

Original Research Article

MANAGEMENT OF ACCIDENTAL INGESTIONS OF CAUSTIC PRODUCTS IN EMERGENCY DEPARTMENTS IN DAKAR : ABOUT 31 CASES

ABSTRACT

Background : Caustics are corrosive substances whose ingestion causes tissue damage that can range from mucosal irritation to total necrosis or even perforation of the affected digestive or bronchial segment. Ingestion is often accidental in children and a real public health problem in low and middle income countries, particularly in Africa.

Aims : The main objective of this study was to describe the epidemiological, diagnostic, therapeutic and scalable aspects of accidental ingestions of caustics in the medical emergency department of the National Children's Hospital Center Albert Royer (NCHCAR) in Dakar. **Methods :** This is a descriptive and analytical study over a 12-month period, from March 2020 to February 2021. The study population was children aged 0 to 15 years who were seen in consultation or hospitalized following a caustic product ingestion.

Results : During the study period, we included 31 children for accidental ingestion of caustics out of a total of 900 hospitalized children, i.e., a hospital frequency of 3.44% (31/900). The mean age of the children was 21.29 ± 13.10 months and the extremes were 8 and 60 months. The age group [12-18 months] was the most represented (25.81%). Boys were predominant (51.61%) with a sex ratio of 1.07. Sodium hypochlorite (bleaching water) was the main product ingested (64.52%); caustic soda concerned 22.58% of children. More than half (77.45%) of the children were symptomatic with mainly digestive signs including oral ulcerations (41.93%) and vomiting (38.71%). The oesogastroduodenal fibroscopy performed in 19 of the 31 children (61.29%) was normal in 14 children (73.68%). Five children had endoscopic lesions of which 2 cases were stage I and 3 cases stage IIa of the Zargar classification. Initial management was exclusively medical with antisecretory drugs (70.97%), analgesics (38.71%) and corticosteroids (35.48%). The evolution was favorable for

the majority of patients. One child presented a dysphagia to solids after 4 weeks of evolution treated by endoscopic dilatation.

Conclusion : Accidental ingestions of caustics are frequent in emergency departments. They generally affect children under 24 months of age. The management is medical in the uncomplicated forms which are more and more predominant. Prevention is based on education and awareness of the dangers of caustic products.

Keywords : *caustic ingestion, accident, child, digestive endoscopy*

1. INTRODUCTION

Caustics are corrosive substances whose ingestion causes tissue damage ranging from mucosal irritation to total necrosis or even perforation of the affected digestive or bronchial segment [1]. There are three main classes of caustics: strong acids ($\text{pH} < 2$), strong bases ($\text{pH} > 12$) and oxidants. Caustics are used in many household, industrial and agricultural products. Some are merely irritants and generally do not cause severe injury; others, such as strong acids, strong bases or oxidants, are highly corrosive [2]. Ingestion is often accidental in children. It is a real public health problem in low- and middle-income countries, particularly in Africa. In 2004, the World Health Organization (WHO) estimated the incidence of caustic esophagitis at 110/100,000 people per year [3]. In France, there are around 15,000 cases of caustic ingestion per year. In Africa, the incidence of accidental caustic ingestions is estimated at 0.8% in the Congo [4], while in Morocco it is 3.6% [5]. In Senegal, caustic ingestion accounts for 20.4% of childhood domestic accidents [6], with an estimated incidence of 1.3% [7]. Accidental caustic ingestion is a medico-surgical emergency which in severe cases, can be life-threatening or even fatal. The severity of the clinical picture depends on the volume ingested, the contact time with tissues and the type of product. Delayed treatment and inadequate technical facilities, often

encountered in Africa, also contribute to morbidity and mortality. Diagnosis is mainly clinical, with biology, imaging and endoscopic explorations used to assess lesions and guide therapeutic decisions [8]. Existing data mainly concern the surgical management of caustic ingestions. The main objective of this study was to describe the epidemiological, diagnostic, therapeutic and evolutionary aspects of accidental caustic ingestions in the medical emergency department of the National Children's Hospital Center Albert Royer (NCHCAR) in Dakar.

2. MATERIAL AND METHODS

2.1. Study site

The study took place in the emergency department (ED) of the Albert Royer National Children's Hospital in Dakar. All children aged 0 - 18 years are admitted to this department for consultation for any reason. It includes a triage unit, an emergency room where vital emergencies are treated, a short-term hospitalization room and ambulatory follow-up boxes.

2.2. Type and duration of study

This is a descriptive study over a 12-month period, from March 2020 to February 2021.

2.3 Study population

2.3.1 Inclusion criteria

Any child aged 0 to 15 seen in consultation or hospitalized in the ED following ingestion of a caustic product.

2.3.2 Non-inclusion criteria

Patients with incomplete or unusable records.

2.4 Data collection and analysis

○ Collection tools

- A pre-established data collection form;
- Collection of information from medical files

○ Parameters studied

The following parameters were studied for all included cases :

- Epidemiological (children's age, gender, parents' occupation, type of product ingested, quantity ingested, procedures performed at home by parents)
- Clinical and paraclinical (ED consultation time, clinical manifestations, biological signs, endoscopic signs, imaging)
- Therapeutic (time taken to attend the emergency department, type of treatment, drugs administered, dietary intake and length of hospital stay)
- Follow-up : patients were followed up at day 8 and week 4, by telephone call or on-site visit.

2.5 Statistical analysis

The data collected was entered into Excel. Analysis was carried out with Epi Info Version 7. For descriptive analysis, qualitative variables were described by frequency tables, bar charts and pie charts. Quantitative variables were described by their position (mean, median and mode) and dispersion (standard deviation, extremes) parameters.

3 RESULTS AND DISCUSSION

3.1 RESULTS

Over the study period, we included 31 children with accidental caustic ingestion out of a total of 900 hospitalized, representing a hospital frequency of 3.44% (31/900).

The mean age of the children was 21.29 ± 13.10 months, with extremes of 8 and 60

months. The mode and median were 17 and 18 months respectively. The age group [13-24 months] was the most represented (48.39%) (Table 1). Boys predominated (51.61%), with a sex ratio of 1.07. The great majority of children came from suburban areas (93.55%). Sodium hypochlorite (bleaching water) was the main product ingested (64.52%); caustic soda concerned 22.58% of children (Figure 2). In more than half the cases, the quantity ingested was not specified by the parents (67.74%), and was low in 22.60% of cases. The average time to the emergency room was 2.37 ± 2.11 hours (1-8 hours). The mode and median were one hour. Milk administration was the main procedure performed at home by parents (63.64%) (Table 3). More than half (77.45%) of the children were symptomatic, with mainly digestive signs including oral ulcerations (41.93%) and vomiting (38.71%) (Table 2). Oesogastroduodenal fibroscopy was performed in 19 of the 31 children (61.29%), and was normal in 14 (73.68%). Five children had endoscopic lesions, including 2 with stage I and 3 with stage IIa of the Zargar classification. Initial management was exclusively medical, with antisecretory agents (70.97%), analgesics (38.71%) and corticosteroids (35.48%) (figure 2). The majority of patients had a favourable outcome. One child developed dysphagia to solids after 4 weeks, treated by endoscopic dilatation.

3.2 DISCUSSION

In Senegal, accidental ingestions of caustics are a frequent reason for emergency room visits (3.44%). We recorded a total of 31 cases over the 12 months of the study, representing a frequency of 2.6 cases per month. In Africa, the same frequency was found in Congo, with 2.8 cases [4]. It was slightly lower in Algeria, at 2 cases per month [9]. This high frequency of caustic ingestions in Africa is partly linked to the fact that parents are often less vigilant in supervising their children, but

also to the repackaging of these products in unsuitable containers, such as bottles usually containing mineral water intended for consumption. The confinement imposed on the population during the covid-19 pandemic period (2020), with school closures, is another explanation. The majority (71%) were under 24 months of age, with a predominance of children aged 12 to 18 months (25.81%). These results concur with those observed in the literature, where caustic ingestion was noted in children aged 6 to 60 months [4, 7, 9, 10]. This is the age at which children are most vulnerable to domestic accidents, due to their curiosity to discover their surroundings and explore the environment, and above all their immaturity in discerning objects or products that are dangerous to their physical integrity. In all cases, ingestion was accidental. According to the literature, boys are usually more vulnerable to domestic accidents, due to their more turbulent and agitated nature. This was also our finding, with a male predominance and a sex ratio of 1.07. However, a slight female predominance was found in some series [9, 11]. Sodium hypochlorite (bleaching water) was implicated in 71% of cases, while caustic soda accounted for 29%. Similar findings have been reported in Congo [4] and Italy [12]. Bleaching water is commonly used by domestic servants in households for washing up and laundry. Caustic soda is often used in powder or soap form by the underprivileged for laundry and other household needs. They are often decanted into containers intended for consumer products. This explains the frequent involvement of these products in accidents. The quantity ingested was minimal in most cases, as in the case of accidental intake, in contrast to an attempt at autolysis, where the quantity ingested is often large and massive. This has been the case in other series in the literature [4, 7, 10]. The average consultation time was 3 hours after ingestion for more than half the children (61%). This delay could be linked to the fact that parents often

administer a substance to the child before thinking of seeking treatment. In 7 cases, the child was given milk, in 1 case food, and in 1 case mouthwash. Clinical manifestations were dominated by gastro-intestinal (GI) signs, notably oral ulcerations (41.93%), vomiting (38.71%), hypersalivation and dysphagia (29.03) each. Respiratory signs were dyspnoea, stridor and laryngeal oedema, 1 case each. These were less frequent, given the minimal quantity of substance ingested. These data concur with the predominance of digestive signs reported in the literature. Respiratory, cutaneous and ORL signs occur mainly in the event of large-scale ingestion, false routes or induced vomiting [4, 7, 9, 13]. Upper GI endoscopy is the key examination for assessing lesions and guiding medical and surgical management. However, according to some authors, it should not be performed systematically, as it is an invasive examination that is performed under general anaesthetic in small infants, and is often normal, showing no oesophageal or gastric digestive lesions. It also carries the risk of digestive perforation or haemorrhage. In 50-75% of cases, endoscopy is normal or reveals only minimal lesions. Severe lesions are detected in 4 to 37% of cases, depending on the series. [14, 15, 16]. In our series, it was performed in 61.29% of cases (19/31), including 14 children with a normal result (73.68%). Five (5) children had endoscopic lesions, including one at stage IIa of the Zargar classification. For all these children, symptoms were either minimal or absent. This finding, in line with the literature, reinforces the recommendation that oesogastroduodenal fibroscopy should not be performed routinely. It is only useful for patients with noisy symptoms, who may have taken a significant amount of caustic on questioning. This certainly requires a meticulous clinical examination, but above all a well-conducted interview. Management of caustic ingestions is medical and surgical, depending on endoscopic lesions and

complications. Surgery is usually performed in severe cases with acute digestive perforation or esophageal stenosis. In our series, all children were treated in medical emergencies. None presented a complication requiring surgical treatment on admission. In addition to standard general measures, the 3 pillars of medical treatment include antisecretory agents, corticosteroids and antibiotic prophylaxis. Although there is no consensus on the recommendations, authors use them in different proportions. Although widely debated, corticosteroid therapy is recommended by many authors for its anti-inflammatory and anti-granulomatous action. It is also used to prevent esophageal stenosis. To be effective, corticosteroids must be administered early and in high doses (1g/1.73m² body surface area/D) [17, 18]. In our series, corticosteroid therapy was used sparingly (35.5%). This is linked to the fact that we did not have many severe cases, with a high proportion of asymptomatic patients. Corticosteroids are indicated in severe cases with deep ulceration classified as Zargar stage IIb. Corticosteroids were administered in 100% of patients in one study in Morocco [14], and in none in another [9]. Anti-secretory agents were widely prescribed in 71% of patients, as was the case in France in 61% of cases [19]. Antibiotics were rarely prescribed in our patients (19.35%), in contrast to some where they were systematically used in all patients [10]. We noted one case of esophageal stenosis managed by endoscopic dilatation. In addition, the evolution was good.

Table 1 : Features of population

Features	Number (n)	Percentages (%)
Age group (months)		

0 – 12	7	22,58
13 – 24	15	48,39
25 – 36	5	16,13
>36	4	12,92
Gender		
Boys	16	51,61
Girls	15	48,39
Area of residence		
City center	14	45,16
Periphery	17	54,84
Parents' occupation		
Employed	18	58
Not employed	13	42

Table 2 : Distribution of children according to clinical manifestations

clinical manifestations	Number (n)	Percentages (%)
Gastrointestinal signs		
Oral ulceration	13	41,93
Vomiting	12	38,71
Hypersalivation	9	29,03
Dysphagia	9	29,03
Labial tumefaction	9	29,03
Odynophagia	8	25,80
Buccal erosion	8	25,80
Epigastric pain	1	3,22
Respiratory Signs		
Dyspnea	1	3,22
Stridor	1	3,22

Laryngeal edema	1	3,22
Cutaneous and mucosal signs		
Skin scalds	2	6,45
Redness of the eyes	2	6,45

Table 3 : Distribution of children by gesture performed at home (N=11)

Immediate actions	Frequency (n)	Percentage (%)
Milk intake	7	63,64
Oral rinsing	1	9,09
Early feeding	1	9,09
Palm oil intake	1	9,09
Induced vomiting	1	9,09
Total	11	100,00

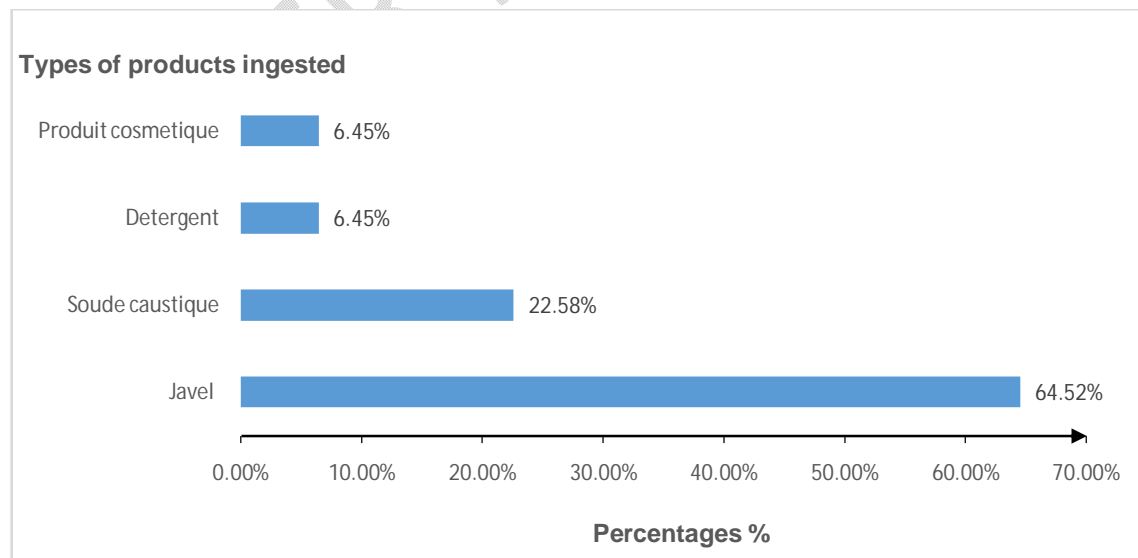


Figure 1 : Children by type of product ingested (N=31)

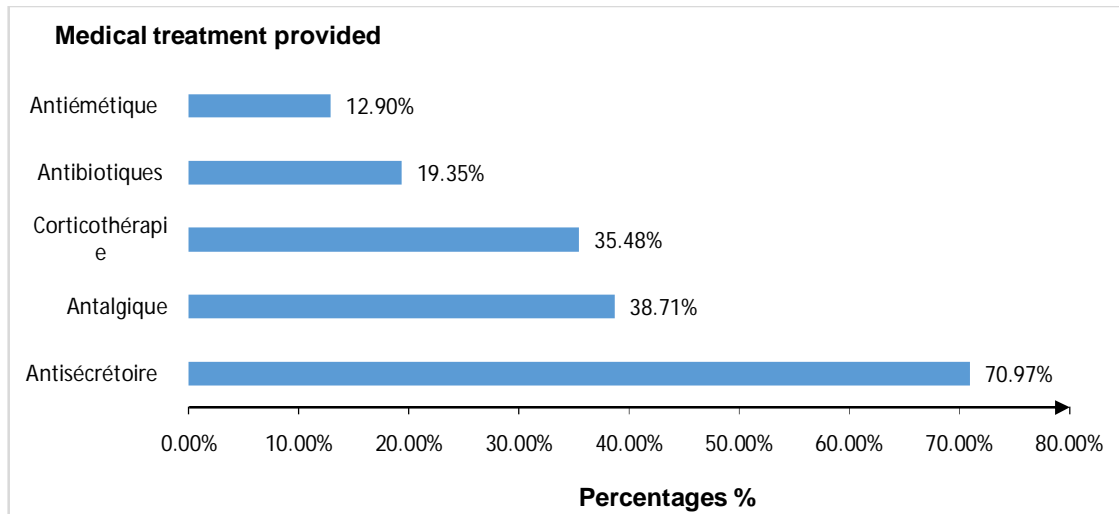


Figure 2 : Distribution of children by type of care (N=31)

4. CONCLUSION

Accidental ingestions of caustics are frequent in emergency departments. They generally affect children under 24 months of age. Treatment is medical in uncomplicated cases. Prevention is based on educating the public and raising awareness of the dangers of caustic products.

Consent

As per international standard, parental written consent has been collected and preserved by the author(s).

Ethical Approval:

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

Not conflicts of interest

REFERENCES

1. Mathe D, Marget B. Ingestion of caustics. *Encycl Medchir* 2007; 25-030-A-20.
2. De Ferron P., Gossot D., Sarfati E., C  lerier M. Oesogastric lesions caused by ingestion of liquid chlorine bleach in adults. *Med Press.* 1987; 16 (42): 2110-2.
3. Lambert H, Manel J, Bellou A. Ingestions of corrosives. Acute poisoning. Amsterdam: Elsevier 1999; 333-50.
4. Ikobo L, Apendi PCA, Ibara B, Jean Robert Mabilia Babela^{1,2}, Deby-Gassaye et al. Ingestion of Caustics by Children in Brazzaville. *Open Journal of Pediatrics*, 2018, 08(03):283-291. DOI : 10.4236/ojped.2018.83029.
5. Association of poison control and toxicovigilance centres. Exposure to bleach in the home: Study of cases recorded by poison control and toxicovigilance centers, France, 2011.
6. Mohamed, A. S., Mbaye, P., Fall, M., Diouf, A., Ndoeye, N., Diaby, A. et al. Epidemiology of Domestic Accidents in Children in Dakar (Senegal). *Health Sci Dis* 2019, 25; 20 (5).
7. F. Ly, B. Camara, F. Ngomna, A. Sakho Kane, A. Sall Diouf, et al. Acute poisoning in the pediatric department of the National Hospital Center of Pikine. A propos of 34 collected cases. *Med. Afr. Black.* 2019; 6604: 200-209
8. Zargar S.A., Kochhar R., Metha S., Metha S K. The role of fiberoptic endoscopy in the management of corrosive ingestion and modified endoscopic classification of burns. *Gastrointest Endosc.* 1991; 37(2):165-9.
9. N. Oumnia, M. Lahcene, A. Tebaibia, A. Djenaoui, M.A. Boudjella, N. Matougui et al. Epidemiology and evolution of caustic burns of the upper digestive tract: about 483 cases. *J Afr Hepato Gastroenterol.* 2009; 3(3): 130-6. Doi : 10.1016/S0399-8320(09)72702-2

10. Niedzielski A, Schwartz SG, Partycka-Pietrzyk K, Grażyna Mielnik-Niedzielska. Caustic Agents Ingestion in Children: A 51-Year Retrospective Cohort Study. *Ear Nose Throat J.* Jan 2020; 99(1): 52-7. DOI: 10.1177/0145561319843109
11. Bedou M, Lahmidani NI. Management of caustic ingestions: experience of CHU Hassan of FES. *International Journal of Advanced Research.* 2020; 08 (04): 205-14.
12. Di Nardo G, Betalli P, Illiceto MT, Giannotti Giulia, Luigi Martemucci, Flora Caruso et al. Caustic Ingestion in Children: 1 Year Experience in 3 Italian Referral Centers. *J Pediatr Gastroenterol Nutr.* 2020 Jul;71(1):19-22. DOI: 10.1097/MPG.0000000000002685.
13. Karaman İ, Koç O, Karaman A, Derya Erdoğan, Yusuf Hakan Çavuşoğlu, Çağatay Evrim Afşarlar et al. Evaluation of 968 children with corrosive substance ingestion. *Indian J Crit Care Med.* 2015 ; 19(12): 714-8. DOI: 10.4103/0972-5229.171377.
14. S. Roida, I. Ait Sab, M. Sbihi. Ingestion of caustic product in children. *Journal of Pediatrics and Child Care* (2010) 23, 179-184.
15. De Jong AL, Macdonald R, Ein S, V Forte, A Turner. Corrosive esophagitis in children: a 30-year review. *Int J Pediatr Otorhinolaryngol* 2001; 57:203-17. DOI: 10.1016/s0165-5876(00)00440-7.
16. Betalli P, Falchetti D, Giuliani S, Alessandro P, Luigi DO, Gian LA et al. Caustic ingestion in children: Is endoscopy always indicated? The results of an Italian multicenter observational study. *Gastrointestinal Endoscopy* 2008; 68:434-9. DOI : 10.1016/j.gie.2008.02.016.
17. Boukthir S, Fetni I, Mrad SM, Mongalgi MA, Debbabi A, Barsaoui S. High-dose corticosteroid therapy in the treatment of severe caustic esophagitis in children. *Arch Pediatr.* 2004;11(1):13-7. doi: 10.1016/j.arcped.2003.10.011.
18. Breton A, Olives JP, Cadranel S. Management of severe caustic esophageal burns in children with very high doses of steroid. *J Pediatr Gastroenterol Nutr* 2004; 39: S458.
19. Rodriguez A, Thumerel M, Delcambre F. Proposal for a recommendation concerning the therapeutic management of esophageal and gastric lesions after ingestion of caustic in adults. *Chir. cardiovascular chest.* 2013; 17(3): 139-50