

Endoscopic Aspects of Caustic Injuries of the Upper Gastrointestinal Tract in Parakou, Benin Republic: A Multicenter Study

Saké Khadidjatou^{1*}, Fanou Coffi Denis², Agbeille Mohamed Falilatou¹,
Hountondji Astrid Alexandrine¹, Tamou Sambo Bio Elie¹, Tchaou Blaise Adélin¹,
Sehonou Jean³, Kodjoh Nicolas³

¹Faculty of Medicine, University of Parakou, Parakou, Benin

²Military Teaching Hospital-Regional Teaching Hospital of Parakou, Parakou, Benin

³Faculty of Health Sciences, University of Abomey Calavi, Cotonou, Benin

Email: *khadisak@yahoo.fr

How to cite this paper: Khadidjatou, S., Denis, F.C., Falilatou, A.M., Alexandrine, H.A., Elie, T.S.B., Adélin, T.B., Jean, S. and Nicolas, K. (2023) Endoscopic Aspects of Caustic Injuries of the Upper Gastrointestinal Tract in Parakou, Benin Republic: A Multicenter Study. *Journal of Biosciences and Medicines*, 11, 15-24.

<https://doi.org/10.4236/jbm.2023.1110002>

Received: August 16, 2023

Accepted: September 25, 2023

Published: September 28, 2023

Copyright © 2023 by author(s) and Scientific Research Publishing Inc.

This work is licensed under the Creative

Commons Attribution International

License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

Abstract

Objective: Caustic ingestion is a medico-surgical emergency. The objective of this study is to describe endoscopic lesions of the upper gastrointestinal tract secondary to caustic ingestion in Parakou, Benin Republic. **Patients and Methods:** This was a retrospective and descriptive cross-sectional study. The study was multicenter in the gastrointestinal endoscopy units of the Teaching Hospital Center of Borgou-Alibori and the Military Teaching Hospital of Parakou. It covered the period from July 2015 to October 2021. This included any patient who ingested a caustic substance and performed a gastroscopy in one of the two endoscopy units. The variables studied were: socio-demographic data, the nature of the caustic substance ingested, the time between the caustic ingestion and the performance of gastroscopy and injuries of the upper gastrointestinal tract. **Results:** Out of the 24 patients included, 19 were men, *i.e.* a sex ratio of 3.8. Their average age was 25.54 ± 12.04 years with extremes of 6 and 50 years. Five subjects (20.83%) were under the age of 18 and the ingestion was accidental in them. Among the 19 patients aged at least 18 years, caustic ingestion was voluntary in 14 (73.68%). The caustic substance ingested was either a base (sodium hydroxide or caustic soda) or an acid (sulfuric acid) in 14 cases (58.33%) and 10 cases (41.67%), respectively. The time between the caustic ingestion and the performance of gastroscopy varied from 1 to 1095 days. The endoscopic lesions objectified were: stenosis (37.5%), ulcerations (29.17%), necrosis (20.83%), or erythema (12.25%). **Conclusion:** In Parakou, caustic ingestion, usually bases, is often voluntary in adult men. Endoscopic lesions were often ulcerative but sometimes necrotic.

Keywords

Caustic Injuries, Bases, Acids, Endoscopy, Parakou

1. Introduction

Caustic ingestion is rare but potentially serious [1]. It is a medico-surgical emergency whose management is multidisciplinary involving the emergency doctor, surgeon, radiologist, anesthetist, gastroenterologist, ENT doctor, and psychiatrist [2]. The time between ingestion and appropriate management is an important prognostic factor. The substances in question are strong acids, strong bases or oxidants [2] [3]. The extent of damage depends on the chemical properties, quantity, concentration, and physical form of the substance ingested [3] [4]. Upper gastrointestinal endoscopy plays a major role in diagnosing and assessing the severity of the caustic injury as well as guiding an appropriate treatment [5] [6]. In 2004, the World Health Organization (WHO) estimated the incidence of caustic esophagitis at 110/100,000 people per year [7]. In children, it is often an accidental exposure, whereas in adolescents and adults it is mostly a voluntary act with a suicidal goal [3]. Alan *et al.* [4] have compiled an overview of corrosive product ingestions by consulting book chapters and articles published from 1970 to 2018. It showed that in adults, ingestion of corrosives is mostly done by suicidal patients or those suffering from serious psychiatric disorders. Accidental ingestions are often benign [4]. Dangerous commercial products are available in the home environment. Among the corrosives commonly found are oxidants such as bleach, hydrogen peroxide, or potassium permanganate, but also bases, often associated with surfactants in household products or unblocking furnace cleaners, drain cleaners, oven and grill cleaners, and acids such as sulfuric, nitric, and hydrochloric acids in toilet bowl cleaners, rust removers, automobile batteries, and finally in lesser quantities in solvents such as white spirit or formaldehyde [4]. Early endoscopy is recommended because about 30% of patients with caustic ingestion will have no injury and can be discharged promptly. Endoscopy is usually done within 24 - 48 h after ingestion. However, many experts have recommended endoscopy as soon as possible because delayed endoscopy is associated with prolonged hospital stays and increased hospital expense [5]. Classification and severity of caustic injury on endoscopy help predict outcomes [5]. In Benin, few data are available on caustic injuries. The present work aims to describe endoscopic lesions of the upper gastrointestinal tract secondary to caustic ingestion in Parakou, in the North of Benin Republic. In this work we approached successively with the methodology used, the results we arrived at, which we have discussed, and then the conclusion.

2. Patients and Methods

2.1. Type and Period of Study

This was a retrospective and descriptive cross-sectional study. It covered a pe-

riod of 6 years and 3 months from July 2015 to October 2021.

2.2. Study Framework

The study was multicenter. It was conducted in the gastrointestinal endoscopy units of the Teaching Hospital of Borgou-Alibori (CHUD-B/A) and the Military Teaching Hospital (HIA-CHU) of Parakou, Benin Republic.

2.3. Study Population

The study focused on patients seen for a gastrointestinal endoscopy (GIE) following a caustic ingestion in one of the two gastrointestinal endoscopy units, during the study period.

- Inclusion criteria: any patient having ingested a caustic substance and performed a GIE in one of the two gastrointestinal endoscopy units was included
- Non-inclusion criteria: was not included, any patient having ingested another toxic substance such as herbicides or formalin

2.4. Sampling

An exhaustive recruitment of all patients who had ingested a caustic substance and were admitted during the study period in one of the chosen gastrointestinal endoscopy units was carried out. The sampling method was non-probabilistic. Any patient meeting the inclusion criteria was registered.

2.5. Judgment Criteria

A caustic substance was considered ingested upon declaration by the patient and/or his/her entourage. The nature of the caustic substance ingested was specified by the patient, his/her entourage or visualized by the doctor through its packaging. The date and time of ingestion were indicated approximately by the patient or his/her entourage.

2.6. Performance of Upper Gastrointestinal Endoscopy (GIE)

GIE was performed by gastroenterologists in patients with no signs of digestive perforation, fasting for at least 6 hours under local anesthesia with lidocaine hydrochloride (Xylocaine[®]) gel. Insufflation was minimal during the examination. Endoscopic lesions were evaluated according to Zargar's classification [8]. This classification is as follows:

- Grade 0: Normal examination;
- Grade 1: Erythema, edema;
- Grade 2a: Superficial ulcerations, pseudomembranes, hemorrhage of the mucosa;
- Grade 2b: Deep discrete and circumferential ulcerations;
- Grade 3a: Focal and non-circumferential necrosis;
- Grade 3b: Extensive and circumferential necrosis.

2.7. Variables

The variable of interest was caustic ingestion. The variables studied were: socio-demographic data, the nature of the caustic substance ingested, the time between the caustic ingestion and the performance of GIE, and injuries of the upper gastrointestinal tract.

2.8. Data Collection

Data were collected using endoscopy registers of the two gastrointestinal endoscopy units selected.

2.9. Data Processing and Analysis

Data analysis was done using SPSS 21 software. Hejase & Hejase [9] contend that giving data meaning leads to useful information. Furthermore, according to Hejase and Hejase [10], “descriptive statistics deals with describing a collection of data by condensing the amounts of data into simple representative numerical quantities or plots that can provide a better understanding of the collected data.” Therefore, the qualitative variables were expressed in frequency and percentage. In addition, the mean and standard deviation were used for the quantitative variables whose distribution was normal, otherwise the median with the 1st and 3rd quartiles. Data were depicted in tables for simplicity of visualization.

2.10. Ethical Considerations

In this retrospective study, the data collected were used with respect for anonymity and confidentiality.

3. Results

3.1. Sociodemographic Data of Patients

A total of 24 patients were included. 5 and 19 of them were children and adults, respectively. According to the Convention on the Rights of the Child, subjects under the age of 18 years were considered children. Nineteen patients (79.17%) were male, *i.e.*, a sex ratio of 3.8. Their average age was 25.54 ± 12.04 years with extremes of 6 years and 50 years. Patient socio-demographic data are summarized in **Table 1**.

3.2. Data on the Caustic Substance Ingested

In all the patients included, the caustic substance ingested was in liquid form. The caustic ingestion was accidental in 10 patients including 5 children. In all the children included in this study, the caustic ingestion was only accidental. In the 19 adults, the ingestion was voluntary 14 times (73.68%). The nature of the substance ingested was either a base (sodium hydroxide or caustic soda) or an acid (sulfuric acid) in 14 cases (58.33%) and 10 cases (41.67%), respectively.

Table 1. Distribution of patients according to socio-demographic data (n = 24, CHUD-B/A, HIA-CHU, Parakou, 2015-2021).

	Size	Percentage (%)
Age (years)		
<18	05	20.83
[18 - 28[07	29.17
[28 - 38[10	41.66
[38 - 48[01	04.17
≥48	01	04.17
Sex		
Male	19	79.17
Female	05	20.83

3.3. Data on GIE

The median time between the caustic ingestion and the performance of GIE was 7.5 days [3.5; 21], with extremes of 1 and 1095 days. Twelve (50%) had performed this examination before the seventh day after the caustic ingestion. At least one segment of the upper gastrointestinal tract was normal in 15 patients (62.50%). The endoscopic lesions objectified were: ulcerations in 13 patients (n = 54.17%), stenosis in 9 patients (37.50%), necrosis in 9 patients (37.50%) or erythema in 6 patients (25%). The stenosis was esophageal in 8 patients and duodenal in one patient. The stenosis occurred mainly in patients who had accidentally ingested the caustic substance (4 children and 5 adults). On the other hand, the cases of necrosis, ulceration and erythema were more frequent in voluntary ingestion. **Table 2** shows the distribution of patients according to the site and type of endoscopic lesions based on Zargar's classification. In the esophagus, lesions were often discreetly deep or circumferential ulcerations (5 patients) and localized necrosis (5 patients). The gastric mucosa was often endoscopically normal (8 patients) or there were superficial ulcerations (6 patients). In more than half of patients (13 *i.e.* 54.17%), the duodenum was not affected.

Table 3 shows the distribution of patients according to the voluntary nature or not of the caustic ingestion and the type of endoscopic lesions. Necrosis was more frequent in subjects who had voluntarily taken the caustic (5 gastric localizations versus none in the case of accidental ingestion). As for ulcerations, they were much more frequent in cases of voluntary ingestion of caustics (5 cases) than in cases of accidental intake (2 cases).

4. Discussion

This study provided an overview of secondary injuries to caustic ingestion at Parakou in the Benin Republic. This is one of the rare studies on this topic in Benin.

Table 2. Distribution of patients according to the site and type of endoscopic lesions based on Zargar's classification (n = 24, CHUD-B/A, HIA-CHU, Parakou, 2015-2021).

		Size	Percentage (%)
Esophagus	Grade 0	04	16.67
	Grade 1	02	08.33
	Grade 2a	02	08.33
	Grade 2b	05	20.83
	Grade 3a	05	20.83
	Grade 3b	00	00
	Stenosis*	08	33.33
Stomach	Grade 0	08	33.33
	Grade 1	04	16.67
	Grade 2a	06	25
	Grade 2b	01	04.17
	Grade 3a	02	08.33
	Grade 3b	03	12.50
	Stenosis*	00	00
Duodenum	Grade 0	13	54.17
	Grade 1	02	08.33
	Grade 2a	05	20.83
	Grade 2b	01	04.17
	Grade 3a	01	04.17
	Grade 3b	01	04.17
	Stenosis*	01	04.17

*Stenosis may be associated with other lesions at the same time.

Table 3. Distribution of patients according to whether the caustic ingestion was voluntary or not and the type of endoscopic lesions based on Zargar's classification (n=24, CHUD-B/A, HIA-CHU, Parakou, 2015-2021).

		Voluntary ingestion		Accidental ingestion	
		Size	%	Size	%
Stenosis (n = 09)	Esophageal	03	33.33	05	55.56
	Gastric	00	00	00	00
	duodenal	01	11.11	00	00
Necrosis (n = 09)	Esophageal	03	33.33	02	22.22
	Gastric	05	55.56	00	00
	Duodenal	02	22.22	00	00

Continued

Ulceration (n = 13)	Esophageal	05	38.46	02	15.38
	Gastric	05	38.46	02	15.38
	Duodenal	05	38.46	01	07.69
Erythema (n = 06)	Esophageal	02	33.33	00	00
	Gastric	01	16.67	03	50
	Duodenal	01	16.67	01	16.67
No lesion (n = 15)	Esophageal	02	13.33	02	13.33
	Gastric	03	20	05	33.33
	Duodenal	05	33.33	08	53.33

A patient can have several lesions at the same time.

In 6 years and 3 months, in the two gastrointestinal endoscopy units of Parakou, 24 cases were included, which indicates the rarity of the phenomenon. The same observation is made in several countries in the world but through monocentric studies. In Germany, in 12 years, Hollenbach *et al.* [11] found 31 adults who had ingested a caustic substance. Okugbo *et al.* [12] in Nigeria identified in 14 years, 49 children aged 1 to 16 who had ingested a caustic substance. In Ghana, over 12 years, Tetey *et al.* [13] reported 29 cases of caustic ingestion with serious pharyngo-esophageal injuries in subjects aged 2 to 56 years.

Caustic ingestion is often accidental in children, but voluntary in adults. In the present study, all cases of caustic ingestion in children were accidental but voluntary in more than 7 out of 10 adults. Accidental ingestions in adults occur mainly at night, during an episode of intense thirst. They are favored by acute alcoholic intoxication and the deconditioning of the caustic substance (substance transferred into a bottle for food use and not labeled) or the siphoning of a caustic substance [2]. The quantity ingested is lower in attempts at autolysis. Attempts at autolysis account for 75% of ingestions. They occur in a particular psychiatric context such as depression or psychosis, known in 50% of cases. We frequently note a context of isolation, affective immaturity, or a break in psychiatric treatment. These ingestions can be massive and an association with drug or alcohol poisoning should be sought [2].

According to a study based on 396 adults, Chen *et al.* [14] in Taiwan reported that the presence of psychiatric comorbidities predicted severe endoscopic lesions of the upper GI tract, higher rates of surgical admission and intensive care unit stay, an increase in systemic and gastrointestinal complications and poorer 5-year relative survival rates in patients with caustic ingestion.

In a Nigerian study of 49 children, 97.96% of patients accidentally ingested the caustic substance [12]. In another Ghanaian study including both children and adults, caustic ingestion was accidental in all 29 subjects included [13].

In the present study, six out of ten patients ingested caustic soda used for local soap making and the others ingested sulfuric acid contained in car and motor-

cycle batteries. All the children have accidentally taken caustic soda and this poses the problem of parental negligence. They keep this dangerous substance in packaging intended for water or soft drinks and leave them accessible to children. In several studies around the world, the most ingested substance in both children and adults is base, especially caustic soda [6] [11] [12] [13] [15] [16].

In the present study, the delay between caustic ingestion and the performance of GIE was long. This could be explained by the delay in consultation, the use of self-medication with milk or palm oil and the lack of financial means for the performance of GIE.

Stenosis on GIE is one of the chronic complications of caustic ingestion. This stenosis was reported in 4 of the 5 children who accidentally ingested caustic substances. It is therefore the responsibility of parents not to leave these substances within the reach of children. Cases of necrosis, ulcerations and erythema were more frequent in the event of voluntary ingestion. Indeed, in these cases, the patient ingests a more or less important quantity of the substance which promotes the occurrence of more or less serious GI tract injuries. In the present study, duodenal injuries seem to be frequent (10 out of 24 patients, *i.e.*, 41.67%); as in a German study in which 11 out of 31 patients (35.48%) had duodenal injuries [11]. In Iran, in a referral hospital, 32 subjects out of 150 (21.33%) who ingested a caustic substance had duodenal injuries [16]. These findings are contrary to data in the literature. According to literature, a pylorospasm prevents the arrival of caustic substances in the duodenum. In Mexico, only 8 children out of 133 (6.02%) had duodenal injuries [15]. This last result corroborates the data of the literature.

The main limitation of this study is its retrospective nature, which did not allow the assessment of the therapeutic management and evolution of patients.

Prospective studies involving a larger number of patients over a longer period of time are needed to evaluate clinical signs, psychiatric history of patients, treatment and evolution.

5. Conclusion

In Parakou, bases are the main caustic substance ingested. This ingestion is often voluntary in men. The most common endoscopic lesions are ulcerations. Prospective studies on a larger scale are necessary to address the therapeutic and evolutionary aspects of caustic ingestion in the Benin Republic.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] Chirica, M., Bonavina, L., Kelly, M.D., Sarfati, E. and Cattan, P. (2017) Caustic Ingestion. *The Lancet*, **389**, 2041-2052.
[https://doi.org/10.1016/S0140-6736\(16\)30313-0](https://doi.org/10.1016/S0140-6736(16)30313-0)

- [2] Fieux, F., Chirica, M., Villa, A., Losser, M.-R. and Cattan, P. (2009) Ingestion de produits caustiques chez l'adulte. *Réanimation*, **18**, 606-616. <https://doi.org/10.1016/j.reaurg.2009.08.003>
- [3] Société Française d'Endoscopie Digestive (2011) Consensus en endoscopie digestive: Prise en charge de l'oesophagite caustique. *Acta Endoscopica*, **41**, 303-308. <https://doi.org/10.1007/s10190-011-0191-7>
- [4] Hall, A.H., Jacquemin, D., Henny, D., Mathieu, L., Josset, P. and Meyer, B. (2019) Corrosive Substances Ingestion: A Review. *Critical Reviews in Toxicology*, **49**, 637-669. <https://doi.org/10.1080/10408444.2019.1707773>
- [5] Methasate, A. and Lohsiriwat, V. (2018) Role of Endoscopy in Caustic Injury of the Esophagus. *World Journal of Gastrointestinal Endoscopy*, **10**, 274-282. <https://doi.org/10.4253/wjge.v10.i10.274>
- [6] Morilla Fernández, J.A., Egea Valenzuela, J., Fernández Llamas, T., Melero Nicolás, B., Navalón Rubio, M., Gil Ortega, D., *et al.* (2021) The Role of Endoscopy in Caustic Ingestion in the Pediatric Population: Experience in a Tertiary Center. *Revista Espanola De Enfermedades Digestivas*, **113**, 272-275. <https://doi.org/10.17235/reed.2020.7171/2020>
- [7] Othman, N. and Kendrick, D. (2010) Epidemiology of Burn Injuries in the East Mediterranean Region: A Systemic Review. *BMC Public Health*, **10**, 83-92. <https://doi.org/10.1186/1471-2458-10-83>
- [8] Zargar, S.A., Kochhar, R., Nagi, B., Mehta, S. and Mehta, S.K. (1989) Ingestion of Corrosive Acids Spectrum of Injury to Upper Gastrointestinal Tract and Natural History. *Gastroenterology*, **97**, 702-707. [https://doi.org/10.1016/0016-5085\(89\)90641-0](https://doi.org/10.1016/0016-5085(89)90641-0)
- [9] Hejase, A.J. and Hejase, H.J. (2011) Foundations of Management Information Systems. Sader Publishers, Beirut, 61.
- [10] Hejase, A.J. and Hejase, H.J. (2013) Research Methods, a Practical Approach for Business Students. 2nd Edition, Massadir Inc., Philadelphia, 220.
- [11] Hollenbach, M., Tünnemann, J., Struck, M.F., Feisthammel, J., Schlosser, T., Schaumburg, T., *et al.* (2019) Endoscopic Findings and Outcome in Caustic Ingestion of Acidic and Alkaline Agents in Adults: A Retrospective Analysis. *Medicine*, **98**, 35-41. <https://doi.org/10.1097/MD.00000000000016729>
- [12] Okugbo, S.U., Anyahun, G.A., Efobi, C.A. and Okugbo, O.T. (2020) Presentation and Management Outcome of Childhood Corrosive Oesophageal Injury in Benin City. *African Journal of Paediatric Surgery*, **17**, 74-78. https://doi.org/10.4103/ajps.AJPS_90_10
- [13] Tettey, M., Edwin, F., Tamatey, M., Okonta, K., Entsua-Mensah, K., Adzamlı, I., *et al.* (2022) Management of Caustic Pharyngoesophageal Injuries in Korle Bu Teaching Hospital, Accra, Ghana: A 12-Year Retrospective Review of 29 Cases. *The Pan African Medical Journal*, **42**, Article No. 213. <https://doi.org/10.11604/pamj.2022.42.213.30206>
- [14] Chen, Y.-J., Seak, C.-J., Chen, C.-C., Chen, T.-H., Kang, S.-C., Ng, C.-J., Lee, C.-W., *et al.* (2020) The Association between Caustic Ingestion and Psychiatric Comorbidity Based on 396 Adults within 20 Years. *Risk Management and Healthcare Policy*, **13**, 1815-1824. <https://doi.org/10.2147/RMHP.S272527>
- [15] Barrón Balderas, A., Robledo Aceves, M., Coello Ramírez, P., García Rodríguez, E. and Barriga Marín, J.A. (2018) Endoscopic Findings of the Digestive Tract Secondary to Caustic Ingestion in Children Seen at the Emergency Department. *Archivos Argentinos de Pediatría*, **116**, 409-414. <https://doi.org/10.5546/aap.2018.eng.409>

- [16] Banagozar Mohammadi, A., Zaare Nahandi, M., Ostadi, A., Ghorbani, A. and Hal-laj, S.H. (2022) Endoscopic, Laboratory, and Clinical Findings and Outcomes of Caustic Ingestion in Adults; a Retrospective Study. *Gastroenterology and Hepatology from Bed to Bench*, **15**, 59-65.