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Étude des cas d'intoxications et d'expositions accidentelles aux corps étrangers aux urgences pédiatriques du CHU de Nantes entre 2018 et 2020

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par

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Etude des cas d'intoxications et d'expositions accidentelles aux corps étrangers aux urgences pédiatriques du CHU de Nantes entre 2018 et 2020

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STUDY OF CASES OF INTOXICATION AND ACCIDENTAL EXPOSURE TO FOREIGN BODIES IN THE PEDIATRIC EMERGENCY CARE UNIT OF NANTES UNIVERSITY HOSPITAL BETWEEN 2018 AND 2020

Introduction:

Toxic agent and foreign body exposure in pediatric population is a global issue of public health care, in the world with a major impact on health economics (1–4). The annual registry of the American Association of Poison Control Centers (AAPCC) showed that there are 36,503 severe intoxications and nearly 68,000 ingestions of foreign bodies per year in the United States, with children under 18 years old (1).

Young children are particularly affected by accidental exposure. When we look at the whole French population in 2010 the incidence of poisoning was approximately 0.1%, and 1.2% for children under 5 years old (5). Indeed, during their first years of life, children discover their environment, and they are exposed to many objects and products that are more or less dangerous without being aware of the danger. Whereas when children become older, this issue is more related to voluntary intention in the context of psychiatric pathology (2). This lack of risk perception is responsible for the accidental ingestion of toxic products or drugs that children may find in their immediate environment in 98% of cases (4,6,7). In developed countries, poisoning accounts for around 7% of all accidents in children under 5 years and in about 2% of all childhood deaths (3). In France, calls for child poisoning accounted for nearly 50% of the activity of French Poison Control Centers (PCC); out of 187,028 calls, 86,478 referred to children under 10 years of age with a peak between 1 and 4 years old; out of which 40% were related to accidental drugs ingestion (6).

Lack of risk perception also leads to the insertion of foreign bodies in the nose, ears, eyes or even more frequently by ingesting foreign body. In France, the incidence of foreign bodies accidental insertion in natural orifice was approximately 5 to 7 % of the everyday life accidents of children aged from 1 to 7 years old in 2010 (5).

Prevention programs have been developed in France since 1983, which have led to a decrease of 50% in poisoning mortality in 20 years (8). The mortality rate in the children population remained low around 10 deaths per year in France (9).

Nevertheless, this avoidable issue is responsible for visits in the pediatric emergency care unit, leading to a conventional hospitalization rate of 18.7% and a rate of hospitalization in intensive care unit of 1 to 2% (10,11).

The majority of studies are global epidemiological analyses, with data from poison control centers or specialized services. There are few studies based on the real practice of a pediatric emergency service. And often the issue of accidental ingestions of toxic products is separated from drugs ingestions and foreign body exposure accidents.

In the absence of recent data, the objective of our work was to describe the population of children who consulted a pediatric emergency department, for the following reasons: accidental ingestion of a foreign body, drug or toxic product, as well as accidental insertion of a foreign body in the nose, ears or eyes and describe their management in a pediatric emergency department.

Methods:

Study design

We performed a retrospective unicentric observational study. We included:

- All children under 6 years old,
- Who were cared for in the Pediatric Emergency Care Unit (PECU) of Nantes University Hospita between January 1, 2018, and December 19, 2020,
- With exposition to foreign bodies by different ways, per os, intra nasal, intra auricular and intra ophthalmic,
- Who suffered ingestion of toxic products and drugs.

We excluded:

- Children who suffered a carbon monoxide inhalation,
- Collective food poisoning,
- Adverse effects of any therapeutic dose medication.

Data collection and research strategy

Data were collected from the patient records in the hospital database using anonymized data files. Two databases were cross-referenced to select patients:

- The information system medicalization program (PMSI) selected the files with the International Classification Disease 10 (ICD). The ICD 10 is an international classification for coding medical procedures according to recommendations of the World Health Organization.
- The hospital search database. It is a data warehouse, managed by the epidemiological service of Nantes University Hospital, that allows you to search for keywords in hospitalization reports, emergency room summaries or biological and imaging test reports.

The files were selected in these databases via different strategies:

- Hierarchical nodes: all files from the PECU with foreign bodies exposure and ingestion of drug or toxic product were selected from PMSI,
- Data mining with following keywords: "intoxication" "toxic" "ingestion" "foreign body" "cannabis" "drug" "button battery" for hospital search database.

After selecting the patients, we collected the following data:

Circumstances and mechanism of the accident:

Age and sex; date of the accident; motivation for consulting in the emergency care unit (visualized accident, suspected accident, or an unsuspected accident i.e. reason unrelated to our studying accidents that led to a visit in the PECU); the mechanism of the accident (per os, intra nasal, intra auricular, or intra ophthalmic); the place of the accident (home, school, or other public places, parks, restaurant...); the class of foreign bodies, toxic products, and drugs.

Clinical symptoms:

ENT (ear, nose, throat) or respiratory symptoms; digestive symptoms; neurological symptoms; other clinical symptoms; symptoms persistence in the PECU.

Medical care:

Biological analyses, blood or urinary toxicology research, X rays, CT or MRI scans. Treatments such as activated charcoal, gastric fibroscopy and ENT fibroscopy (technique for search and remove the foreign body), surgery, and the further patient orientation (discharged or hospitalized).

Stratified analysis

We performed a stratified analysis on the presence or absence of symptoms following the accident. We considered as symptomatic any child who presented symptoms before hospital consultation and/or at the PECU.

Statistical analysis

The descriptive statistical analysis was performed with the "tableone" package of the R® software version 6.1.2. Concerning the stratified description of symptomatic and non-symptomatic children (see 4.B), the statistical tests used to compare asymptomatic and symptomatic children were the χ^2 test for binary and categorical variables (or Fisher's exact test if non-parametric) as well as the 1-way ANOVA test for continuous variables (or Kruskal-Wallis test if non-parametric) with verification of the hypothesis of homogeneity of variances. The 1-way ANOVA test was equivalent to the Student test in this case.

Data management followed the French Data Protection Authority recommendations. Due to its retrospective and non-interventional design, signed informed consent was waived.

Results:

Study population

Between January 1, 2018, and December 19, 2020, we extracted 783 files from the PMSI and 1380 files from the hospital search database. After the duplicate exclusions, 1852 were retained; among them, 878 were excluded. The files excluded are represented in the flowchart below (figure 1). To conclude, 974 files were finally selected for our study.

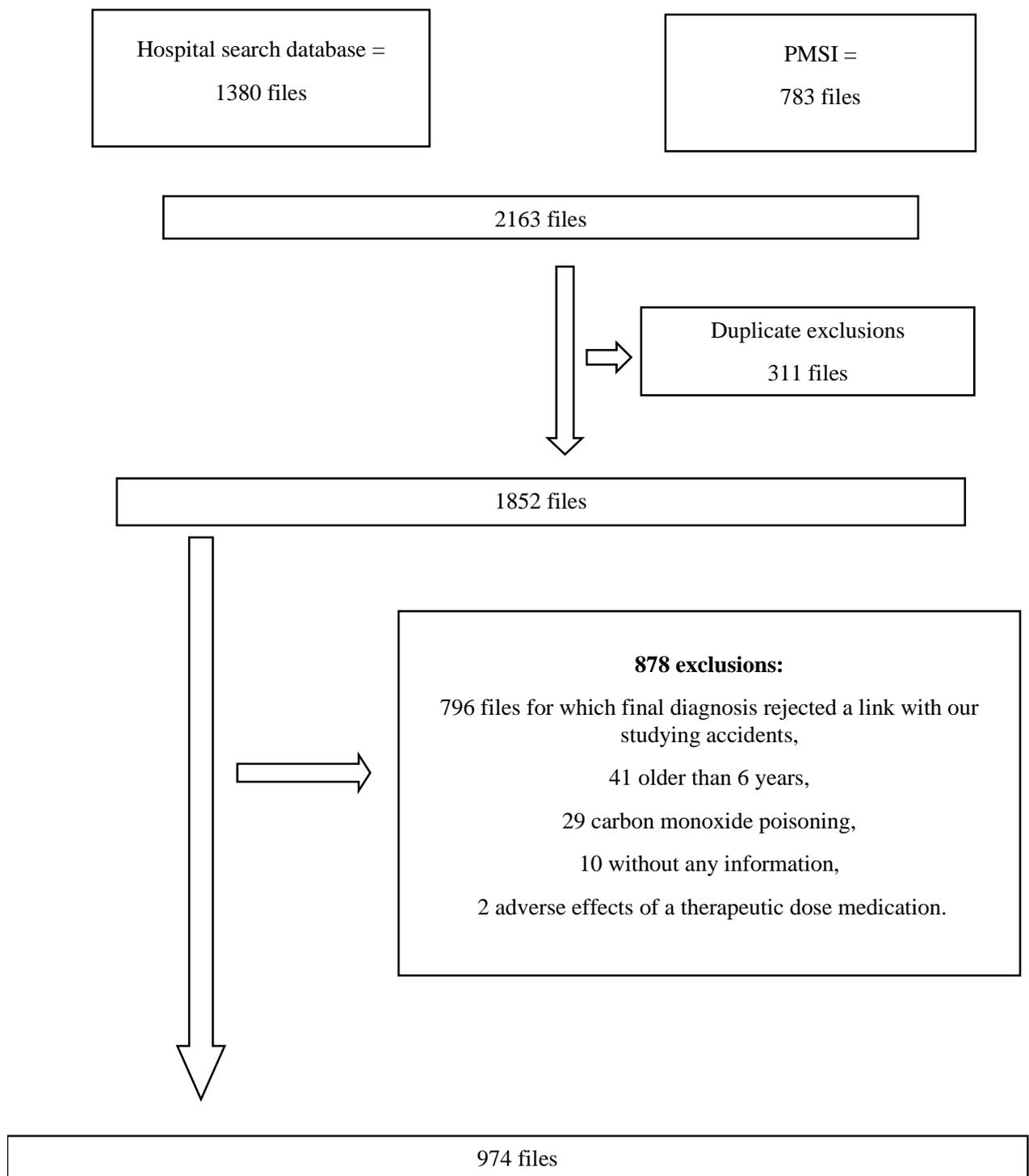


Figure 1: Flowchart of the study, 2018-2020 Nantes PECU.

PMSI : information systems medicalization program

Population characteristics and circumstances data

Among the study population, 521 were boys, 453 girls (odd ratio M/F: 1,15). The average age of children was 3 years old; 398 (41%) were symptomatic, 574 (59%) asymptomatic (table 1).

Table 1 Circumstances and mechanism of the accident, 2018-2020 Nantes PECU n = 974 :

| Variables | Modalities | Population n (%) | Asymptomatic n (%) | Symptomatic n (%) | p-value |
|------------------------------|---------------------------------------|------------------|--------------------|-------------------|---------|
| Effective | | 974 | 576 | 398 | |
| Patients data | | | | | |
| Gender | Male | 521 (53.5) | 301 (52.3) | 220 (55.3) | 0.388 |
| | Female | 453 (46.5) | 275 (47.7) | 178 (44.7) | |
| Age (mean (SD)) | | 3.08 (1.55) | 3.29 (1.45) | 2.76 (1.64) | <0.001 |
| General accident data | | | | | |
| Accident year | 2018 | 224 (23.0) | 124 (21.5) | 100 (25.1) | 0.346 |
| | 2019 | 348 (35.7) | 214 (37.2) | 134 (33.7) | |
| | 2020 | 402 (41.3) | 238 (41.3) | 164 (41.2) | |
| Accident place | Home | 582 (87.1) | 304 (86.9) | 278 (87.4) | 0.426 |
| | School | 40 (6.0) | 24 (6.9) | 16 (5.0) | |
| | Public place (road, shop, restaurant) | 21 (3.1) | 8 (2.3) | 13 (4.1) | |
| | Other | 25 (3.7) | 14 (4.0) | 11 (3.5) | |
| Accident circumstance | Visualized accident | 592 (60.8) | 377 (65.5) | 215 (54.0) | <0.001 |
| | Suspected accident | 346 (35.5) | 186 (32.3) | 160 (40.2) | <0.001 |
| | Initially unsuspected accident | 24 (2.5) | 2 (0.3) | 22 (5.5) | 0.014 |
| Accident way | Oral route | 630 (64.7) | 295 (51.2) | 335 (84.2) | <0.001 |
| | Intra nasal | 230 (23.6) | 204 (35.4) | 26 (6.5) | |
| | Intra auricular | 80 (8.2) | 66 (11.5) | 14 (3.5) | |
| | Intra ocular | 34 (3.5) | 11 (1.9) | 23 (5.8) | |
| Accident agent | Foreign body | 816 (83.8) | 483 (83.9) | 333 (83.7) | 0.868 |
| | Drug | 94 (9.7) | 70 (12.2) | 24 (6.0) | 0.002 |
| | Toxic product | 65 (6.7) | 24 (4.2) | 41 (10.3) | <0.001 |

NB: A child swallowed 1 foreign body and 1 drug (total of accident agent = 975), in accident place 306 files (31.4%) were without information, and in accident circumstance 12 files (1.2%) were without information.

We found an increase in the proportion of our accidents over the global population consulting the PECU: 0.62% in 2018 (224 accidents for 35,883 consultations), 0.98% in 2019 (348 accidents for 35,406 consultations) and 1.6% in 2020 (402 accidents for 24,867 consultations). This increase was relatively steady in the number of events registered, which is reflected in an increasing and linear trend, i.e. a gradual increase in the trend in number of cases reported per month of about +20 cases over 3 years.

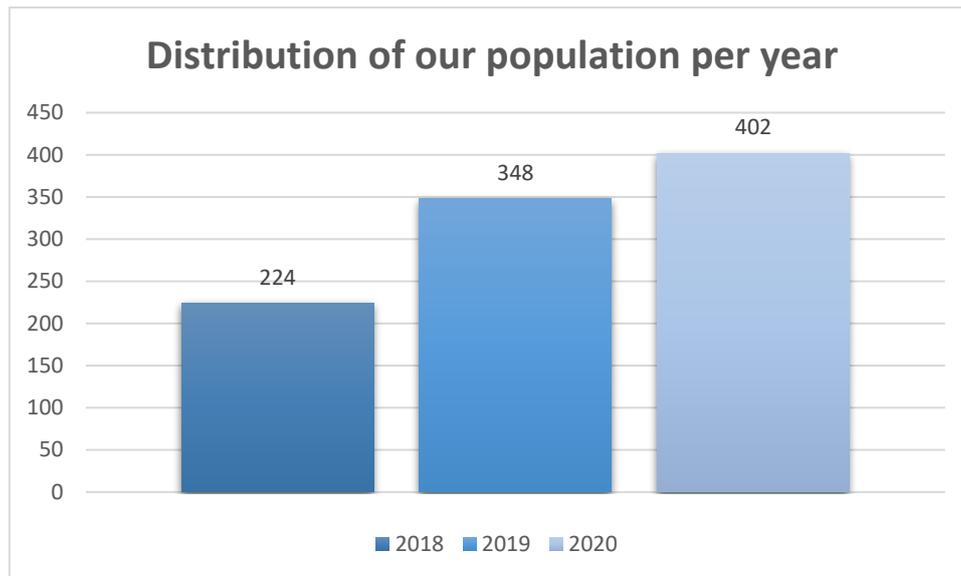


Figure 2: Distribution of our population per year, 2018-2020 Nantes PECU, n = 974

The place of accident was known in 668 files (68.6%). Among these 668 files, 582 accidents (87.1%) occurred at home.

Accident circumstances were known in 962 files (98.8%). Among these 962 files, 592 (60.8%) were visualized by witnesses or suspected (346, 35.5%). When the accident was not visualized by witnesses but only suspected, the accident was further confirmed in only 10% of cases. In our analysis, we considered as confirmed a foreign body found radiographically or in the PECU. We also considered as confirmed a suspicion of accidental ingestions of toxic products or drugs with a positive research of toxics.

More rarely, children were admitted to the PECU without any notion of accidental exposure (24 children (2.5%)) and most of them were symptomatic (22 children (91.7%)). In these cases, the main family of symptoms was neurological symptoms with 15 children out of 22.

Clinical onset

Symptomatic children were younger than asymptomatic (2.76 years old vs 3.29 years old, $p < 0.001$). We did not see significant differences on the gender of the child.

For the symptomatic children, the way was mainly per os (84.2% $p < 0.001$), and for the asymptomatic children it was more frequently intra nasal or intra auricular accidents (35.4%, 11.5% $p < 0.001$).

When the child was symptomatic, symptoms were generally reported by the parents or direct witnesses of the accident.

Table 2: Clinical symptoms, 2018-2020 Nantes PECU, n = 398

| Clinical symptoms | Symptomatic children n (%) |
|---|----------------------------|
| Respiratory and ENT(ear, nose, throat) symptoms | 272 (68.3) |
| Penetration syndrom | 45 (11.3) |
| Oxygen requirement | 4 (1.0) |
| Cough | 144 (36.2) |
| Hypersialorea | 59 (14.8) |
| Digestive symptoms | 124 (31.1) |
| Vomiting | 74 (18.6) |
| Neurological symptoms | 37 (9.3) |
| Consciousness disorder | 12 (3.0) |
| Cerebellum syndrom | 9 (2.3) |
| Cardiological symptoms | 0 (0.0) |
| Persistent clinical symptoms in the PECU | 91 (22.9) |
| Total | 433 (108.7) |

Nb: a child could present different types of symptoms following the accident this was why our total of clinical signs was higher than our symptomatic children.

Respiratory and ENT symptoms, related in 272 (68.3%) files, were the most common clinical symptoms.

Digestive symptoms were reported in 124 cases (31.1%) and neurological symptoms in 37 of cases (9.3%). No cardiological symptom was found.

On the arrival at the PECU, only 91 of symptomatic children (22.9%) still presented symptoms during the medical examination.

Agents exposure

- *Foreign body accident*

Exposure to a foreign body was by far the most frequent reason for consultation at the PECU (816 children (83.8%)). The class of foreign bodies is described in table 3.

Table 3 : Class of foreign bodies, 2018-2020 Nantes PECU n = 816

| Class of foreign bodies | Population n (%) | Asymptomatic n (%) | Symptomatic n (%) | p-value |
|-------------------------|------------------|--------------------|-------------------|---------|
| Toy | 132 (16.2) | 82 (17.0) | 50 (15) | <0.001 |
| Food | 130 (15.9) | 43 (8.9) | 87 (26.1) | |
| Jewel | 96 (11.8) | 82 (17.0) | 14 (4.2) | |
| Button battery | 72 (8.8) | 61 (12.6) | 11 (3.3) | |
| Coin | 65 (8.0) | 31 (6.4) | 34 (10.2) | |
| Office material | 61 (7.5) | 37 (7.7) | 24 (7.2) | |
| Plant | 38 (4.7) | 21 (4.3) | 17 (5.1) | |
| Metallic hardware | 34 (4.2) | 18 (3.7) | 16 (4.8) | |
| Magnet | 11 (1.3) | 9 (1.9) | 2 (0.6) | |
| Other | 177 (21.6) | 99 (20.5) | 78 (23.4) | |
| Total | 816 (100.0) | 483 (100.0) | 333 (100.0) | |

The most common foreign bodies were toys (132, 16.2%), food (130, 15.9%), button battery (72, 8.8%), coins (65, 8.0%), metallic hardware (nail, screw, metal) (34, 4.2%), non toxic plant (38, 4.7%), magnet (11, 1.3%).

The other category included unknown foreign body (no information in the medical file) with nearly 60 files and also glass fragment, tissue...

Accidents related to a food exposure were significantly more often symptomatic (26.1% vs. 8.9% $p<0.001$), as were coin ingestions (10.2% vs. 6.4% $p<0.001$). Conversely, children who ingested a button battery were more often asymptomatic (12.6% vs. 3.3% $p<0.001$).

- **Medical drugs exposure**

Table 4 : Class of drugs, 2018-2020 Nantes PECU, n = 94.

| Class of drugs | Population n (%) | Asymptomatic n (%) | Symptomatic n (%) | p-value |
|--------------------------------|-------------------|--------------------|-------------------|---------|
| Analgesic | 38 (40.0) | 31 (44.3) | 7 (28.0) | 0.001 |
| Anxiolytic | 9 (9.5) | 2 (2.9) | 7 (28.0) | |
| Cardiotropic | 9 (9.5) | 9 (12.9) | 0 (0.0) | |
| Anti-emetic | 4 (4.2) | 4 (5.7) | 0 (0.0) | |
| Antipsychotic | 4 (4.2) | 2 (2.9) | 2 (8.0) | |
| Antispasmodic | 4 (4.2) | 4 (5.7) | 0 (0.0) | |
| Antidepressant | 3 (3.2) | 2 (2.9) | 1 (4.0) | |
| Antihistaminic | 3 (3.2) | 3 (4.3) | 0 (0.0) | |
| Hypnotic | 2 (2.1) | 0 (0.0) | 2 (8.0) | |
| Anti-diabétique | 2 (2.1) | 2 (2.9) | 0 (0.0) | |
| Opiate substitution therapy | 2 (2.1) | 0 (0.0) | 2 (8.0) | |
| Nonsteroidal anti-inflammatory | 2 (2.1) | 2 (2.9) | 0 (0.0) | |
| Corticosteroid | 2 (2.1) | 2 (2.9) | 0 (0.0) | |
| Other | 11 (11.6) | 7 (10.0) | 4 (16.0) | |
| Total | 95 (100.0) | 70 (100.0) | 25 (100.0) | |

Nb: a child swallowed 2 drugs during the study period.

Ninety four accidental drug intoxications in children under 6 years old were recorded. With one child who swallowed two drugs. The main class was analgesic ingestion 38 (40%) (33 paracetamol, 5 tramadol), followed by 9 anxiolytics intoxications (9.5%) and cardiotropic with 9 cases (9.5%). Children were more often asymptomatic after drug ingestion (12.2% vs 6% p= 0.002). The analgesic category was mainly asymptomatic as well as the cardiotropic drug.

The other class included various drugs like: antibiotic, proton pump inhibitors, levothyroxine, zinc, potassium...

- **Toxic agent exposure**

Table 5: Class of toxic products, 2018-2020 Nantes PECU, n = 65.

| Class of toxic products | Population n (%) | Asymptomatic n (%) | Symptomatic n (%) | p-value |
|-------------------------|-------------------|--------------------|-------------------|---------|
| Household product | 27 (41.5) | 13 (54.2) | 14 (34.1) | 0.001 |
| Cannabis | 12 (18.5) | 1 (4.2) | 11 (26.8) | |
| Petroleum by-product | 2 (3.1) | 0 (0.0) | 2 (4.9) | |
| Cosmetic product | 7 (10.8) | 2 (8.3) | 5 (12.2) | |
| Other | 17 (26.2) | 8 (33.3) | 9 (22.0) | |
| Total | 65 (100.0) | 24 (100.0) | 41 (100.0) | |

We identified 65 (6,7%) cases of toxic substance ingestion. The most common toxic substance was household product with 27 cases (41.5%).

Ingestions of toxic products were more often symptomatic (10.3% vs 4.2% $p < 0.001$), with notably cannabis ingestions (26.8% vs 4.2% $p = 0.001$).

The other class included: fireplace cleaner, essential oils, garden products...

Medical care

- **Orientation (table 6)**

Table 6 : Orientation and clinical evolution, 2018-2020 Nantes PECU, n = 974:

| Variables | Modalities | Population n (%) | Asymptomatic n (%) | Symptomatic n (%) | p-value |
|---------------------------|--|---------------------|-----------------------|----------------------|---------|
| Orientation | Discharged home | 835 (85.7) | 539 (93.6) | 296 (74.4) | <0.001 |
| | Hospitalization in pediatric care | 132 (13.6) | 37 (6.4) | 95 (23.9) | |
| | Hospitalization in intensive care unit | 7 (0.7) | 0 (0.0) | 7 (1.7) | |
| Clinical evolution | Recovery | 973 (99.9) | 576 (100.0) | 397 (99.7) | 0.852 |
| | Sequels | 1 (0.1) | 0 (0.0) | 1 (0.3) | |
| | Death | 0 | 0 | 0 | |

Hospitalization was required for 132 (13.6%) children, intensive care unit (ICU) for 7 (0.7%) children. The hospitalization rate was higher in the symptomatic group (23.9% vs 6.4% $p < 0.001$) as well as the hospitalization in intensive care unit (1.8% vs 0 $p < 0.001$). The discharge rate was logically higher in the asymptomatic group (93.6% versus 74.4% $p < 0.001$).

Among the 7 children hospitalized in ICU, 3 had tramadol intoxication, 1 had swallowed cannabis, 1 buprenorphine, 1 a piece of meat, and 1 had methemoglobin poisoning following a meal with home-cooked beets (rich in nitrate) and sausages (rich in sulfite).

One patient presented sequels at a distance from ingestion with oesophageal stenosis, while all the others recovered without sequel.

- **Further examinations (table 7)**

Table 7 : Medical care, 2018-2020 Nantes PECU, n = 974 :

| Variables | Modalities | Population n (%) | Asymptomatic n (%) | Symptomatic n (%) | p-value |
|-----------------------------|-------------------------------------|---------------------|-----------------------|----------------------|---------|
| Further examination | Biological test | 62 (6.4) | 29 (5.0) | 33 (8.3) | 0.056 |
| | Toxic test (blood or urinary test) | 50 (5.1) | 21 (3.6) | 29 (7.3) | 0.017 |
| | X-Ray | 372 (38.2) | 171 (29.7) | 201 (50.5) | <0.001 |
| | ENT (ear, nose, throat) endoscopy | 96 (9.9) | 27 (4.6) | 69 (17.3) | <0.001 |
| | Gastric fibroscopy | 25 (2.6) | 11 (1.9) | 14 (3.5) | 0.176 |
| | Cerebral CT scan | 7 (0.7) | 0 (0.0) | 7 (1.8) | 0.005 |
| | Cerebral MRI | 2 (0.2) | 0 (0.0) | 2 (0.5) | 0.326 |
| Medical intervention | Foreign bodies removing in the PECU | 219 (22.5) | 187 (32.5) | 32 (8.0) | <0.001 |
| | Surgery | 83 (8.5) | 54 (9.4) | 29 (7.3) | |
| | Activated charcoal | 10 (1.0) | 1 (0.3) | 9 (1.6) | |
| | Symptomatic treatment | 4 (0.4) | 0 (0.0) | 4 (1.0) | |
| | Antidote | 2 (0.2) | 2 (0.3) | 0 (0.0) | |
| | oro-tracheal intubation | 1 (0.1) | 0 (0.0) | 1 (0.3) | |

Biological tests were performed on 62 (6.4%) children, 50 (5.1%) children had blood or urine toxicity test. These tests were positive for 36 (3.7%) children.

Medical imaging was performed in 417 (42.8%) cases. Symptomatic children had more examinations than asymptomatic and notably X-rays (50.5% vs 29.7% p< 0.001). Brain CTs scans and cerebral MRIs were only performed for symptomatic patients.

Six cerebral CTs scans were prescribed after 1 toxic ingestion, 2 cannabis intoxications and 3 tramadol intoxications and 2 cerebral MRIs for 1 child who swallowed tramadol and 1 lorazepam, all because of the presence of neurological symptoms.

All the 96 endoscopic examinations were performed for diagnostic and therapeutic purposes.

- **Medical intervention (table 7)**

A foreign body was removed in the PECU in 219 (22.5%) cases. It was removed by a surgeon in 83 (8.5%) cases, under local anesthesia in the ENT or ophthalmologic department in 65 (6.7%) cases and under general anesthesia in the operating room in 18 (1.8%) cases. Activated charcoal was prescribed in 10 cases (1%), antidote in 2 cases (0.2%).

Discussion:

Who is exposed and how?

With an average age of 3 years old and a strong male predominance, the population studied in our work was similar to the various studies which found a majority of boys under 4 years old (4,11–13). We have shown that these accidents were involved in about 1% of annual visits in the PECU of the Nantes university hospital, thus a non-negligible part of the activity of this hospital unit. In our study, we observed that the oral way was the most current accidental way, as found in other studies (14,15). These accidents of everyday life occurred more often in the children house. In an American study, nearly 80% of accidental poisoning in children were due to a lack of supervision (16). However, in our study, accidents were visualised by those around the children in the majority of cases. This high proportion of visualized accident was also found in others studies (4,8).

In literature we found factors endogenous to children (17). Children under 6 years of age were in the midst of psychomotor development, discovering their environment, exploring it, and searching autonomy. These young children who are curious, spontaneously put everything they find in their immediate environment in their mouths without being aware of the danger of the product. As we had seen previously, in our study accidental intoxications occurred more often in boys, which was also found in the literature with approximately 60% of accidental intoxications attributed to boys (18–21). Other factors such as personality, emotional development, the presence of any disability and hyperactivity also played a role in the occurrence of intoxication (22). We also distinguished between exogenous factors directly linked to the child's environment, such as family factors (separated, blended family, etc.), cultural, socio-economic and material environment (23). In addition, an American study had shown that the mechanism of imitation of adult behaviour (taking a medicine in front of the child, for example) could account for around 20% of accidental poisoning by oral ingestion in children under 6 years of age (20).

When the accident was not visualized by witnesses but only suspected, the accident was confirmed in only 10% of cases, maybe some emergency room visits and many additional examinations could be avoid.

But these results were probably overestimated, some accidents were considered as unconfirmed because they were not verifiable (for example, ingestion of toxic products not detectable by a toxicology test i.e. household products, or a toxicology test not performed in the PECU).

Accidents linked to foreign body exposure were the first cause of accidents whereas in the activity reports of the AAPCC, ingestion of foreign bodies was only found in fourth position of the pediatric calls (1). But when we looked at the national report of accidents of everyday life, which was based on the activity of 5 French emergency services, the occurrence of foreign bodies exposures was higher than the ingestion of drugs and toxic products in the pediatric population (5). We could find an explanation by the fact that poison centers are less often called for accidents related to foreign bodies.

What are the consequences of these accidents?

In the different clinical symptoms, we firstly found respiratory symptoms, then digestive symptoms. Neurological symptoms were in the third position. When we looked at the other main studies, we saw that in foreign bodies ingestion, digestive and respiratory symptoms were the most common symptoms (24–26), and in the drugs ingestion studies most of the symptoms presented by children were neurological symptoms (4,10). Therefore, it was because we had a major part of foreign bodies ingestion in our study that we saw the respiratory and digestive symptoms appearing first.

There was no great differences between symptomatic and asymptomatic children in these foreign bodies accidents. Other studies focusing on foreign bodies ingestion found mostly symptomatic patients (13,22). However these studies were designed with different profiles of children. They were selected in specialized services, surgery services for most of them, and only via the per os way which was different from our emergency care unit population. We could see that button batteries represented almost 9% of our population, and even if we found that they were mostly asymptomatic, serious complications were reported, especially esophageal lesions (27). It was therefore important to listen to the parents in order to remove these button batteries as soon as possible.

We saw that most of drug ingestions were asymptomatic (70%); in literature, around 70.8% of poisoned children were asymptomatic (4). Some experts have evaluated the part of poisoning non-diagnostic around 40%, mostly linked to this asymptomatic population (28).

The main class was analgesic as in a Spanish study (4). Tramadol poisoning had led 3 children in intensive care unit. Many recent studies showed that even though pediatric tramadol fatalities were rare, some could lead to death (29,30). Therefore the French authorities had decided to limit the prescription for tramadol in April 2020 (31).

Toxic products were more frequent in symptomatic patients. The largest family was household cleaning products. Then we had cannabis ingestions which were significantly more symptomatic (a child who had to be taken to intensive care following ingestion of cannabis). There was a recent alert from the French National Drug Authority on this issue to alert practitioners of the significant increase in the number of these accidental ingestions (32).

How to manage these accidents?

We found similar rates of hospitalization than in other studies (4,10,11). Symptomatic ingestion of toxic products and drugs led to the most serious consequences with 6 hospitalizations out of 7 in intensive care unit. Therefore, a symptomatic accident may lead significantly more to hospitalization, thus, it is why we should be very careful during our medical interview and our clinical examination to look out for symptoms after the accident. The diagnosis of poisoning was sometimes not evoked at the time of admission to the PECU but only found after complementary examinations. It was particularly the case children with unexplainable neurological signs.

Accidental pediatric intoxications, beyond the clinical consequences for the child, require medical management combining a diagnostic approach and clinical monitoring. In our study we found a lower radiography rate, compared to other studies (24,28). This was explained by our population which included foreign body ingestion as well as foreign body insertion in ear, nose and eyes, as well as toxic product and drug ingestion, consequently less eligible to radiography. The 2 cerebral MRIs and 5 of the 7 cerebral CTs scans made, were prescribed after a symptomatic ingestion of drugs or toxic products that could have been detected in a urinary test. This urinary test could have given practitioners a very quick answer about the ingested drugs; this may be due to the sometimes lengthy response time for the results of these samples and the impossibility or delay of analysis in the absence of urine.

The rate of surgery (12,24) and fibroscopic examinations (12,24,25) was quite similar to other studies. In the asymptomatic population, which was more concerned by foreign bodies in ear and nose, foreign body was more often extracted in the PECU. In the symptomatic group, where most of accidents were per os, they needed more investigations, to find out where the foreign body was located, and to extract it when possible and necessary.

We noted that activated charcoal was given to 10 children, who had a drug ingestion. The activated charcoal was much more frequent in other studies 8.3 % (8) and even more in a Spanish cohort around 60% depending on the center (4). However, many studies showed that activated charcoal had not demonstrated strong benefits, especially when the ingestion had taken place more than 1 hour ago in asymptomatic children (33,34). In our study we were not able to have the length of time between the accident and the admission in the PECU. We also found that antidote have been prescribed for only 2 children, maybe this result is underestimated due to the retrospective character of our study.

One child had sequels after the accident: which was an esophageal stricture after ingestion of a toxic product. No death was registered during the 3 years of our study. In a Spanish cohort there were also few complications: one death with a carbon monoxide inhalation and 6 sequels after caustic ingestion with also esophageal stenoses (4).

How to prevent ?

These poisonings and accidental ingestions could be avoided through targeted and appropriate information and prevention actions for the general public and health professionals. It is essential to promote prevention by adopting good habits in the family circle: make sure that they are inaccessible for children (for example, storing drugs, toxic products and small foreign body out of reach of children, avoiding deconditioning, using secured pharmacy, closed drawer...).

Other preventive measures have demonstrated their efficiency, such as the use of safety caps and the securing of packaging (35). Future work in this area should therefore lead to improvements in the prevention of the occurrence of sometimes serious events in a particularly vulnerable population; i.e. by identifying areas of prevention and thus developing more relevant information and prevention campaigns for the general public, the medical community, public health actors and health authorities.

Limitations, strengths and perspectives of our study

Our study had limitations. Firstly, it was a retrospective study and biases could be related to a lack of information in the medical files. Secondly, it was an unicentric study and the results represented only the population consulting in Nantes University Hospital. However, the size of the sample is one of the strong points of this study, with more than 900 cases of children included; similarly, the methodology of the inclusions, exploiting the PMSI and the hospital search database at the same time, make it possible to include an exhaustive number of children.

Our study was performed during the lockdown related to the COVID 19 pandemic. The impact of COVID and lockdown on the dynamics of pediatric poisonings was not the objective of our study. However, results do not seem to show a major change in the dynamics of these events that is associated with lockdown, and thus with school closures. It seems to be more an increase throughout the year of this problematic. Our results were consistent with an American study conducted in 2020, which also found no "lockdown" effect on a potential increase in hospitalisations due to pediatric poisonings (36,37). The hypotheses considered were an increased vigilance of adults in charge of children and/or a fear of catching COVID on the way to the hospital. A qualitative study among parents could be informative in this context.

CONCLUSION

Throughout this study, we pointed out the importance of accidental ingestion and foreign body accidental insertion in ear nose and eye, with 974 in three years, representing around 1% of all the visits in our studying period.

These emergencies consultations generated additional examinations, a significant waiting time in the PECU, and hospitalizations in significant proportions. We have seen that symptomatic children were requiring the most examinations and hospitalizations, and in this population the per os way was predominant.

Most of these accidents took place at home in the presence of witnesses, so it is essential to improve prevention and education of parents on this issue. To improve these primary prevention measures, a prospective study is required to better understand these accidents.

This study is the first step of a research project, a future prospective and multicentric cohort of accidental ingestions in children, initiated by Nantes University Hospital. It will allow a better identification of the determinants, and a much more exhaustive collection of data. For example, more precise circumstantial data (in which room of the house, time of ingestion), the social-economic level of the families victims of these accidents, a more detailed analysis of the therapeutics (fibroscopy, surgery), the length of stay in the pediatric emergency room as well as the length of hospitalization. This broad follow-up will also allow us to set up primary prevention measures, at the level of parents, practitioners, but also at the level of the product manufacturers. It will also help us to trigger more effective care for children victims of these accidents.

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SERMENT D'HIPPOCRATE

Au moment d'être admis à exercer la médecine, je promets et je jure d'être fidèle aux lois de l'honneur et de la probité.

Mon premier souci sera de rétablir, de préserver ou de promouvoir la santé dans tous ses éléments, physiques et mentaux, individuels et sociaux.

Je respecterai toutes les personnes, leur autonomie et leur volonté, sans aucune discrimination selon leur état ou leurs convictions. J'interviendrai pour les protéger si elles sont affaiblies, vulnérables ou menacées dans leur intégrité ou leur dignité. Même sous la contrainte, je ne ferai pas usage de mes connaissances contre les lois de l'humanité.

J'informerai les patients des décisions envisagées, de leurs raisons et de leurs conséquences. Je ne tromperai jamais leur confiance et n'exploiterai pas le pouvoir hérité des circonstances pour forcer les consciences.

Je donnerai mes soins à l'indigent et à quiconque me les demandera. Je ne me laisserai pas influencer par la soif du gain ou la recherche de la gloire.

Admis dans l'intimité des personnes, je tairai les secrets qui me seront confiés. Reçu à l'intérieur des maisons, je respecterai les secrets des foyers et ma conduite ne servira pas à corrompre les mœurs.

Je ferai tout pour soulager les souffrances. Je ne prolongerai pas abusivement les agonies. Je ne provoquerai jamais la mort délibérément.

Je préserverai l'indépendance nécessaire à l'accomplissement de ma mission. Je n'entreprendrai rien qui dépasse mes compétences. Je les entretiendrai et les perfectionnerai pour assurer au mieux les services qui me seront demandés.

J'apporterai mon aide à mes confrères ainsi qu'à leurs familles dans l'adversité.

Que les hommes et mes confrères m'accordent leur estime si je suis fidèle à mes promesses ; que je sois déshonoré et méprisé si j'y manque.

NOM : D’ALEMAN

PRENOM : Gaëtan

Titre de Thèse : Etude des cas d’intoxications accidentelles et d’expositions accidentelles aux corps étrangers aux urgences pédiatriques du CHU de Nantes entre 2018 et 2020

RESUME

-Introduction: Lors de leurs premières années de vie, les enfants sont exposés dans leur environnement à de multiples objets et produits plus ou moins dangereux. Les ingestions, inhalations et intoxications accidentelles sont fréquemment responsables de consultations dans les services d’urgences pédiatriques voire d’hospitalisations. Notre objectif principal était de décrire les caractéristiques épidémiologiques ainsi que les modalités de la prise en charge des enfants de moins de 6 ans ayant consulté aux urgences pédiatriques du CHU de Nantes pour ces motifs.

-Méthode: Nous avons réalisé une étude unicentrique rétrospective descriptive. Nous avons inclus tous les enfants de moins de 6 ans, ayant consulté aux urgences pédiatriques de Nantes entre 2018 et 2020 pour une ingestion accidentelle médicamenteuse ou de produits toxiques, ainsi que les enfants ayant été exposés à des corps étrangers par voie per os, intra nasale, intra auriculaire ou intra ophtalmique.

- Résultats: 974 enfants ont été inclus, l’âge moyen des enfants était de 3 ans (écart type: 1,55 ans), 53,5% des enfants étaient des garçons, 87 % des accidents avaient eu lieu au domicile de l’enfant, 83,8% des cas étaient secondaires à une exposition per os, intra nasale, intra auriculaire ou ophtalmologique des corps étrangers, 9,7 % à des intoxications médicamenteuses et 7,5% à des ingestions de produits toxiques. 40,9% des enfants étaient symptomatiques, 42,8% des enfants ont eu un examen d’imagerie, 6,7 % un bilan biologique. 85,7% des enfants sont rentrés à domicile, 13,6% ont été hospitalisés dans le service de pédiatrie générale, 0,7% dans une unité de soins intensifs pédiatrique. La population d’enfants symptomatiques était plus jeune (2,76 ans), avec plus fréquemment des ingestions per os (84,2%), les examens complémentaires étaient plus fréquents, ainsi que les hospitalisations (pédiatrie conventionnelle (23,9%) ou soins intensifs (1,8%)).

-Conclusion: Avec plus de 300 consultations par an, ce travail souligne la fréquence des recours aux urgences pédiatriques des enfants de moins de 6 ans pour suspicion d’ingestion, d’inhalation et d’exposition involontaires à des corps étrangers, médicaments et ou de toxiques. Aux vues de ces résultats, il semble important de sensibiliser les personnes en charge d’enfants en bas âge, à ces accidents domestiques afin de pouvoir les prévenir et diminuer leur nombre.

MOTS-CLES : URGENCES PEDIATRIQUES, INTOXICATIONS ACCIDENTELLES, CORPS ETRANGERS, PRODUITS TOXIQUES

Study of cases of intoxication and accidental exposure to foreign bodies in the pediatric emergency care unit of Nantes University Hospital between 2018 and 2020

SUMMARY

-Introduction: During their first years of life, children are exposed in their environment to multiple objects and products more or less dangerous. Accidental ingestions, inhalations and intoxications are frequently responsible for consultations in pediatric emergency departments and even hospitalizations. Our main objective was to describe the epidemiological characteristics and the management of children who consulted the pediatric emergency department of the Nantes University Hospital for these reasons.

-Methods: We conducted a single-center retrospective descriptive study. We included all children under 6 years who consulted the pediatric emergency department of Nantes between 2018 and 2020 for accidental ingestion of drugs or toxic products, as well as children who were exposed to foreign bodies by per os, intra nasal, intra auricular or intra ophthalmic way.

- Results: 974 children were included, the average age of the children was 3 years (SD: 1.55 years), 53.5% of the children were boys, 87% of the accidents took place in the child's home, 83.8% of the cases were secondary to per os, intra nasal, intra auricular or ophthalmic exposure to foreign bodies, 9.7% to drug intoxication and 7.5% to ingestions of toxic products. 40.9% of the children were symptomatic, 42.8% of the children had an imaging examination, 6.7% a biological workup. 85.7% of the children were discharged home, 13.6% were hospitalized in the general pediatric service, 0.7% in a pediatric intensive care unit. The population of symptomatic children was younger (2.76 years), with more frequent per os ingestions (84.2%), more frequent complementary examinations, and more frequent hospitalizations (conventional pediatrics (23.9%) or intensive care (1.8%)).

-Conclusion: With more than 300 consultations per year, this study highlights the frequency of pediatric emergency room visits for children under 6 years for suspected ingestion and involuntary exposure to foreign bodies, drugs, or toxic substances. In view of these results, it seems important to make people in charge of young children aware of these domestic accidents in order to prevent them and reduce their number.

KEYWORDS: PEDIATRIC EMERGENCIES, ACCIDENTAL POISONING, FOREIGN BODIES, TOXIC PRODUCTS