

Overview of caustic ingestion cases at the Children's Hospital of Vilnius University Hospital Santaros klinikos between 2011 and 2018

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Background. Although not common, caustic ingestion can cause serious injury and sequelae. Clinical symptoms do not always represent the depth of lesions of the intestinal tract, which makes management of these patients difficult.

Materials and methods. Between 2011 and 2018, we performed a retrospective one-centre study on ingestion of corrosive agents by children. We used ICD-10 codes of X49, X54.X, and T28.2. Cases of eye or skin burns were excluded.

Results. Sixty-five cases were found. Due to a lack of data, we analysed 56 cases. The majority of them were boys (64%); 41% of patients were between 12 and 24 months old. The median age was one year. In 68% of cases, the corrosive substance was alkali: laundry detergent pods and sodium hydroxide accounting for 25% and 14%, respectively. Of the hospitalised patients and all those admitted to the paediatric intensive care unit (PICU), 78% had oesophagogastroduodenoscopy (EGD), 61% within 24 h after ingestion. The time of EGD was not known for 29% of patients. Nine (29%) had 2nd- or 3rd-degree burns of the oesophagus or the stomach, one of them did not have any visible changes of the lips and oral mucosa or any symptoms.

Conclusions. Physicians should be suspicious about potential lesions of the gastrointestinal tract when managing caustic ingestion cases. It is recommended to perform EGD for symptomatic children within 24 hours after the accident.

Keywords: caustic ingestion, corrosive substance, alkali, acid, endoscopy

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INTRODUCTION

Ingestion of corrosive agents by children is uncommon, but this condition requires high suspicion (1). Due to the discrepancy between the clinical picture and endoscopic findings, clinicians face difficulties in making decisions about further investigations and management (1).

Caustic substances are divided into alkalis and acids (2), but some authors separate potassium permanganate and ammonia (1) as specific individual agents. Ingestion of alkalis is known to cause liquefactive necrosis and deep injuries across all parts of the gastrointestinal tract (1–3). Acids cause coagulative necrosis with the stomach affected more than other parts (1–3). Despite differences of action on the mucosa, in both cases injuries should be considered as potentially serious and investigated in an appropriate manner (4). Solid forms of corrosives, such as potassium permanganate, can cause serious local injury as they get attached to the mucosa. While local effects are most pronounced, substances, such as phosphoric acid, strong bases and acids can also have systemic effects, so toxicology consulting is suggested (1, 3).

The European Society of Gastrointestinal Endoscopy (ESGE) and the European Society for Paediatric Gastroenterology Hepatology and Nutrition (ESPGHAN) recommend to perform endoscopy on a symptomatic child within 24 hours after ingestion (strong recommendation, high quality evidence) (4). The recommendation to withhold investigations as long as there are no symptoms or visible burns is weak with moderate quality evidence (4). In this case, the follow up must be ensured.

We performed a retrospective study of paediatric caustic ingestion cases between 2011 and 2018 at the Children's Hospital of Vilnius University Hospital Santaros klinikos. The aim was to analyse epidemiological data and endoscopic findings and to gain insights into management strategies concerning guidelines at this tertiary paediatric centre.

MATERIALS AND METHODS

We performed one-centre retrospective study for the period of 2011–2018. We searched the patient database of the Children's Hospital using ICD-10

codes for X49 (accidental poisoning by and exposure to other and unspecified chemicals and noxious substances), T54.X (toxic effect: corrosive acids/alkalis/unspecified/others), and T28.2 (burn of other parts of the alimentary tract). Patients with eye or skin burns were excluded and only the cases of ingestion of corrosive substances were analysed.

We collected epidemiological data (sex, age), the type of the corrosive substance, and whether it was accidental or intentional. In addition, we documented the presence or absence of oral lesions or any symptoms (drooling, swelling, or respiratory symptoms). We calculated the time after ingestion and endoscopy and evaluated EGD findings.

RESULTS

We had 65 paediatric cases of ingestion of caustic agents between 2011 and 2018. As information about nine patients was not available, 56 cases were included in the study.

All analysed cases were accidental. There were 36 (64%) boys and 20 (36%) girls (Table 1). Twenty-eight per cent of children were consulted as outpatients; the rest were hospitalised, 25% of them in the PICU.

Table 1. Characteristics of the patients

Characteristic	Number of patients	% of the total number
Sex		
Male	36	64
Female	20	36
Hospitalisation		
Outpatients	16	28
Inpatients	40	72
Admission to PICU		
PICU	10	19
Not hospitalised in PICU	30	54
EGD		
EGD performed	31	55
No EGD	25	45

The vast majority of children were under five years old, 23 (41%) were between 12 and 24 months of age, with the youngest patient only one month of age and the oldest 17 years old (Fig. 1).

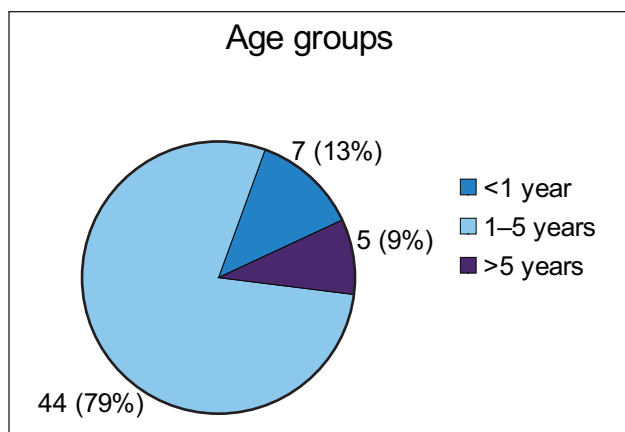


Fig. 1. Patient distribution between age groups

The median age was one year. It was not surprising that the accidents in the group of the youngest happened due to a mistake of their parents or their own curiosity while in the group of older children due to inappropriate storage of caustic agents (not in original package).

Ingestion of alkaline substances (68%) outnumbered acids (18%), and three cases of potassium permanganate were documented (Table 2). Children most often tended to ingest laundry de-

Table 2. Ingested corrosive substances

Caustic agent	Number of cases	% of the total number
Alkali	38	68
Detergent laundry pod	14	25
Sodium hydroxide	8	14
Acids	10	18
KmnO ₄	3	5
Ammonium	2	3.5
96% ethanol	1	2
Not known	2	3.5

tergents (14 cases, or 25%) and sodium hydroxide was in the second place (eight cases, or 14%). In two cases, parents could not specify the ingested caustic agent.

Twenty-seven (48%) patients had at least one episode of vomiting, drooling, or respiratory symptoms, 13 (23%) had obvious signs of caustic burn, while 21 (37.5%) had neither (Table 3). Thirty-one patients had EGD and the majority – 25 (44.6%) were symptomatic or had signs of burns. EGD was not performed on 25 patients, eight of whom had either signs or symptoms: two of them had signs of burns, and six were symptomatic. On the other hand, five asymptomatic children had EGD.

Fifty-five per cent of all the patients who came to ED, 78% of the hospitalised patients and all patients admitted to the PICU underwent EGD (Table 1). The vast majority of the patients (19 children, or 61%) had endoscopy less than 24 hours after ingestion of the substance (Fig. 2). The median time before EGD was 17 hours. The exact time was not known for nine patients as it was not specified in the documentation.

Out of 31, 18 (58%) had caustic injury of the oesophagus or the stomach. Nine patients had 2nd- or 3rd-degree burns: four of them did not have obvious signs but had drooling, vomiting, and/or respiratory symptoms, while one patient had neither signs nor symptoms (Table 4). Two had ingested laundry detergents and three various acids.

While 16 patients were asymptomatic, eight had either signs of burns or symptoms, but did not have EGD (Table 5). Two patients had signs of burns on their lips: one had ingested iodine and the other sodium hydroxide. Symptomatic outpatients had ingested dishwashing and laundry detergents, or a kettle descaling agent. Two symptomatic

Table 3. Symptoms and signs in relation to EGD

Signs of burns or symptoms after ingestion	No EGD (% of the total number)	EGD (% of the total number)	Total (% of the total number)
No signs or symptoms	16 (29)	5 (9)	21 (38)
Signs or/and symptoms	8 (14)	25 (44)	33 (58)
Not known	1 (2)	1 (2)	2 (4)
Total (% of all)	25 (45)	31 (55)	

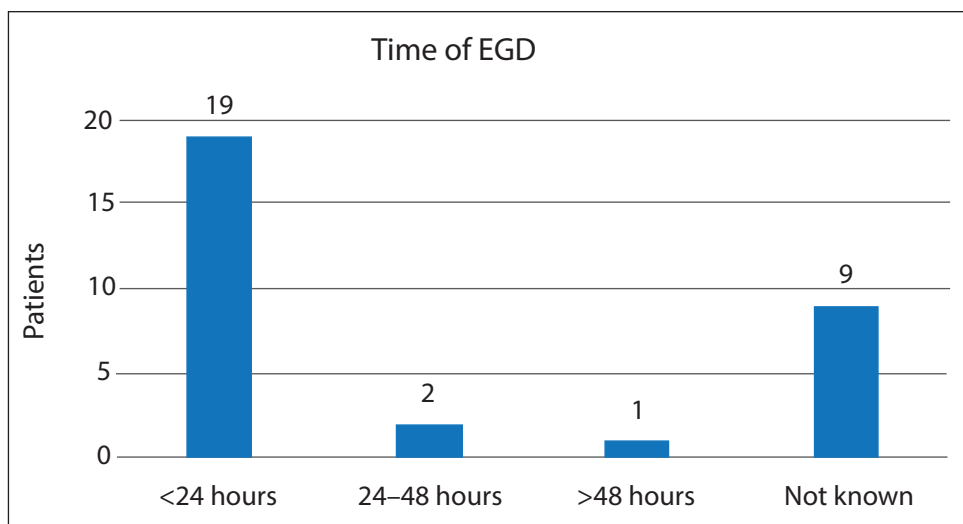


Fig. 2. Time of EGD after ingestion of a corrosive substance

Table 4. Correlation between clinical presentation and EGD findings

Signs or symptoms after ingestion	EGD results				Total (% of those with EGD)
	No injury	1st degree	2nd-3rd degree	Degree not specified	
No signs or symptoms	2	1	1	1	5 (16)
Signs of burns	1	0	1	1	3 (10)
Symptoms: drooling, vomiting, or respiratory	6	2	3	3	14 (45)
Signs and symptoms	4	0	3	1	8 (26)
Not known	0	0	1	0	1 (3)
Total (% of those with EGD)	13 (42)	3 (10)	9 (29)	6 (19)	

Table 5. Signs and symptoms in patients who did not undergo EGD

Patients without EGD	No signs and symptoms	Signs	Symptoms	Signs and symptoms	Not known
Outpatients	11	2	3	0	0
Inpatients	5	0	3	0	1
Total (% of those without EGD)	16 (64)	2 (8)	6 (24)	0 (0)	1 (4)

inpatients had bitten laundry detergent pods and one ingested concentrated acetic acid.

DISCUSSION

We had 65 cases of caustic ingestion during a seven-year period. The dominance of boys corresponds to literature data (2, 3, 5). We found a peak of incidents at 12–24 months of age and most cas-

es in under-five-year-olds, which correlates with some studies (2, 6). However, there are studies that emphasize an older group of patients such as the median age of 4 years and 3 months in a recent study of a paediatric centre in Poland (5).

The substance was not specified in two cases. Alkalis predominated as the most frequent caustic agent, of which sodium hydroxide and laundry detergent pods were most common. The dominance

of corrosive agents can differ depending on the country or the region (3). In our study, ingestion of sodium hydroxide was documented in 14.2% of cases while it was the causing agent in only 4% of cases in the study performed at Children's Hospital in Lublin, Poland (5). However, the latter study included hot water as a caustic agent, and it consisted of 20.3% of all cases (5). The nature of the ingested agent is important and parents should always be encouraged to bring (or at least have a photo) of its package for identification and better understanding of potential consequences.

Our data shows that most of the patients with 2nd- or 3rd-degree burns had signs, symptoms, or both. Nevertheless, we had one patient with serious injury without significant findings on physical assessment. On the other hand, eight children, who had either signs or symptoms, did not undergo EGD even if their history suggested ingestion of such a highly corrosive substance as sodium hydroxide. We lack information on the reasons for decisions in these situations. We could not get information about the follow-up either. Our findings confirm that management decisions are difficult with these patients, especially when some patients with signs, symptoms, or both have normal EGD results (8). ESGE/ESPGHAN provides us with strong recommendations based on high quality evidence that every symptomatic child should undergo EGD (4). As is known, some patients can have significant respiratory tract involvement (9) so it should also be evaluated, possible respiratory complications considered, and airway protected if necessary (10).

Optimal timing of EGD is within 24 hours after ingestion of the corrosive substance (4, 7). If performed later, it increases the risk of perforation (7). This recommendation of the ESGE/ESPGHAN is strong and supported by high quality evidence (4). Of all children that had EGD, 54.8% had it within this time frame. We did not have documented time for 35.4% of cases. Here we would like to point the importance of accurate documentation (the time of ingestion of the agent and the time of EGD), especially when the patient is transferred from another hospital. These details are important for adequate evaluation of the symptoms and EGD results. On the other hand, four patients had EGD performed within 5 h after ingestion. Three

of them had 1st degree injuries, but in this case EGD might be misleading as it is difficult to evaluate the full extent of the injury so early and we do not have information about repeated endoscopy.

It was outside the scope of this study to analyse the causes or measures that could have been taken to prevent caustic burns in children. However, we are in agreement with other authors about how important it is for parents to receive appropriate information about safe storage of potentially harmful substances at home (1, 3, 5, 6).

CONCLUSIONS

Each case of ingestion of corrosives should be taken seriously and should have proper investigations. It is of high importance to identify the substance, document time of ingestion and EGD for future references. Current guidelines suggest EGD for symptomatic children within 24 hours after ingestion of corrosives.

The most important step in the management of these cases is prevention.

Received 17 October 2019

Accepted 6 November 2019

References

1. Chirica M, Bonavina L, Kelly MD, Kelly MD, Sarfati E, Cattani P. Caustic Ingestion. *The Lancet*. 2017 May 20; 389(10083): 2041–52.
2. Kurowski JA, Kay M. Caustic ingestion and foreign bodies ingestion in pediatric patients. *Pediatr Clin N Am*. 2017 Jun; 64(3): 507–24.
3. Arnold M, Numanoglu A. Caustic ingestion in children – a review. *Semin Pediatr Surg*. 2017 Apr; 26(2): 95–104.
4. Tringali A, Thomson M, Dumonceau JM, Tavares M, Tabbers MM, Furlano R, et al. Pediatric gastrointestinal endoscopy: European Society of Gastrointestinal Endoscopy (ESGE) and European Society for Paediatric Gastroenterology Hepatology and Nutrition (ESPGHAN) Guideline Executive Summary. *Endoscopy*. 2017 Jan; 49(1): 83–91.
5. Niedzielski A, Schwartz SG, Partycka-Pietrzyk K, Mielnik-Niedzielska G. Caustic agents ingestion in children: a 51-year retrospective cohort study. *Ear Nose Throat J*. 2019; 20(10): 1–6.

6. Rafeey M, Ghojzadeh M, Sheikhi S, Vahedi L. Caustic ingestion in children: a systematic review and meta-analysis. *J Caring Sci.* 2016 Sep 1; 5(3): 251–65.
7. Balderas AB, Aceves MR, Ramirez PC, et al. Endoscopic findings of the digestive tract secondary to caustic ingestion in children seen at the emergency department. *Arch Argent Pediatr.* 2018; 116(6): 409–14.
8. Smith E, Liebelt E, Nogueira J. Laundry detergent pod ingestion: is there a need for endoscopy? *J Med Toxicol.* 2014 Sep; 10(3): 286–91.
9. Sjogren PP, Skadra DE, Park AH. Upper aerodigestive injuries from detergent ingestion in children. *Laryngoscope.* 2017 Feb; 127(2): 509–12.
10. Bird JH, Kumar S, Paul C, Ramsden JD. Controversies in the management of caustic ingestion injury: an evidence based review. *Clin Otolaryngol.* 2017 Jun; 42(3): 701–8.

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**APSINUODIJIMO KOROZINĖMIS
MEDŽIAGOMIS APŽVALGA VILNIAUS
UNIVERSITETO SANTAROS KLINIKŲ VAIKŲ
LIGONINĖJE 2011–2018 METAIS**

Santrauka

Įžanga. Nors apsinuodijimas korozinėmis medžiagomis nėra dažnas, jis gali sukelti ryškius pažeidimus ir ilgalaikes pasekmes. Klinikiniai požymiai ne visuomet atskleidžia pažeidimo sunkumą, todėl sudėtinga priimti sprendimus dėl tolesnio ištyrimo.

Metodika. Mes atlikome retrospektyvinį vieno centro tyrimą: nagrinėjome 2011–2018 m. korozinėmis medžiagomis apsinuodijusių vaikų atvejus. Įtraukimo kriterijai: TLK-10 AM kodai – X49, X54.X, T28.2; atmetimo kriterijai: ne virškinamojo trakto (akių arba odos) nudegimai.

Rezultatai. Iš viso radome 65 atvejus, dėl duomenų stokos įtraukėme 56. Didžiąją dalį sudarė berniukai (64,2 %). 41 % pacientų buvo 12–24 mėnesių amžiaus. Amžiaus mediana – vieneri metai. 67,9 % atvejų apsinuodyta šarmais: skalbimo kapsulės turiniu (25 %) ir natrio hidroksidu (14,2 %). 77,5 % hospitalizuotų pacientų ir visiems pacientams, hospitalizuotiems į vaikų intensyviosios terapijos skyrių, atlikta ezofagogastroduodenoskopija (FEGDS). 54,8 % pacientų FEGDS atlikta per 24 valandas po apsinuodijimo, 35,4 % pacientų FEGDS atlikimo laikas nebuvo patikslintas. Devyniems (29,0 %) vaikams nustatyti II ar III laipsnio virškinamojo trakto nudegimai. Vienas pacientas neturėjo išorinių nudegimo požymių ir simptomų.

Išvados. Korozinėms medžiagoms patekus į virškinamąjį traktą, gydytojas visuomet turėtų įtarti galimą jo pažeidimą. Simptomų ar akivaizdžių nudegimo požymių turintiems vaikams per 24 valandas būtina atlikti FEGDS.

Raktažodžiai: korozinės medžiagos, šarmai, rūgštys, endoskopija