, had severe mucosal injury on initial endoscopic evaluation. Similar findings have been observed by many studies in both children and adults, which has established early endoscopy as a recommendation for the management of corrosive ingestion[11,12,17,22,23].

## CONCLUSIONS:

We conclude that corrosive injury is more commonly due to acids and acids cause severe injury to UGI tract and subsequent complications. Endoscopy should be done soon after the corrosive ingestion as it is safe, helps in assessing the severity and extent of injury, in planning proper management and in predicting the outcome.

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