


The Effect of the COVID-19 on Corrosive Ingestion in Thailand

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Purpose: Since January 2020, the outbreak of COVID-19 coronavirus has impacted global mental health, daily activities, and economies, including Thailand. The essential strategy is the disease-preventing measure of “lockdown.” Corrosive ingestion is one of the most common forms of self-harm and problems worldwide. This study aimed to evaluate the effect of corrosive ingestion in the COVID-19 situation.

Methods: This was a retrospective study of adult patients (≥ 18 y) who had ingested corrosives and been admitted to surgical department, Thammasat University Hospital between June and December 2019 (pre-COVID-19) and January to June 2020 (COVID-19 period) and compared the epidemiological and clinical features between these two groups.

Results: Nine and 20 patients were admitted in the pre-COVID-19 and COVID-19 periods, for an increase of 122%; males numbered 15. A minority of ingestions, 8/29, were intentional of which 7 were in the COVID-19 period. The Zargar classification showed a trend towards more gastric injury in the COVID-19 vs pre-COVID-19 periods: 8/17 vs 1/9 ($p=0.09$). Because of the endoscopic grade 0 in stomach was significantly higher in pre-COVID-19 than COVID-19 case (pre-COVID-19; 8 patients (88.9%), COVID-19; 9 patients (45%); p value 0.011).

Conclusion: Data from this study suggest increasing trends of corrosive ingestion and greater gastric injury during the COVID-19 period.

Keywords: corrosive ingestion, caustic injury, esophagus, stomach, COVID-19

Introduction

Corrosive ingestion is a global and serious public health challenge and is a common form of self-harm and its incidence is more common in developing countries, including Thailand, compared to developed countries.¹⁻⁹ Common ingested corrosives include acids or bases. The causes of corrosive ingestion vary by age. Children mostly ingest corrosives accidentally while in adults it is both accidental and intentional. Common reasons for intentional ingestion include stress and attempted suicide.^{1,8-11}

Currently, many research studies focus on the risk factors for corrosive ingestion^{12,13} but, to our knowledge, there are no studies examining the effect of the COVID-19 pandemic. Since January 2020, the outbreak and global spread of COVID-19 have impacted global mental health, daily activities, and economies, including Thailand, where the government adopted an early strategy of “Lockdown.”^{14,15} Lockdown in many countries has resulted in a fall of cases and interrupted disease transmission. This motivated us to examine the effect of COVID-19 in Thailand on rate and severity of corrosive ingestion in adults.

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Methods

We conducted a retrospective study of adult patients (ie ≥ 18 years) who had ingested a corrosive substance and had been admitted to the Surgical unit of Thammasat University Hospital, a tertiary referral center situating in the northern Bangkok conurbation. The study protocol was approved by the Human Ethics Committee of Thammasat University (Faculty of Medicine); reference no. MTU-EC-SU-0-207/63. Patient informed consent was waived as it was a retrospective study and patient data were maintained with confidentiality. The data were used only for the study purpose. Patients were identified through the hospital electronic documentation system between July to December 2019 (pre-COVID-19) and January to June 2020. Patients were excluded if their data were incomplete or had not been admitted.

Esophagogastroduodenoscopy was performed by a team of experienced surgeons within 24 hours of ingestion and endoscopic findings of corrosive injuries classified using the Zargar classification.^{16,17} Patients also underwent a computerized tomography (CT) scan and the results classified according to the CT score.^{18,19} Both scores are detailed in Table 1.

Data were collected on to a standardized form including patient characteristics, history of ingestion: type of corrosive agent, reasons ingested, physical examination, endoscopic findings, CT score. Data were analyzed and compared between the pre-Covid-19 and Covid-19 periods. The statistical analysis was performed using the Chi-test or Fisher's exact test, as appropriate, for categorical data and the Mann-Whitney *U*-test for continuous data. All data were analyzed with SPSS v.22.0 data (Statistical Package for Social Sciences, SPSS Inc., Chicago, IL, USA). A *p*-value < 0.05 was considered to be statistically significant.

Results

Over one year, 29 patients were enrolled in this study, composed of 9 patients (31.0%) in the pre-COVID-19 period and 20 patients (69.0%) in the COVID-19 group for an increase of 122.22%. The patients in the pre-COVID-19 and COVID-19 groups were not significantly with respect to age, reasons for ingestion, type of corrosive agent, and physical signs (Table 2).

All demographic characteristics were similar between the two groups but the majority was male (15/29) in both groups and an acid agent (24/29) was the most common

Table 1 Endoscopic Score and Computerized Tomography Score of Corrosive Injury

| Score | Endoscopic Score ^{16,17,20} | Computerized Tomography Score ^{18,19,21} |
|-------|---|---|
| 0 | Grade 0; Normal | Normal |
| I | Grade 1; Edema and hyperemia of the mucosa | No definite swelling of esophagus wall (< 3 mm, within normal limit) |
| II | Grade 2a; Friability, blisters, exudates, hemorrhages, whitish membrane, erosion and superficial ulceration | Edematous wall thickening (> 3 mm) without periesophageal soft tissue infiltration |
| | Grade 2b; Grade 2a plus deep discrete or circumferential ulceration | |
| III | Grade 3a; Small scattered areas of multiple ulceration and areas of necrosis with brown-black or greyish discolouration | Edematous wall thickening with periesophageal soft tissue infiltration pulse well-demarcated tissue interface |
| | Grade 3b; Extensive necrosis | |
| VI | Grade 4; Perforation | Edematous wall thickening with periesophageal soft tissue infiltration plus blurring of tissue interface or localised fluid collection around the esophagus or the descending aorta |

agent ingested. All symptoms and signs were not significant. Only abdominal bloating was significantly higher in COVID-19 vs pre-COVID-19 group.

On endoscopy, 12/27 had a normal esophagus and 17/26 a normal stomach. All endoscopic grading of injury was similar between the two COVID-19 periods but a normal stomach was significantly more likely on the pre-COVID-19 group (Table 3).

There were no cases of esophageal perforation or any deaths (Table 4). Four patients needed mechanical ventilation, three in the COVID-19 period (Figure 1).

Discussion

Corrosive ingestion is one of the serious public health problems in many developing countries. Causes of corrosive

Table 2 The Patient Demographic Data

| Corrosive Injuries | Pre-COVID-19 Situation (n=9) | COVID-19 Situation (n=20) | P value |
|--------------------------------|------------------------------|---------------------------|---------|
| Age, mean \pm SD (years) | 40 \pm 20.2 | 43.8 \pm 15.1 | 0.59 |
| Sex male/female, n (%) | 2 (22.2)/7 (77.8) | 13 (65)/7 (35) | 0.032 |
| BMI, (Kg/m ²) | 20.6 \pm 3.7 | 23.2 \pm 3 | 0.06 |
| Intentional/accidental, n (%) | 1 (11.1)/8 (88.9) | 7 (35)/13 (65) | 0.14 |
| Acid/Alkaline, n (%) | 8 (88.9)/1 (11.1) | 16 (80)/4 (20) | 0.74 |
| Symptom, n (%) | | | |
| - Nausea/vomiting | 4 (44.4) | 14 (70) | 0.23 |
| - Odynophagia | 4 (44.4) | 8 (40) | 0.83 |
| - Hoarseness | 1 (11.1) | 4 (20) | 0.54 |
| - Dyspnea | 1 (11.1) | 3 (15) | 0.78 |
| - Abdominal bloating | 0 (0) | 8 (40) | 0.02 |
| Sign, n (%) | | | |
| - Injected pharynx | 3 (33.3) | 9 (45) | 0.57 |
| - Upper airway obstruction | 1 (11.1) | 4 (20) | 0.54 |
| - Abdominal tenderness | 2 (22.2) | 5 (25) | 0.88 |
| Computerized tomography, n (%) | 1 (11.1) | 3 (15) | 0.78 |
| EGD, n (%) | 9 (100) | 20 (100) | 0 |

Abbreviations: BMI, body mass index; EGD, esophagogastroduodenoscopy.

ingestion are accidental and suicide.^{1,8–11} The socioeconomic and psychological factors are crucial intentional motivation^{22,23} in the COVID-19 pandemic, the outbreak of coronavirus impacts global mental health.^{14,15} Most of the government strategies applied the “Lockdown situation” to manage the COVID-19 pandemic worldwide, and Thailand was affected by creating a significant sudden change in economic conditions and human way of life.^{24–26}

We have shown in this small study that the overall incidence of corrosive ingestion more than doubled during the first 6 months of the COVID-19 pandemic but increased 3-fold for intentional ingestion. Males

Table 3 Endoscopic Finding Related to Corrosive Injuries Compared Between pre-COVID-19 and COVID-19 Situation

| Endoscopic Grading | Pre-COVID-19 n (%) | COVID-19 n (%) | P value |
|--------------------|--------------------|----------------|---------|
| Esophagus | | | |
| 0 | 4 (44.4) | 8 (40) | 0.83 |
| I | 3 (33.3) | 7 (35) | 0.86 |
| 2a | 2 (22.2) | 2 (10) | 0.49 |
| 2b | 0 (0) | 0 (0) | 0 |
| 3a | 0 (0) | 1 (5) | 0.33 |
| 3b | 0 (0) | 0 (0) | 0 |
| 4 | 0 (0) | 0 (0) | 0 |
| Stomach | | | |
| 0 | 8 (88.89) | 9 (45) | 0.011 |
| I | 1 (11.1) | 5 (25) | 0.36 |
| 2A | 0 (0) | 1 (5) | 0.33 |
| 2B | 0 (0) | 0 (0) | 0 |
| 3A | 0 (0) | 1 (5) | 0.33 |
| 3B | 0 (0) | 1 (5) | 0.33 |
| 4 | 0 (0) | 0 (0) | 0 |

predominated and there was also a trend in increased gastric but not esophageal injury.

During the COVID-19 period, the government instituted a nationwide lockdown. Studies have documented the deleterious psychological effects of lockdown and COVID18 pandemic^{14,15} and the socioeconomic and psychological aspects^{22,23} that drive individuals to self-harm

Table 4 Patient Outcomes Related to Corrosive Injuries

| Outcomes | Pre-COVID-19 | COVID-19 | P value |
|-------------------------------------|---------------|---------------|---------|
| Perforation, n (%) | 0 (0) | 0 (0) | 0 |
| Stricture, n (%) | 0 (0) | 2 (10) | 0.16 |
| Ventilator support, n (%) | 1 (11.1) | 3 (15) | 0.78 |
| Surgical operation, n (%) | 0 (0) | 1 (5) | 0.33 |
| Mortality, n (%) | 0 (0) | 0 (0) | 0 |
| Hospital stay, mean \pm SD (days) | 2.7 \pm 1.1 | 4.9 \pm 8.1 | 0.24 |

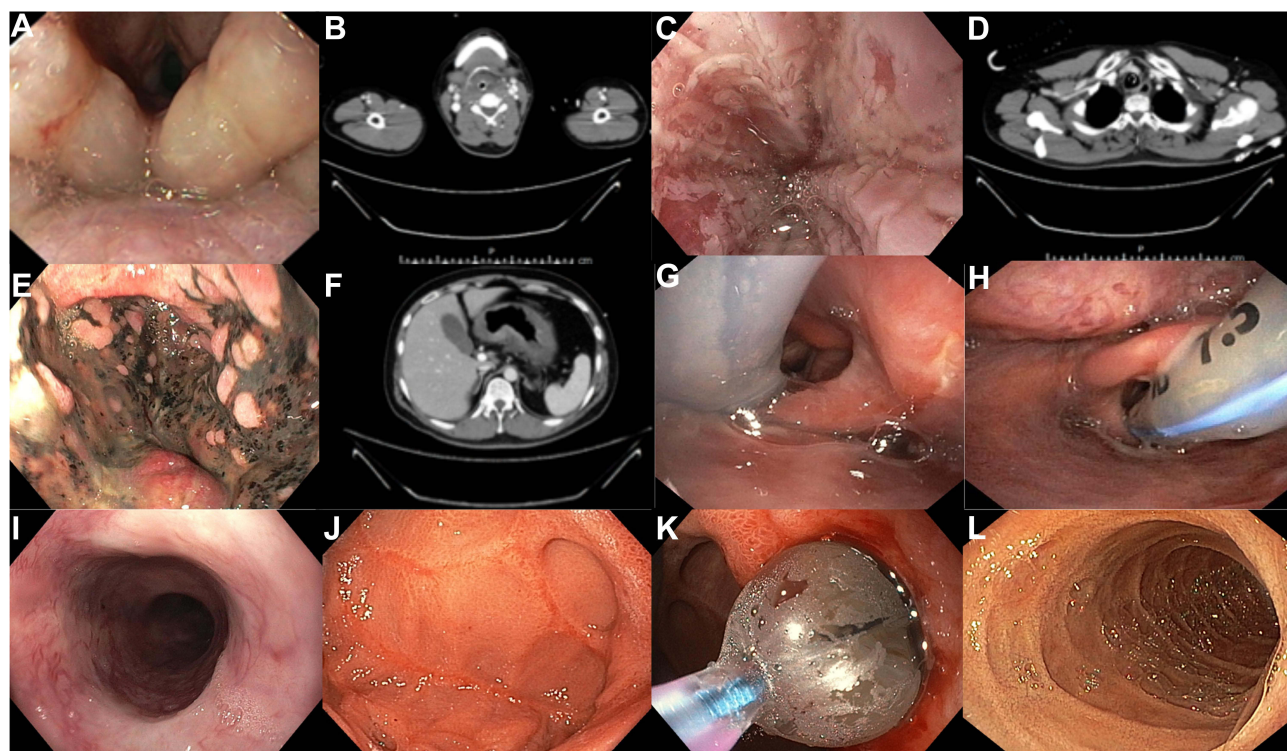


Figure 1 The endoscopic findings and computerized tomography (CT) scan of corrosive injury. A 24-year old Thai male patient with ingested toilet cleaning agent was admitted and evaluated by endoscopy and CT scan in the COVID-19 pandemic. (A and B) The oropharynx, hypopharynx, and larynx demonstrated edema and wall thickening. (C and D) The esophageal lumen showed Zargar 2a with a whitish membrane, erosion, without periesophageal soft tissue infiltration. (E and F) The stomach revealed Zargar 3a with edematous wall thickening plus scattered brown-black areas with mild perigastric soft tissue infiltration without fluid collection. He was treated by orotracheal intubation with ventilation support in the surgical intensive care unit. The parenteral nutrition gave and a closed clinical monitor. (G and H) After the situation improved, the laryngo-bronchial was evaluated, and the patient was successfully extubated. (I and J) Four weeks after corrosive ingestion, the patient demonstrated scar formed without stricture of esophagus and fibrotic scar of stomach with a pyloric stricture. (K and L) A patient was treated by endoscopic balloon dilation and steroid injection every 1–2 weeks. Finally, the endoscopy could be pass to the duodenum with successive clinical improvement.

and suicide that have been exacerbated by the pandemic. We hypothesize that these factors led to the 3-fold increase in intentional ingestion. However, we did not detail each factor, such as unemployment, bankruptcy, or bereavement related to the COVID-19 pandemic. Further studies are required to evaluate the factors that describe corrosive injuries and the COVID-19 situation.

Still, it had six corrosive patients in the COVID-19 group admitted in only one day because they misunderstood a disinfectant solution in a general bottle from recycling. On this day, the Subdistrict Administrative Organization (SAO) officers had put the bottles to contain disinfectant and distributed them to the people. However, the number of patients was not different because hospital staff complained about SAO, and SAO suddenly stopped the delivery. The accidental event cases had a previous report from a beverage bottle that causes misleading.²⁷ The lack of caution in giving information on bottles from repacking is one of the added causes of an accident. Despite the increase in intentional ingestion, we came across a cluster of accidental ingestion

because of a misunderstanding of the instructions by patients, consistent with a previous report.²⁷ This underscores the need for clear health messaging.

The endoscopic findings showed a trend for more severe gastric injury and were consistent with the significantly higher rate of reported gastric bloating that we found. One patient in the COVID-19 group had a Zargar grade of 3a in the esophagus and grade 3b in the stomach. This patient was evaluated by computerized tomography without perforation, a known risk of corrosive ingestion. However, after one month, the patient developed pyloric stricture and underwent drainage gastrostomy with feeding jejunostomy followed by a Roux-en-Y bypass. Although there were no reported deaths, corrosive ingestion can cause significant morbidity.

Conclusions

Data from this study suggest increasing trends of corrosive ingestion and greater gastric injury during the COVID-19 period. In this study, the number of patients was small because of the single institute with the limited time period of the

COVID-19 lockdown in Thailand. The large number with multicenter study or nationwide would benefit the knowledge about the relation of COVID situation and corrosive injury. Despite this, our data increased intentional self-harm/ingestion during the lockdown, and that strategies to reduce the psychosocial and economic effects of lockdown are needed.

Data Sharing Statement

The datasets used and/or analyzed during the present study are available from the corresponding author on reasonable request.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

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References

- Havanond C. Clinical features of corrosive ingestion. *J Med Assoc Thai.* 2003;86(10):918–924.
- Awsakulsutthi S, Havanond C. A retrospective study of anastomotic leakage between patients with and without vascular enhancement of esophageal reconstructions with colon interposition: Thammasat University Hospital experience. *Asian J Surg.* 2015;38(3):145–149. doi:10.1016/j.asjsur.2015.01.005
- Havanond C, Havanond P. Initial signs and symptoms as prognostic indicators of severe gastrointestinal tract injury due to corrosive ingestion. *J Emerg Med.* 2007;33(4):349–353. doi:10.1016/j.jemermed.2007.02.062
- Havanond C. Is there a difference between the management of grade 2b and 3 corrosive gastric injuries? *J Med Assoc Thai.* 2002;85(3):340–344.
- Contini S, Scarpignato C. Caustic injury of the upper gastrointestinal tract: a comprehensive review. *World J Gastroenterol.* 2013;19(25):3918–3930. doi:10.3748/wjg.v19.i25.3918
- Are'valo-Silva C, Eliashar R, Wohlgelemler J, Elidan J, Gross M. Ingestion of caustic substances: a 15-year experience. *Laryngoscope.* 2006;116(8):1422–1426. doi:10.1097/01.mlg.0000225376.83670.4d
- Chirica M, Bonavina L, Kelly MD, Sarfati E, Cattani P. Caustic ingestion. *Lancet.* 2017;389(10083):2041–2052. doi:10.1016/S0140-6736(16)30313-0
- Mahawongkajit P, Tomtitchong P, Boochangkool N, et al. Risk factors for esophageal stricture in grade 2b and 3a corrosive esophageal injuries. *J Gastrointest Surg.* 2018;22(10):1659–1664. doi:10.1007/s11605-018-3822-x
- Mahawongkajit P, Tomtitchong P, Boochangkool N, Mingmalairak C, Awsakulsutthi S. A prospective randomized controlled trial of omeprazole for preventing esophageal stricture in grade 2b and 3a corrosive esophageal injuries. *Surg Endosc.* 2020. doi:10.1007/s00464-020-07707-0
- Pace F, Antinori S, Repici A. What is new in esophageal injury (infection, drug-induced, caustic, stricture, perforation)? *Curr Opin Gastroenterol.* 2009;25(4):372–379. doi:10.1097/MOG.0b013e32832ad2e4
- Hugh TB, Kelly MD. Corrosive ingestion and the surgeon. *J Am Coll Surg.* 1999;189(5):508–522. doi:10.1016/S1072-7515(99)00160-X
- Hoffman RS, Burn MM, Gosselin S, Longo DL. Ingestion of caustic substances. *N Engl J Med.* 2020;382(18):1739–1748. doi:10.1056/NEJMr1810769
- Uygun I, Bayram S. Corrosive ingestion managements in children. *Esophagus.* 2020;17(4):365–375. doi:10.1007/s10388-020-00745-6
- Violant-Holz V, Gallego-Jiménez MG, González-González CS, et al. Psychological health and physical activity levels during the COVID-19 pandemic: a systematic review. *Int J Environ Res Public Health.* 2020;17(24):E9419. doi:10.3390/ijerph17249419
- Arnot M, Brandl E, Campbell OLK, et al. How evolutionary behavioural sciences can help us understand behaviour in a pandemic. *Evol Med Public Health.* 2020;2020(1):264–278. doi:10.1093/emph/eoaa038
- Zargar SA, Kochhar R, Mehta S, Mehta SK. The role of fiberoptic endoscopy in the management of corrosive ingestion and modified endoscopic classification of burns. *Gastrointest Endosc.* 1991;37(2):165–169. doi:10.1016/S0016-5107(91)70678-0
- Chirica M, Kelly MD, Siboni S, et al. Esophageal emergencies: WSES guidelines. *World J Emerg Surg.* 2019;14:26. doi:10.1186/s13017-019-0245-2
- Ryu HH, Jeung KW, Lee BK, et al. Caustic injury: can CT grading system enable prediction of esophageal stricture? *Clin Toxicol.* 2010;48(2):137–142. doi:10.3109/15563650903585929
- Isbister GK, Page CB. Early endoscopy or CT in caustic injuries: a re-evaluation of clinical practice. *Clin Toxicol.* 2011;49(7):641–642. doi:10.3109/15563650.2011.604035
- Abbas A, Brar TS, Zori A, Estores DS. Role of early endoscopic evaluation in decreasing morbidity, mortality, and cost after caustic ingestion: a retrospective nationwide database analysis. *Dis Esophagus.* 2017;30(6):1–11. doi:10.1093/dote/dox010
- Cheng HT, Cheng CL, Lin CH, et al. Caustic ingestion in adults: the role of endoscopic classification in predicting outcome. *BMC Gastroenterol.* 2008;8:31. doi:10.1186/1471-230X-8-31
- Sánchez-Ramírez CA, Larrosa-Haro A, Vázquez-Garibay EM, Macías-Rosales R. Socio-demographic factors associated with caustic substance ingestion in children and adolescents. *Int J Pediatr Otorhinolaryngol.* 2012;76(2):253–256. doi:10.1016/j.ijporl.2011.11.015
- Benjamin RN, David T, Iyadurai R, Jacob KS. Suicidal nonorganophosphate poisoning in a tertiary hospital in South India: nature, prevalence, risk factors. *Indian J Psychol Med.* 2018;40(1):47–51. doi:10.4103/IJPSYM.IJPSYM_223_17

24. Rampal L, Liew BS, Choolani M, et al. Battling COVID-19 pandemic waves in six South-East Asian countries: a real-time consensus review. *Med J Malaysia*. 2020;75(6):613–625.
25. Pan-Ngum W, Poomchaichote T, Cuman G, et al. Social, ethical and behavioural aspects of COVID-19. *Wellcome Open Res*. 2020;5:90. doi:10.12688/wellcomeopenres.15813.1
26. Goodwin R, Wiwattanapantuwong J, Tuicomepee A, Suttiwan P, Watakakosol R. Anxiety and public responses to covid-19: early data from Thailand. *J Psychiatr Res*. 2020;129:118–121. doi:10.1016/j.jpsychires.2020.06.026
27. Thompson JN. Corrosive esophageal injuries. I. A study of nine cases of concurrent accidental caustic ingestion. *Laryngoscope*. 1987;97(9):1060–1068. doi:10.1288/00005537-198709000-00012

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