

## Accidental Corrosive Acid Intoxication - a Case Report

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### ABSTRACT

**Background:** Acute poisonings with corrosive substances cause serious chemical injuries to upper gastrointestinal tract, the most common site being the oesophagus and the stomach. The degree and extent of damage depends on several factors like the type of substance, the morphologic form of the agent, the quantity, and the intent. In the acute stage, perforation and necrosis may occur. Injury to UGI tract due to ingestion of acidic corrosive substances is common in India. Acute corrosive intoxications constitute a major problem in clinical toxicology since the most commonly affected population are the young with psychic disorders, suicidal intent and alcohol addiction.

**Case Report:** We report a fatal case of accidental corrosive acid ingestion with a brief review of literature.

**Conclusion:** Ingestion of a corrosive substance can produce severe injury to the gastrointestinal tract and can even result in death. Stringent legislation is necessary in developing countries to curtail unrestricted access of adults to dangerous corrosive chemicals.

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► *Implication for health policy/practice/research/medical education:* Corrosive Acid Intoxication

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### 1. Introduction:

Ingestion of corrosive substances has devastating effects on the upper GIT and present major problems in management (1). Acute corrosive poisonings appear as a result of ingestion of acids, bases, oxidants, heavy metal salts and other chemical substances. Modern technology

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has enabled synthesis of chemical substances with strong corrosive features that are often used in everyday life (2). Ingestion of corrosive substances either accidentally by alcoholics and children or intentionally for purpose of suicide is a common form of poisoning in India (3, 4). Whereas contiguous injury to the oesophagus and stomach are common following alkali ingestion, the isolated injury to the stomach following acid ingestion though rare are reported (3).



**Fig. 1.** It shows mucosal injury to the oesophagus.



**Fig. 2.** It shows mucosal injury to the stomach, blackened and peppery.

The entry mode of corrosive substances in the body is oral (ingestion of a corrosive agent), and rarely inhalation (inhalation of corrosive vapours) (5). Acid ingestion tends to occur less frequently in the United States (<5%) but appears to be more common in countries like India where hydrochloric acid and sulphuric acid are easily accessible (3). Intoxication is caused by acids are generally available as toilet bowl cleaners (sulphuric, hydrochloric), anti rust compounds (hydrochloric, oxalic, hydrofluoric), battery fluids (sulphuric), and swimming pool cleaners (hydrochloric) (6, 7). Beside acids, corrosive alkalis are also being abused, such as sodium hydroxide (NaOH) and potassium hydroxide (KOH). They are used in everyday life for cleaning sanitary surfaces and as drain openers (8-10).

Corrosive injuries are a source of morbidity all over the world, but the burden is more in developing countries (11, 12). This is because corrosive agents are easily available as items of household use and are not subject to any regulatory control. Human exposure to caustic substances is usually due to accidental or suicidal injuries. Here a fatal case of corrosive acid ingestion was described with a brief review of literature.

## 2. Case Report:

A 65-year female consumed acid accidentally at her home than deceased was taken to lady Hardinge medical

college where she was declared brought dead. On autopsy examination

### External examination

Observations showed excoriation of lips, corrosion of mucosa of mouth and tongue.

### Internal findings

Mucous membrane of oesophagus is inflamed and swollen. Mucous membrane of stomach is inflamed, oedematous, blackened and peppery feel. Peritoneal cavity filled with black grumous acidic liquid containing mostly altered blood from escape of acidic stomach contents into peritoneal cavity following perforation of stomach. Organs are congested. During autopsy samples of biologic fluids were taken for toxicological examination. On Toxicological analyses sulphuric acid was detected.

## 3. Discussion:

Ingestion of corrosive substances either accidentally or intentionally for the purpose of suicide is a common form of poisoning in India because of easy access to acids as they are used as cheap toilet cleansers (3, 4)

Solutions with pH smaller than 2 or greater than 12 are highly corrosive and can cause severe chemical burns in the upper gastrointestinal tract. The most serious lesions occur in the oesophagus and the stomach since the poison remains there a long time (13-16). Agents of alkaline pH usually result in oesophageal injury, and agents of acid pH often cause

gastric damage. Squamous epithelium lining the oesophagus is sensitive to alkaline agents; however, alkaline agents upon reaching the stomach are rapidly neutralized by the gastric acidity of the stomach. Conversely, oesophageal mucosa is resistant to acid agents, which in turn produce severe inflammatory changes throughout the gastric wall. Corrosive agents regardless of their pH acidity can be destructive in some instances to both oesophagus and stomach.

Acid induces coagulation necrosis with scar formation and this may limit tissue penetration, but this does not appear to be a major variable in determining the extent of injury. Some earlier studies indicated that acid preferentially damages the stomach (17, 18), recent studies have reported extensive damage to the oesophagus as well (3). In contact with alkalis, tissue proteins are transformed into proteinates and fats into soaps, resulting in penetrating or liquefaction necrosis (19). The pathologic classification of caustic injury to the oesophagus is similar to classification of burns to the skin. The degree of injury correlates directly with stricture formation and mortality.

Corrosive injuries are common in children, and are mostly accidental in general. Due to their curious nature, young children tend to explore household items which may include corrosive cleaning products. They accidentally ingest these substances resulting in corrosive injuries. This is especially true in developing countries where overcrowding and insanitary living conditions combined with poor regulatory control expose children to such chemicals. A recent review data on corrosive ingestion in children from Sierra Leone estimates that most frequently injured were children below 5 years of age (80%) and more boys were injured than girls (70%) (11). In sub-Saharan Africa, corrosive ingestion accounts for 0.3% of paediatric admissions in the Gambia and

for 0.5% in Nigeria, thus amounting to 0.84% of total childhood mortality in these countries (11). Death rates, especially in underprivileged countries, may reach as high as 12% (11).

The most reported corrosive agent was caustic soda, followed by kerosene, sodium hypochlorite and other alkaline household chemicals. The ingestion of acid was more common in India than in other countries (20). A large Indian study among children showed that corrosive ingestion accounts for 7.6% of all cases of acute poisoning admitted to a tertiary care centre, the leading agents being kerosene, drugs and pesticides (21). A multicentric study of children showed that corrosive poisoning accounted for 1.7%–9.3% of all cases of poisoning in various centres in India ranking behind kerosene, drug and pesticide poisonings (22).

According to the American Association of Poison Control Centres annual report 2008, corrosive ingestion ranked third among causes of poisonings in children, with cosmetics and analgesics being the first and pesticides the second leading cause of poisoning (23). Corrosive ingestion accounted for 9.7% of all poisonings in children. However, there was no mortality among children in 2008 in the USA as a result of corrosive poisoning (23). While Singapore study showed that corrosive ingestion was the second most common mode of suicide, accounting for 27% of all suicidal deaths (24). Later, legislation prohibiting over-the-counter sale of caustic soda was enforced, following which there was a steady decline in the number and proportion of suicidal deaths from corrosive ingestion. Although, the cases of suicides has steadily increased all over the world and people with suicidal intent resort to methods other than corrosives. The same trend is seen in most developed countries. As mentioned previously, of all corrosive poisonings in the USA, only 4.5% were suicidal (23).

Our case report agrees with a study shown that mucosal injury to the oesophagus is

more serious and grades 3 and 4 injuries are more frequently seen in patients who attempted suicide as compared with accidental ingestion (25). Individual case studies (26-28) or studies of small number of cases (29, 30) have led to the suggestion (1, 28-32) that acids cause maximal damage to the stomach and relatively minor damage to the oesophagus because of rapid transit and the great resistance of squamous epithelium to acids. Although Zargar *et al* concluded that acid injury of UGI tract is a serious condition that effects oesophagus and stomach equally and results in high mortality and morbidity (3). While in present case report gastric mucosal injury are more in comparison to oesophagus.

'Acid licks the oesophagus and bites the stomach' was the dictum in the past. This principle has been challenged by many authors who have shown that even with acid ingestion oesophageal injuries are common (33). It is also believed that if the injury occurs in a fasting state, gastric injuries occur in the antrum whereas if they occur in the postprandial state, the body of the stomach is affected. The largest Indian experience, reported from our centre, had 82.6% of 109 injuries secondary to acid ingestion (34).

#### 4. Conclusion:

Ingestion of a corrosive substance produces severe injury to the gastrointestinal tract and can even result in death. Corrosive ingestion is an important cause of morbidity in developing countries, where a large proportion of ingestions are suicidal. Parents or adults should be made aware of the need to keep household corrosives safely away from adults to prevent such accidental deaths. Also, stringent legislation is necessary in developing countries to curtail unrestricted access of adults to dangerous corrosive chemicals.

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