

## TO STUDY ENDOSCOPIC FINDINGS & OUTCOMES OF CORROSIVE SUBSTANCE INGESTION AND RELATIONSHIP BETWEEN PATIENT HEIGHT WITH POST CORROSIVE ESOPHAGEAL STRICTURE

Gurunath Dnyandev Bhang<sup>1</sup>, Katepally Saikrishna<sup>2</sup>

Received : 12/04/2023  
Received in revised form : 11/05/2023  
Accepted : 25/05/2023

**Keywords:**

Liver function tests; C-reactive protein; Computed tomography scan.

Corresponding Author:

**Dr. Katepally Saikrishna**

Email: mailkranthi777@gmail.com

DOI: 10.47009/jamp.2023.5.3.266

Source of Support: Nil,  
Conflict of Interest: None declared

*Int J Acad Med Pharm*  
2023; 5 (3); 1305-1310



<sup>1</sup>Postgraduate, Department of Gastroenterology, Gandhi Medical College / Hospital, Hyderabad, Telangana State, India.

<sup>2</sup>Associate Professor, Department of Gastroenterology, Gandhi Medical College / Hospital, Hyderabad, Telangana State, India.

### Abstract

**Background:** To study relationship of grade of mucosal injury within first 72 hours of corrosive ingestion and their correlation with progression to esophageal stricture. **Materials and Methods:** Total of 75 patients all patients who were admitted to Gandhi hospital with Corrosive substance ingestion were included in this study from February 2020 to February 2022. **Result:** This study was conducted on 75 patients of meeting the inclusion criteria for a period of 2 years. Data analysis involved, calculating the mean, Standard Deviation and Standard Error and 95% Confidence Interval of the Difference (CI) for performance of both the patients across stricture & non-stricture groups. **Conclusion:** All of our patients presented within 72 hours of ingestion to our hospital. We found males & younger patients age group of 21-40 years are likely to do corrosive ingestion, due to various reasons such as personal disputes, love failures, unemployment & various others stressors in the life.

## INTRODUCTION

Poisoning is one of the most commonly used suicidal method. Caustic ingestion is one of them. Although poisoning mortality occurred in most instances but once life is saved subsequent morbidity is rare in most of the poisoning, caustic ingestion is an exception to this though initial mortality may be less but subsequent morbidity is very high in caustic ingestion.<sup>[1-3]</sup>

Ingestion of corrosive substances remains a major public health issue in both western countries as well as in developing countries such as India. These injuries are still on rise in developing countries and are related to various social, economic, psychological, educational and personal issues. The term “corrosive” is often used interchangeably with “caustics” but corrosion implies mechanical degradation which does not always apply to caustics. The term “corrosion” derived from the Latin verb *corrodere* that translates as “to gnaw” underscores how corrosive substances “gnaw” their way through the flesh. Corrosive ingestion is rather common problem in India due to lack of strict laws that regulate sales of these caustic agents.<sup>[4]</sup>

Many of the corrosive substances are available in household and industries. Most commonly available corrosives in household includes toilet cleaner acids,

bleaches, phenols etc. Alkali ingestion is more common in western countries whereas acid ingestion dominates in Asian countries. Also, in western population accidental ingestion is more common and most of these ingestions are seen in children. Whereas in India most of these injuries are seen in adults. In India suicidal ingestion is more common than accidental. Accidental ingestion is seen most commonly amongst children’s and persons with psychological issues also in inebriated states such as under the influence of alcohol consumption.<sup>[5]</sup>

After ingestion of caustic substances significant tissue damage occurs in acute phase though early initiation of appropriate therapy may prevent aggravation of the injuries and may facilitate future management in chronic phases.<sup>[6]</sup> However, in India most of these injuries are being managed at peripheral centres before being referred to the tertiary centres hence it can also be one of the factors for further aggravation of the chronic phase.<sup>[6]</sup>

The true prevalence of caustic ingestion is difficult to predict as largely many of these ingestions are often not reported and they go unnoticed. The clinical outcome of corrosive ingestion depends upon the extent and depth of the initial injury. Mild injuries involving only the mucosa usually heal

without any sequelae, whereas moderate injuries extending beyond mucosa results in esophageal stricture.<sup>[7]</sup> Severe transmural injuries manifest as perforation in the acute phase or tight undilatable stricture in the recovery phase. Endoscopy plays a major role in diagnosing and assessing the severity of caustic injury as well as guiding an appropriate treatment. Hence, we have conducted this study to correlate endoscopic findings & outcomes of corrosive substance ingestion at Gandhi medical college and Hospital, Secunderabad.

#### Aim of the Study

1. To study relationship of grade of mucosal injury within first 72 hours of corrosive ingestion and their correlation with progression to esophageal stricture.
2. To study the relationship of height of patient to progression to esophageal stricture.
3. To study the relation of type of corrosive ingestion and progression to esophageal stricture

### MATERIALS AND METHODS

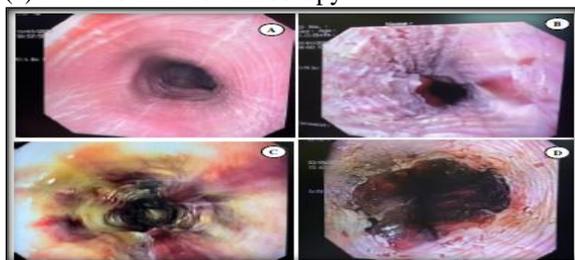
Total of 75 patients meeting the inclusion criteria who were admitted to Gandhi Hospital with corrosive ingestion during the period from February 2020 to February 2022 were evaluated prospectively in this study.

#### Inclusion Criteria

All participants who were admitted to Gandhi Hospital with corrosive substance ingestion were included in this study.

#### Exclusion criteria

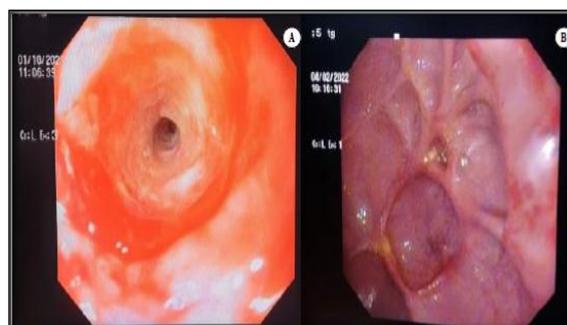
- Patients with
- (a) Esophageal perforation
  - (b) Patients undergoing surgical management eg esophagectomy
  - (c) Patients unfit for endoscopy



UGI scopy showing (A) grade 2a injury (B) grade 2b injury (C) grade 3a injury (D) grade 3b injury of the esophagus.



UGI scopy of stomach showing (A) grade 2 a injury on lesser curvature (B) grade 2b injury of the body of stomach (C) grade 3a (focal necrosis) in the body & antrum (D) grade 3b (extensive necrosis) of the body & lesser curvature.



UGI scopy after 6 weeks, (A) showing esophageal stricture at 20cm from incisors with surrounding erythema, edema & ulcerations (B) showing cicatrized, pulled up antrum causing gastric outlet obstruction.

### RESULTS

Table 1: Distribution of BMI amongst patients

	Frequency	Percentage
Under weight (BMI < 18.5)	22	29.3%
Normal (BMI 18.5-24.9)	41	54.7%
Over weight (BMI 25.0 – 29.9)	8	10.7%
Obese (BMI > 30)	4	5.3%
Total	75	100.0%

Table 2: Distribution of types of corrosive ingestion amongst patients

	Frequency	Percentage
Acid	56	74.7%
Alkali	5	6.7%
Miscellaneous	14	18.7%
Total	75	100.0%

Table 3: Distribution of UGI Scopy findings at admission amongst patients

UGI Scopy grade at admission	Frequency (n)	Percentage (%)
Normal	9	12.0%
Grade 1 Esophageal Injury	7	9.3%
Grade 2a Esophageal Injury	17	22.7%

Grade 2b Esophageal Injury	26	34.7%
Grade 3a Esophageal Injury	8	10.7%
Grade 3b Esophageal Injury	8	10.7%
Total	75	100.0%

**Table 4: Association between esophageal stricture & intent of ingestion**

Intention of Ingestion	Esophageal Stricture		Total
	No	Yes	
Suicidal	38	28	66
Accidental	8	1	9
Total	46	29	75

Pearson Chi-Square = 3.374 df= 2, p value = 0.0069

**Table 5: Association between esophageal stricture & presence of food in the stomach**

Empty Stomach		Esophageal Stricture		Total
	n	No	Yes	
Yes	n	30	20	50
No	n	16	9	25
Total	n	46	29	75

Pearson Chi-Square = 0.112 df= 2, p value = 0.805

**Table 6: Association between esophageal stricture and symptoms at admission**

Symptoms at admission	Esophageal stricture		Total	P value
	Yes	No		
Oral lesion	10	20	30	<0.001
Dysphagia	5	9	14	0.037
Odynophagia	18	23	41	0.001
Vomiting	36	29	65	0.005
Hematemesis	17	19	36	0.019
Malena	7	6	13	0.755
Chest pain	32	25	57	0.164
Abdominal pain	33	24	57	0.406
Hoarseness of voice	5	12	17	0.004
Cough	5	14	19	0.001

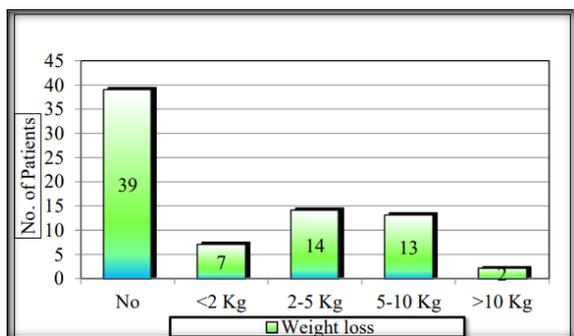
**Table 7: Association of Biofilm production and XDR A. Baumannii**

One – way Anova test						
Esophageal stricture		N	Mean	SD	SE	P value
Height	No	46	162.17	8.73	1.29	0.015
	Yes	29	155.48	14.60	2.71	
Age	No	46	25.89	7.38	1.09	0.006
	Yes	29	33.90	16.70	3.10	
BMI	No	46	20.72	4.22	0.62	0.770
	Yes	29	21.01	4.12	0.77	
Amount (ml)	No	46	114.13	97.38	14.36	0.018
	Yes	29	171.03	102.13	18.97	

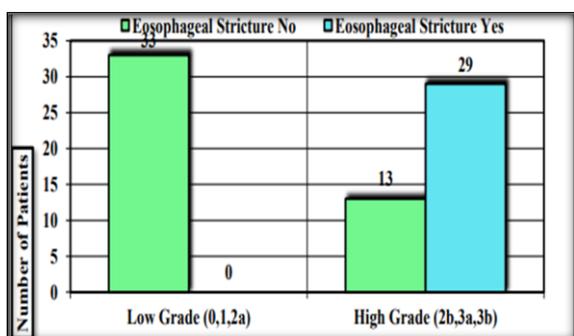
**Table 8: Association between Location of Esophageal stricture and continuous variables**

One – way Anova test						
Esophageal stricture length		N	Mean	SD	P Value	
Age	No stricture	46	25.9	7.4	0.001	
	Up to 2 cm	8	23.6	4.4		
	2 – 5 cm	17	39.1	17.7		
	> 5 cm	4	32.3	214.1		
	Total	75	29.0	12.4		
Height (cm) (2 yr old child omitted)	No stricture	46	162.2	8.7	0.121	
	Up to 2 cm	8	160.3	5.4		
	2 – 5 cm	17	157.1	5.8		
	> 5 cm	3	157.3	3.1		
	Total	74	160.6	7.9		
BMI	No stricture	46	20.7	4.2	0.623	
	Up to 2 cm	8	19.7	4.9		
	2 – 5 cm	17	21.9	3.6		
	> 5 cm	4	19.9	4.9		
	Total	75	20.8	4.25		
Amount (ml)	No stricture	46	114.1	97.4	0.031	
	Up to 2 cm	8	162.5	146.2		

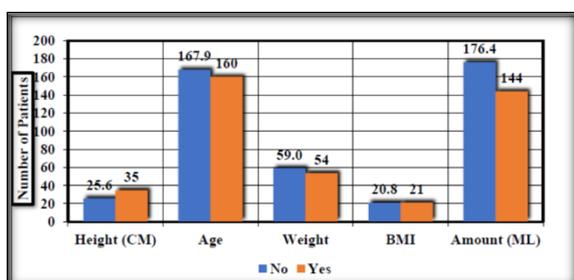
	2 – 5 cm	17	174.1	91.6
	> 5 cm	4	175.0	50.0
	Total	75	136.1	102.4



**Figure 1: Distribution of Weight Loss amongst Patients**



**Figure 2: Comparison of esophageal stricture with grades of esophageal injury**



**Figure 3: Comparison of parameters among 2b stricture and non-stricture group**

## DISCUSSION

Corrosive ingestion is associated with significant morbidity, mortality; prolonged hospital stays those results in huge financial as well as psychosocial burden on individual patient, their families as well as on health system.

In present study including 75 patients, males (n=45) 60% were more commonly associated with corrosive ingestion, 74.7% (n=56) of the study population consumed acid & suicidal intent was present in 88% (n=66) of our patients. Mean age of the patients in present study was 28.99 years. Other Indian studies conducted by Kochhar et al,<sup>[8]</sup> in 2017, Anathakrishnan et al,<sup>[4]</sup> in 2010 & Gupta et al in 2004 also shown acid was most commonly ingested corrosive in Indian subcontinent accounting for 93.54%, 82.8% & 83.4% respectively. Males

were involved most predominantly in all these studies ranging from 55%-66.6%.

However, In a study by Chowdhury SD et al,<sup>[9]</sup> from Vellore, females were predominant in his study population, mean age of 30.5 years at presentation, acid was the most commonly consumed corrosive & 72% consumed it with suicidal intent. Western studies differ from Indian studies with respect to substance ingested, Naoures et al,<sup>[10]</sup> from France showed that acid ingestion is less common in western countries where alkali is most common offending agent. In his study acid ingestion was seen only in 6% & males were affected less commonly 44% than females however suicidal intent was seen in 72% of their study population. Cheng et al,<sup>[11]</sup> Taiwan included larger study population, in his study acid ingestion was seen in only 34.80% & 47% of them were males, suicidal intent was seen in 71.06% of the study population.

Study by Alipour Faz et al,<sup>[12]</sup> in 2017 (n=348) showed mean amount caustic agent ingested was 106.69 ± 100.24 ml, and he showed higher volumes of ingestion were significantly associated with higher grades of mucosal injuries. Zargar et al,<sup>[13]</sup> reported approximate volume of corrosive ingestion in his study was 50-200 ml however they have not correlated with grades of injuries or stricture formation in their study.

We found that presence of oral lesion, dysphagia, odynophagia, vomiting, hematemesis, cough & hoarseness of voice at presentation were significantly associated with secondary progression to esophageal strictures at 6 weeks. Naoures et al demonstrated that presence of dysphagia, epigastric pain & hematemesis at presentation were associated with esophageal stricture. Havanond et al,<sup>[14]</sup> noticed hoarseness of voice at presentation is related to esophageal stricture formation.

In present study, 12% had normal findings, 9.3% had grade 1 injury, 22.7% suffered grade 2a injury, majority 34.7 % had grade 2b injury & Grade 3a & 3b was seen in 10.7% of the patients respectively. Similar to our study, Study by Cabral et al,<sup>[15]</sup> from France has differed from our study in that majority of their patients had normal findings 35.2%, followed by higher grades of injury 3b in 21.3% of their study population. The difference can be due to the most commonly ingested agent was household bleach 34%, followed by caustic sodas 28.6%, acid ingestion accounted only for 7.6% in the study population.

In the present study, all patients with low grade (grades 0,1,2a) injuries recovered without any sequelae. Whereas patients with higher grades of injury on endoscopy at admission progressed to esophageal strictures at 6 weeks & it was statistically significant. Ali Zargar et al,<sup>[13]</sup> in 1991 & Kochhar et al,<sup>[13]</sup> in 2003 also reported that

patients with low grade injuries at admission they recovered without any sequelae hence supporting our study. Recently published data from Bharat Kumar et al,<sup>[9]</sup> & Hashmi et al,<sup>[16]</sup> reported higher grades of injuries at admission are at increased risk of esophageal stricture formation. In our study 15/26 (57.69%) in group 2b, 6/8 (75%) in group 3a & 8/8 (100%) in group 3b developed esophageal strictures at 6 weeks. Mahawongkajit et al,<sup>[17]</sup> has almost similar results to our study, where in 61.3% in grade 2b & 83.3% in grade 3a developed esophageal strictures. Cabral et al,<sup>[15]</sup> has differed from our study in that he had lower percentage of the stricture formation in grade 2b & 3a injuries compared to our study, but in grade 3b his results were similar to our study.

Out of the 29 patients who developed stricture in our study, the most common location was mid-esophagus (55.7%) followed by distal esophagus (34.48%) & proximal esophageal involvement is less common (10.34%). Similar data was reported from 2 studies conducted at PGI Chandigarh, by Jimil Shah et al,<sup>[18]</sup> in 2020 & Kochhar et al in 1999, in their study also most commonly involved segment was mid-esophagus followed by distal & proximal esophagus. As all the patients in our study group ingested the caustic agent in the liquid forms that may be the possible explanation for less common injuries in proximal esophagus. As proximal injuries are more common when solid or powder form of the caustic agent is ingested.

Among the 29 stricture patients in our study majority 23 (79.31%) had a single stricture, 5 (17.24%) had 2 strictures & only 1 (3.44%) patient had more than 2 strictures. Similarly in Bharat Kumar et al,<sup>[9]</sup> (n=43) study 21 patients had stricture of which majority 15 (71.42%) had a single stricture & 6 (28.58%) had multiple stricture which is similar to our study population.

Also, we found majority of our stricture patient 17 (58.6%) had stricture length of 2-5 cm, 8 (27.58%) had stricture less than 2 cm in length, & 4 (13.79%) had stricture length of more than 5 cm. Kochhar et al findings were comparable to that of our study, in his study (n=18), 11 (61.11%) patients had stricture length of 3-6 cm, 5 (27.77%) patients had stricture length of less than 3 cm & 2 (11.11%) had stricture length of more than 6 cm.

In 2018 study by P Mahawongkajit et al,<sup>[17]</sup> from Thailand quoted that patient height can be the useful predictor for progression to esophageal stricture formation. Where he reported that the height of the patients in non-stricture (1.66 ± 0.07 m) group was significantly greater than that of stricture group (1.58±0.08 m) patients. The hypothesis being taller individuals have larger size of the esophagus & they present less luminal area for contact with the corrosive agents hence resulting in fewer strictures compared to the shorter individuals. We also encountered similar findings, the mean height among stricture group in our study was 155.48 cm compared to non-stricture group having mean height

of 162.17 cm and this difference was statically significant. We also tried to find relationship of height with the length of the stricture & location of the stricture but we did not find any statistical correlation for the same.

## CONCLUSION

Corrosive ingestion is a major public health problem, associated with high mortality & increased morbidity among the survivors.

The morbidity is responsible for multiple hospital visits, admissions, complex surgery & risk of malignancy on long term. Hence adversely affecting quality of life also increases financial burden to the individual patient & their families.

The present study enrolled 75 patients of corrosive ingestion over a period of 2 years.

Majority of the study population had suicidal intent for ingestion, & those who consume corrosive with suicidal intent are more likely to ingest larger quantities of corrosive & at significantly higher risk of severe grades of injury & stricture formation.

Presence of certain symptoms at admission such as oral lesions, dysphagia, odynophagia, hematemesis, hoarseness of voice, cough were the significant predictors of esophageal stricture formation at 6 weeks.

Presence of high-grade injuries at admission is significant predictor of esophageal stricture formation.

Majority of our patient who had higher grade of injuries they developed stricture at 6 weeks.

Most location of stricture was mid-esophagus, followed by distal esophagus & proximal esophagus was less commonly involved.

As all patients in our study have ingested corrosive in liquid form, proximal stricture occurs more commonly in those who ingest solid or powder form of corrosive ingestion.

Stricture development was comparable in both males & females there was no gender bias with respect to stricture formation. We also found that patients who had shorter height are at more risk of stricture formation compared to taller patients. But height did not have any significant correlation with the location & length of the stricture. We found that acid was the most commonly ingested agent in our study, due to ease of availability at household as toilet cleaner & also due to lack of any strict laws for regulation of acid sales in our country.

## REFERENCES

1. Arunachalam R, Rammohan A. Corrosive Injury of the Upper Gastrointestinal Tract: A Review. Arch Surg 2016;2:56-62.
2. Joshi P, Yadav R, Dangi A, Kumar P, Kumar S, Gupta V, et al. Corrosive Esophageal Strictures: From Dilatation to Replacement: A Retrospective Cohort Study. Dysphagia 2020;35(4):558-67.
3. Chirica M, Bonavina L, Kelly MD, Sarfati E, Cattani P. Caustic ingestion. The Lancet 2017;389(10083):2041-52.

4. Kalayarasan R, Ananthkrishnan N, Kate V. Corrosive Ingestion. *Indian J Crit Care Med* 2019;23(S4):0-0
5. Contini S, Scarpignato C. Caustic injury of the upper gastrointestinal tract: A comprehensive review. *World J Gastroenterol WJG* 2013;19(25):3918-30.
6. Methasate A, Lohsiriwat V. Role of endoscopy in caustic injury of the esophagus. *World J Gastrointest Endosc* 2018;10(10):274-82.
7. Mahawongkajit P, Tomtitchong P, Boochangkool N, Mingmalairak C, Awsakulsutthi S, Havanond C. A prospective randomized controlled trial of omeprazole for preventing esophageal stricture in grade 2b and 3a corrosive esophageal injuries. *Surg Endosc* 2021;35(6):2759-64.
8. Anand N, Sharma A, Shah J, Kochhar R, Singh SM. Quality of life in patients of corrosive esophageal stricture treated with endoscopic dilatation. *JGH Open* 2021;5(2):301-6.
9. Bharath Kumar C, Chowdhury SD, Ghatak SK, Sreekar D, Kurien RT, David D, et al. Immediate and long-term outcome of corrosive ingestion. *Indian J Gastroenterol* 2019;38(4):356-61.
10. Le Naoures P, Hamy A, Lerolle N, Métivier E, Lermite E, Venara A. Risk factors for symptomatic esophageal stricture after caustic ingestion—a retrospective cohort study. *Dis Esophagus* 2017;30(6):1-6.
11. Riffat F, Cheng A. Pediatric caustic ingestion: 50 consecutive cases and a review of the literature. *Dis Esophagus* 2009;22(1):89-94.
12. Alipour Faz A, Arsan F, Peyvandi H, Oroei M, Shafagh O, Peyvandi M, et al. Epidemiologic Features and Outcomes of Caustic Ingestions; a 10-Year Cross-Sectional Study. *Emerg Tehran Iran* 2017;5(1):e56.
13. Ali Zargar S et al, Kochhar R, Mehta S, Kumar Mehta S. The role of fiberoptic endoscopy in the management of corrosive ingestion and modified endoscopic classification of burns. *Gastrointest Endosc* 1991;37(2):165-9.
14. Mahawongkajit P et al, Tomtitchong P, Boochangkool N, Mingmalairak C, Awsakulsutthi S, Havanond C. A prospective randomized controlled trial of omeprazole for preventing esophageal stricture in grade 2b and 3a corrosive esophageal injuries. *Surg Endosc* 2021;35(6):2759-64.
15. Cabral C, Chirica M, de Chaisemartin C, Gornet J-M, Munoz-Bongrand N, Halimi B, et al. Caustic injuries of the upper digestive tract: a population observational study. *Surg Endosc* 2012;26 (1):214-21.
16. Hashmi MU, Ali M, Ullah K, Aleem A, Khan IH. Clinico-epidemiological Characteristics of Corrosive Ingestion: A Cross-sectional Study at a Tertiary Care Hospital of Multan, South-Punjab Pakistan. *Cureus* 2018;10(5):e2704.
17. Mahawongkajit P, Tomtitchong P, Boochangkool N, Limpavitayaporn P, Kanlerd A, Mingmalairak C, et al. Risk Factors for Esophageal Stricture in Grade 2b and 3a Corrosive Esophageal Injuries. *J Gastrointest Surg* 2018;22(10):1659-64.
18. Jamil Shah et al , Bush N, Rajan K, Nain CK, Singh K, Kochhar R. Gastric secretion in patients with caustic ingestion: A prospective study. *Indian J Gastroenterol* 2021;40(1):50-5.