International Epidemiological Differences in Acute Poisonings in Pediatric Emergency Departments

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Background and Objective: Identifying international differences in the epidemiology of acute poisons in children may help in improving prevention. We sought to evaluate the international epidemiological differences in acute poisonings in children presenting to emergency departments (EDs) from 8 different global regions.

Methods: This was an international multicenter cross-sectional prospective study including children younger than 18 years with acute poisonings presenting to 105 EDs in 20 countries was conducted. Data collection started at each ED between January and September 2013, and continued for 1 year.

Results: During the study period, we registered 363,245 pediatric ED presentations, of which 1727 were for poisoning (0.47%; 95% confidence interval, 0.45%–0.50%), with a significant variation of differences between the regions. Full data were obtained for 1688 presentations. Most poisonings (1361 [80.6%]) occurred at home with either ingestion (1504 [89.0%]) or inhalation of the toxin (126 [7.6%]). Nonintentional exposures accounted for 1157 poisonings (68.5%); mainly in South America and Eastern Mediterranean region), with therapeutic drugs (494 [42.7%]), household products (310 [26.8%]), and pesticides (59 [5.1%]) being the most common toxins. Suicide attempts accounted for 233 exposures (13.8%); mainly in the Western Pacific region and North America), with therapeutic drugs (214 [91.8%], mainly psychotropics and acetaminophen) being the most common toxins. Significant differences between regions were found in both types of poisonings. Recreational poisonings were more common in Europe and Western Pacific region. No patient died.

Conclusions: There are substantial epidemiological differences in acute poisonings among children in different countries and regions of the globe.

International best practices need to be identified for prevention of acute poisonings in childhood.

Key Words: Poisonings, epidemiology, global

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Globally, poisoning in childhood remains a major public health care problem. 1,2 Although fatal child poisonings have decreased substantially in recent decades in the United States, 3 millions of calls and/or referrals are made to poison control centers each year worldwide. Thousands of children are subsequently evaluated in emergency departments (EDs) mainly due to ingestions of household products, medicines, or pesticides, most of which are preventable.1 In the United States alone, each year more than 1 million children younger than 5 years experience potentially toxic ingestions.4,5 Other common causes of child poisonings include suicide attempts and recreational ingestions.

There are limited data regarding global morbidity and differences in poisoning epidemiology between countries. Identifying international epidemiological differences related to acute pediatric poisonings would help to identify and implement appropriate and specific preventive measures. In 2008, an electronic poisoning surveillance system established in Spanish pediatric EDs by the Spanish Society of Pediatric Emergency Medicine6 identified regional epidemiological differences in acute poisonings in children presenting to pediatric EDs in Spain.7,8 This national surveillance system also served as a pilot to investigate such differences between regions worldwide.

The objective of this study was to evaluate and compare the epidemiology of poisonings in children presenting to EDs that are part of the international Pediatric Emergency Research Networks (PERN), a global consortium of pediatric emergency medicine research networks.9

We hypothesized that there would be significant epidemiological differences in the circumstances and etiologies of poisonings among the different global regions.

METHODS

Design

This was an international multicenter cross-sectional prospective registry study of childhood poisoning presentations to 105 EDs in the PERN network. When proposed, PERN comprised representative hospitals from the 5 major pediatric emergency medicine research networks located in Europe and the Middle East (Research in European Paediatric Emergency Medicine [REPEM]), North America (the Pediatric Emergency Care Applied Research Network [PECARN]), the Pediatric Emergency Care Collaborative Research Committee of the American
In that study, therapeutic drugs accounted for 56.2% of acute poisonings. The sample size was intended to identify a 10% difference in frequency between regions for the main toxic substances implicated. The final sample size thus depended both on the final point estimates of the frequencies of the types of toxic substances, and the ranges in the differences between regions. If the frequency of poisoning due to different types of toxic substances among regions varied between 45% and 60%, to find a 10% difference between regions, 90 poisoning episodes per region would be needed; if the frequency of poisonings due to different types of toxic substances among regions varied between 30% and 60%, to find a 10% difference between regions, 25 poisoning episodes per region would be needed; and if the frequency varied between 30% and 40%, to find a 10% difference between regions, 350 poisoning episodes per region would be needed (all with 80% power, \( \alpha = 0.05 \)). The inclusion of approximately 100 poisoning episodes per region was deemed sufficient to meet the primary objectives of the study.

**Statistical Analysis**

We calculated all incidence rates globally (with 95% confidence intervals [CIs]) from the number of new cases of poisonings evaluated at the EDs divided by the total number of ED episodes. We describe the qualitative variables in percentages with 95% CIs. We compared frequencies between regions using the \( \chi^2 \) test. To identify types of poisonings, we used multiple correspondence analysis and cluster analysis.

Because the original variables obtained from the collected data were categorical, we used multiple correspondence analysis to create a reduced number of continuous variables (also known as factors) to make data interpretation easier. We used the following categorical variables: location of poisoning (home, school, street, tavern/bar, other, and unknown), age (<1, 1–6, 7–10, and ≥11 years), mechanism of poisoning (dosage errors, nonintentional/accidental, recreational, suicide attempt, and other), route of poisoning (ingestion, inhalation, and other), and specific toxicant exposure (carbon monoxide, cosmetic, drugs, ethanol, ethyl alcohol + illicit drugs, pesticides, plants, household products, other, and unknown).

We then performed the cluster analysis, which organizes information from apparently heterogeneous episodes into relatively homogenous groups. We used the factors obtained in the multiple correspondence analyses as variables to perform the cluster analysis and to obtain the appropriate grouping of poisonings. To create clusters, we used the squared-euclidean distance and Ward method. Combining multiple correspondence analysis and cluster analysis categorize poisoning episodes into groups suggested by the data—not defined a priori—such that episodes in a given group of poisonings are similar to each other and episodes in different groups are dissimilar.

We performed all statistical analyses using SPSS vs. 22.0 statistical software (IBM, Armonk, NY) and R project.

**Ethics/Human Subjects**

We obtained overall approval from the Clinical Research Ethics Committee of the Basque Country. Approval for the study was granted by the institutional review boards/ethics committees at each participating institution who determined if informed consent was or was not required by participants. When required, informed consent was obtained from parents/guardians, with informed assent obtained from the participants when they were older than 12 years.

**RESULTS**

During the study period, we registered 363,245 pediatric ED presentations to the 105 EDs in the designated enrollment days, of which 1727 were for poisoning (0.47%; 95% CI, 0.45%–0.50%). There was significant variation in incidence of poisoning presentations across the global regions (Table I, Supplemental Digital Content 2, http://links.lww.com/PEC/A148). Of the 1727 episodes, 39
were excluded due to lack of required informed consent or due to episodes missed prospectively. Of the 1688 episodes analyzed, 873 (51.7%; 95% CI, 49.3%–54.1%) were in boys. Poisonings in girls were more common in North America (57.2%; 95% CI, 49.6%–64.7%) and in the Western Pacific regions (55.4%; 95% CI, 43.7%–66.4%). There was a bimodal peak age distribution (Fig. 1). Most of the poisonings (1361 [80.6%]; 95% CI, 78.7%–82.5%) occurred in the home with either ingestions (1504 [89.0%]; 95% CI, 87.5%–90.5%) or inhalations of the toxicants (126 [7.6%]; 95% CI, 6.3%–8.8%). Although unintentional poisoning was the most common mechanism of poisoning (1157 [68.5%]; 95% CI, 66.2%–70.7%), there was a significant variation in the underlying mechanisms across the different regions analyzed (Fig. 2 and Table II, Supplemental Digital Content 3, http://links.lww.com/PEC/A149). No patient died.

The multiple correspondence analyses indicated that 3 factors explained 76.3% of the global variability in the data. After applying cluster analysis to the 3 factors found in the multiple correspondence analyses, we identified 5 main groups of intoxications (Table 1). Group A was related to unintentional inhalation of toxic substances (>50% carbon monoxide) mainly at home and, less frequently, at school; most of the children in this group were older than 10 years. Group B was related to nonintentional ingestions of household products at home by children between 1 and 7 years old. Group C was similar to group B (nonintentional, at home, and children 1–7 years old) but related to the ingestion of therapeutic drugs. Group D was associated with the unintentional ingestion of household products at home by patients older than 10 years. These ingestions were frequently suicide attempts. Group E was related to the recreational ingestion of ethanol or, less frequently, the use of illicit drugs by children older than 10 years in the street or taverns/bars. The distribution of these groups showed significant differences between the analyzed global regions (Table 2).

Unintentional Poisonings

There were no significant differences between regions in either the season or in the day of week for presentations of unintentional poisonings. The type of exposure varied significantly, however, by international region (Fig. 3 and Table III, Supplemental Digital Content 4, http://links.lww.com/PEC/A150); therapeutic drugs were the most frequently involved substances (494 [42.7%]; 95% CI, 39.8%–45.5%), mainly psychotropics, acetaminophen, and nonsteroidal anti-inflammatory drugs, although there were significant differences between regions (Table IV, Supplemental Digital Content 5, http://links.lww.com/PEC/A151).

Of the household products, the most common exposures were to caustic agents (77 [24.8%]; 95% CI, 20.0%–29.6%) and detergents (19.6%; 95% CI, 15.1%–24.0%)—most were single-unit disposable laundry detergent packets in North America, Northern Europe, and Eastern Europe. Nearly 90% (1029 [88.9%]; 95% CI, 87.1%–90.7%) of children with these poisonings were exposed in the child’s home, with nearly one third occurring in the kitchen. In 246 (21.3%; 95% CI, 21.3%–23.6%) of the 1157 unintentional poisonings, caregivers admitted that they kept the toxic substance in a nonoriginal container (>30% in South America and Eastern Mediterranean region). Furthermore, in nearly 50% of the unintentional poisonings due to household products (138 [44.5%]; 95% CI, 38.9%–50.0%), caregivers admitted not keeping these products out of reach of children.

Suicide Attempts

Suicide attempts were more common among girls (192/233 [82.4%]; 95% CI, 77.5%–87.3%). Presentations were more common on weekdays (195/233 [83.7%]; 95% CI, 78.9%–88.4%), with therapeutic drugs being the most common toxicant (214 [91.8%]; 95% CI, 88.2%–95.3%), mainly psychotropics (72 [33.6%]; 95% CI, 27.2%–39.9%), and acetaminophen (69 [32.2%]; 95% CI, 25.9%–38.4%). Of children attempting suicide, 59 (27.5%; 95% CI, 21.5%–33.4%) took more than 1 agent, and 13 (6.0%) mixed therapeutic drugs with ethanol or illicit drugs. The therapeutic drug most commonly associated with suicide attempts varied significantly by region: acetaminophen, 21 of 28 suicide attempts involving therapeutic drugs (75%; 95% CI, 58.9%–91.0%) in Northern Europe; benzodiazepines, 10 of 14 (71%; 95% CI, 47.2%–94.7%) in South America, while 0 of 56 in North America.

Poisonings Due to Recreational Drug Use

Poisonings due to recreational/illicit drug use were more common in males (99/180 [55%]; 95% CI, 47.7%–62.2%), particularly in older adolescents (males aged ≥16 years, 59/115 [51%], males aged ≥16 years, 43/65 [66%]; P < 0.01). Poisonings from recreational/illicit drug use were more on weekends (40.0%). Ethanol was the most common toxicant in recreational poisonings (123 [68.3%]; 15 [12.1%], mixed with illicit drugs), followed by illicit drugs (32 [17.8%], mainly cannabis). The highest rate of recreational poisonings due to illicit drug consumption was in South America.

DISCUSSION

Globally, the unintentional ingestion of therapeutic drugs and household products by young children is the most common...
FIGURE 2. Mechanism of poisoning by international region.

TABLE 1. Description of Groups of Poisonings

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
<th>A (n = 104)</th>
<th>B (n = 534)</th>
<th>C (n = 653)</th>
<th>D (n = 232)</th>
<th>E (n = 165)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toxicant</td>
<td>Carbon monoxide</td>
<td>57 (54.8)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Household product</td>
<td>1 (1)</td>
<td>306 (57.3)</td>
<td>11 (1.7)</td>
<td>0 (0)</td>
<td>1 (0.6)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ethanol</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>14 (2.1)</td>
<td>0 (0)</td>
<td>114 (69.1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ethanol + illicit drugs</td>
<td>5 (4.8)</td>
<td>0 (0)</td>
<td>12 (1.8)</td>
<td>1 (0.4)</td>
<td>45 (27.3)</td>
<td></td>
</tr>
<tr>
<td>Pesticides</td>
<td>0 (0)</td>
<td>58 (10.9)</td>
<td>3 (0.5)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Cosmetics</td>
<td>0 (0)</td>
<td>48 (9)</td>
<td>2 (0.3)</td>
<td>1 (0.4)</td>
<td>0 (0)</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Therapeutic drugs</td>
<td>2 (1.9)</td>
<td>5 (0.9)</td>
<td>574 (87.9)</td>
<td>213 (91.8)</td>
<td>2 (1.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plants</td>
<td>1 (1)</td>
<td>27 (5.1)</td>
<td>12 (1.8)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>10 (9.6)</td>
<td>8 (1.5)</td>
<td>3 (0.5)</td>
<td>0 (0)</td>
<td>1 (0.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>others</td>
<td>28 (26.9)</td>
<td>82 (15.4)</td>
<td>22 (3.4)</td>
<td>17 (7.3)</td>
<td>2 (1.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanisms</td>
<td>Dosage errors</td>
<td>2 (1.9)</td>
<td>0 (0)</td>
<td>51 (7.8)</td>
<td>11 (4.7)</td>
<td>0 (0)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Nonintentional</td>
<td>90 (86.5)</td>
<td>527 (98.7)</td>
<td>537 (82.2)</td>
<td>0 (0)</td>
<td>3 (1.8)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Recreational</td>
<td>4 (3.8)</td>
<td>0 (0)</td>
<td>18 (2.8)</td>
<td>0 (0)</td>
<td>158 (95.8)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Suicide attempt</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>12 (1.8)</td>
<td>220 (94.8)</td>
<td>1 (0.6)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>other</td>
<td>8 (7.7)</td>
<td>7 (1.3)</td>
<td>35 (5.4)</td>
<td>1 (0.4)</td>
<td>3 (1.8)</td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td>Home</td>
<td>68 (65.4)</td>
<td>499 (93.4)</td>
<td>573 (87.7)</td>
<td>202 (87.1)</td>
<td>19 (11.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Street</td>
<td>1 (1)</td>
<td>0 (0)</td>
<td>18 (2.8)</td>
<td>4 (1.7)</td>
<td>73 (44.2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tavern/bar</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>1 (2.8)</td>
<td>0 (0)</td>
<td>25 (44.2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>School</td>
<td>29 (27.9)</td>
<td>1 (0.2)</td>
<td>2 (0.3)</td>
<td>11 (4.7)</td>
<td>1 (0.6)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>3 (2.9)</td>
<td>32 (6)</td>
<td>49 (7.5)</td>
<td>8 (3.4)</td>
<td>27 (16.4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unknown</td>
<td>3 (2.9)</td>
<td>2 (0.4)</td>
<td>10 (1.5)</td>
<td>7 (3)</td>
<td>20 (12.1)</td>
<td></td>
</tr>
<tr>
<td>Route</td>
<td>Ingestion</td>
<td>2 (1.9)</td>
<td>495 (92.7)</td>
<td>642 (98.3)</td>
<td>227 (97.8)</td>
<td>136 (82.4)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Inhalation</td>
<td>97 (93.3)</td>
<td>1 (0.2)</td>
<td>0 (0)</td>
<td>3 (1.3)</td>
<td>25 (15.2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>5 (4.8)</td>
<td>38 (7.1)</td>
<td>11 (1.7)</td>
<td>2 (0.9)</td>
<td>4 (2.4)</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>&lt;1 y</td>
<td>11 (10.6)</td>
<td>46 (8.6)</td>
<td>47 (7.2)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>1–6 y</td>
<td>31 (29.8)</td>
<td>470 (88.0)</td>
<td>491 (75.2)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>7–10 y</td>
<td>15 (14.4)</td>
<td>16 (3.0)</td>
<td>37 (5.7)</td>
<td>1 (0.4)</td>
<td>1 (0.6)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt;10 y</td>
<td>47 (45.2)</td>
<td>2 (0.4)</td>
<td>78 (11.9)</td>
<td>231 (99.6)</td>
<td>164 (99.4)</td>
<td></td>
</tr>
</tbody>
</table>

Cells show numbers and percentages of each category of different variables in each group.


The P values demonstrate the differences between groups among the analyzed variables. The P values reflect the independence between the analyzed variables, using the χ² test. A P value < 0.05 means that significant differences were found between the analyzed variables the different groups of poisonings.

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mechanism of acute pediatric poisonings reported to poison control centers or of patients receiving care in pediatric EDs. However, we identified significant differences between international regions related to the circumstances of the poisonings and involved toxicants. It is somewhat surprising that no patient died. However, this is consistent with previous reports that fatal child poisonings have decreased substantially in recent decades.3

Although great efforts have been made in the last few decades in prevention, childhood acute poisoning remains a major problem.3–5 Overall, in our study, poisoning accounted for approximately 1 in 200 visits to the EDs. Various epidemiological studies on poisoning emphasizing the importance of acute pediatric poisonings have been conducted in EDs,6,13 National Poison Control Centers,5,14 and prehospital settings.15 To our knowledge, this is the first international, epidemiological study comparing presentations of childhood acute poisonings in EDs across the globe, involving 4 WHO regions. Given that most of these “accidental” poisonings can be prevented,1 different interventions and strategies targeted to the circumstances surrounding the poisonings should be developed and implemented.3

As with reports from single countries,6,13 unintentional poisonings were the most common presentations, although the frequency of unintentional poisoning and the toxicants involved varied greatly across the 8 international regions. The study was not designed to address the reason for these differences, and it is highly likely that differences are multifactorial (eg, differences in drug prescribing practices, exposure to pesticides, access to recreational drugs, parental supervision, educational structures). However, current prevention strategies within regions (eg, limiting quantity of medications prescribed, warning labels, and

**TABLE 2.** Distribution of Groups of Poisonings by Region

<table>
<thead>
<tr>
<th>Regions</th>
<th>A (n = 104)</th>
<th>B (n = 534)</th>
<th>C (n = 653)</th>
<th>D (n = 232)</th>
<th>E (n = 165)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>South America (n = 223)</td>
<td>11 (4.9)</td>
<td>85 (38.1)</td>
<td>103 (46.2)</td>
<td>13 (5.8)</td>
<td>11 (4.9)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>North America (n = 166)</td>
<td>1 (0.6)</td>
<td>25 (15.1)</td>
<td>75 (45.2)</td>
<td>57 (34.3)</td>
<td>8 (4.8)</td>
<td></td>
</tr>
<tr>
<td>Western Europe (n = 178)</td>
<td>19 (10.7)</td>
<td>66 (37.1)</td>
<td>51 (28.7)</td>
<td>19 (10.7)</td>
<td>23 (12.9)</td>
<td></td>
</tr>
<tr>
<td>Eastern Europe (n = 267)</td>
<td>41 (15.4)</td>
<td>81 (30.3)</td>
<td>87 (32.6)</td>
<td>24 (7.9)</td>
<td>37 (13.9)</td>
<td></td>
</tr>
<tr>
<td>Northern Europe (n = 176)</td>
<td>6 (3.4)</td>
<td>51 (29)</td>
<td>65 (36.9)</td>
<td>32 (18.2)</td>
<td>22 (12.5)</td>
<td></td>
</tr>
<tr>
<td>Southern Europe (n = 558)</td>
<td>25 (4.5)</td>
<td>190 (34.1)</td>
<td>235 (42.1)</td>
<td>60 (10.8)</td>
<td>48 (8.6)</td>
<td></td>
</tr>
<tr>
<td>Eastern Mediterranean (n = 46)</td>
<td>1 (2.2)</td>
<td>28 (60.9)</td>
<td>13 (28.3)</td>
<td>4 (8.7)</td>
<td>0 (0)</td>
<td></td>
</tr>
<tr>
<td>Western Pacific (n = 74)</td>
<td>0 (0)</td>
<td>8 (10.8)</td>
<td>24 (32.4)</td>
<td>26 (35.1)</td>
<td>16 (21.6)</td>
<td></td>
</tr>
</tbody>
</table>

Cells show numbers and percentages of each group by region.

Group A: related to nonintentional inhalation of toxic substances (>50% carbon monoxide) mainly at home and, less frequently, at school. Group B: related to nonintentional ingestions of household products at home by children between 1 and 7 years old. Group C: similar to group B (nonintentional, at home and children 1–7 years old) but related to the ingestion of therapeutic drugs. Group D: associated with the intentional ingestion at home of therapeutic drugs by patients older than 10 years, frequently due to suicide attempts. Group E: related to the recreational ingestion of ethanol or, less frequently, the use of illicit drugs by children older than 10 years in the street or taverns/bars.

The P values demonstrate the differences between groups in the analyzed regions. The P values reflect the independence between the analyzed variables, using the χ² test. A P value < 0.05 means that significant differences were found related to the rate of the groups of poisonings in the different regions.

**FIGURE 3.** Toxicants involved in unintentional poisonings by international region.
community outreach and messaging) also play an important role in overall poisoning rates. With the identification of differences across regions, further studies can explore the effectiveness of specific public health prevention measures within countries. Among children with nonintentional poisonings, the most common culprits were therapeutic drugs, although in some regions, poisonings due to household products were more common. In addition, we also observed significant regional differences between therapeutic drugs involved. These differences should be addressed when designing prevention programs.

This study also confirms the substantial international incidence of laundry detergent pod ingestions in children and the need for increased efforts to prevent exposure of young children to these products, mainly in Europe, where the rate of poisonings due to household products was particularly high. Pesticides are a leading cause of poisoning in South America and the Eastern Mediterranean, where most reported cases related to direct exposure to rodenticides used in and around the home. There remains a pressing need for universal prevention messages for childhood poisonings of all types. In this study, 20% of caregivers did not store potential toxicants in the original packaging, and 30% of caregivers did not store these out of reach of children. Regardless of the role of legal regulations about the packaging of therapeutic drugs or household products in poisoning prevention efforts, effective education of families about the methods and strategies to store these products at home needs to be interpreted with this in mind. However, the sample was sufficiently large to detect important epidemiological differences among adolescents, particularly in South America and the Eastern Mediterranean region.

There was also a striking rate of suicide attempts among children seen in the EDs of North America and Western Pacific region, particularly among older adolescents. Suicidal ideation and suicide attempts are the most common mental health emergencies among adolescents, and suicide is the third leading cause of death among individuals aged 10 to 24 years in the United States. We were somewhat limited in comparisons of suicide attempts by region; however, because some of the participating EDs attended children only to 14 years of age. Regardless, screening for mental health issues and suicidality is a strategy that must be considered in pediatric EDs worldwide, particularly in those regions most notably affected.

Approximately 10% of pediatric poisonings were due to recreational/illicit drugs. These events typically involved ethanol, despite most countries having legislation that limits the sale of alcohol to minors. As previously reported, alcohol intoxication was more common in certain regions. The WHO European Region has reported the heaviest alcohol consumption in the world, and alcohol-related harm is disproportionately high among young people. As a consequence, ED visits related to alcohol and illicit drug consumption are increasing. The ED may provide a critical and unique opportunity to screen for alcohol use and initiate care and prevention strategies of these adolescents.

Our study emphasizes the importance of these surveillance systems. Although some countries, such as the United States, have excellent poison control center surveillance systems, the information directly recorded in the ED may help to identify most common exposures in those settings (some of which never are reported to poison control centers). In addition, the availability of poison control centers varies across the world. Although most of the developed countries have well-established facilities for poison control services, this is rarely the case in developing countries.

This study has several limitations worth noting. The number/percentage of EDs included was not the same in all the regions; thus, data from Eastern Mediterranean and Western Pacific regions need to be interpreted with this in mind. However, the sample was sufficiently large to detect important epidemiological differences between regions and to fulfill the main objective of the study. Of note, some of the participating EDs attend to children up to 14 years of age and others up to 18 years, thus limiting the ability to make comparisons between regions in the older adolescent group. The results regarding suicide attempts also do not include suicide attempts by inflicted self-harm (and not by poisoning) and therefore should not be used as a comparison of total suicide rates across regions. In addition, the EDs involved in the study are members of the PERN research network, and are therefore self-selected and may not be truly representative of all pediatric EDs globally. However, the EDs included both secondary and tertiary EDs, pediatric and mixed pediatric and adults EDs, rural and urban EDs, and EDs with small and large volumes, and it therefore seems unlikely that self-selection would have significantly biased the results. On the other hand, international differences related to poison center presence and functionality, the availability of a telephone hotline for poisonings, and prehospital medical services, in addition to other factors, may bias the number of children that are brought to the EDs by region. However, this possibility does not limit the analysis of the study population of children with poisonings presenting to EDs across broad regions of the globe. Finally, our study reflects that pediatric poisonings are more common in EDs from certain regions, which should be taken into account in the organization and provision of services by region.

In conclusion, there are substantial epidemiological differences in acute poisonings in children evaluated in EDs across different countries and regions of the globe. These differences should be taken into account when designing effective local prevention interventions. The role of pesticides in South America and Eastern Mediterranean regions and household products in some European regions, the striking rate of suicide attempts in North America and the Western Pacific regions, and, finally, the low use of the poison control centers are concerning issues to be considered when designing preventive measures. Furthermore, comparisons of outcomes from different treatment practices can inform current practices internationally.

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Other participating sites and investigators include the following:


REFERENCES


