Has the pattern of acute poisoning among children in Albania changed?

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ABSTRACT

The prevalence and type of poisoning vary in different parts of the world and may change overtime, that’s why epidemiological surveillance is very important to evaluate the extent of the problem. This is a retrospective study. Included in this study are all children hospitalized with poisonings in our Pediatric Intensive Care Unit (PICU) during 10 years: 2005-2014. We evaluated the epidemiological data of our country, the trend and the prognosis of poisoning. During the study period out of 5,714 children admitted in our PICU, 5% (280 cases) were poisoning. Trend of poisonings during 10 years has changed significantly. Comparing the two periods: 2005-2009 and 2010-2014 we estimated statistically significant reduction in the second period for the total number of poisonings (P = 0.0001) and significant reduction for drugs, pesticides, hydrocarbons (P = 0.05; P = 0.0005; P = 0.033). Since drugs constitute the main cause of poisoning in our study (50% of cases) we evaluated their trend between two periods. We noticed a sharp increase for Paracetamol P = 0.08, $\chi^2$ = 3063; significant reduction for antipsychotics $P = 0.02, \chi^2 = 5.042$; reduction for Naphazoline $P = 0.22, \chi^2 = 1.455$; and increase for Benzodiazepine $P = 0.22, \chi^2 = 1.455$. A new problematic was methadone poisoning. Mortality occupies 2.5% of cases. Comparing mortality rate between the two periods it wasn’t observed significant mortality reduction, $P = 0.82$, OR = 1.186; 95% CI (0.2652 to 5.3039). Demographic change as well economic and cultural levels have impacted the epidemiological profile of acute poisoning in children in our country. With the large immigrant movement in Europe during last years, we think that even in other countries, characteristics of poisoning may have changed.


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1. INTRODUCTION

Exposure to poisons is a common problem in children [1-4]. The incidence of childhood poisoning in various studies ranges from 0.33% to 7.6%.[2, 5, 6] Each year in the United States more than 1 million poison exposures among children younger than six years of age are reported to the American Association of Poison Control Centers (AAPCC) [1, 2]. According WHO during 2004, acute poisoning caused more than 45,000 deaths in children and teenagers [1].

Different countries have different characteristics regarding type and severity of poisonings depending on industrial development, agricultural activities and cultural practices relating to supervision of children.[1, 7]. That’s why the pattern of poisoning may change overtime. A lot of demographic and economic changes had happened in our country during last years. We would like to underline that this phenomenon is happening even across Europe with a large immigrant movement. For doctors it is important knowing the cultural practices of immigrant people. With our study we try to understand what is happening with poisoning in children in our country, to assess if it has change the pattern of poisoning, if demographic changes have impacted the epidemiological profile of acute poisoning in children and to evaluate the extent of the problem according to which to understand the preventive measures we can take.

2. METHODS AND METHODS

This is a retrospective study. Included in this study are all children admitted at our Pediatric...
Intensive Care Unit (PICU) for a period of 10 years: January 2005 - December 2014. For each patient are collected the following data: age, sex, time of intoxication, route of exposure, mode of intoxication (accidental, iatrogenic or suicidal), the category of poisoning agent, the gravity of the toxicity, laboratory data, toxicological data, transportation from other districts and primary management offered by them, parent factor (presence at the event or negation of the event), medical diagnostic suspicion and prognosis.

The study is divided into three age groups based on their psychomotor development: Group I - 0-5 years old; Group II - 6-12 years; Group III - ≥13 years.

According to each age group is estimated: the distribution Male/Female; the category of poisoning agent and route of exposure.

The gravity of the toxicity is defined under "Poisoning Severity Score" (standardized by WHO in collaboration with the American Academy of Clinical Toxicology, European Community Programme on Chemical Safety and the International Programme on Chemical Safety) to five scale based on gravity evaluative table for poisoning [8].

**NONE (0):** No symptoms or signs related to poisoning
**MINOR (1):** Mild, transient and spontaneously resolving symptoms
**MODERATE (2):** Pronounced or prolonged symptoms
**SEVERE (3):** Severe or life-threatening symptoms
**FATAL (4):** Death

To determine the trend of intoxications and their prognosis over the years were made comparison of above parameters between the two periods: 2005-2009 and 2010-2014.

### 2.1 Statistical analyses

The data were analyzed by statistical package SPSS 16.0.

Categorical variables were expressed as whole number and continuous variables as mean ± standard deviation (SD). Kolmogorov-Smirnov test is used for normal distribution.

To compare continuous variables we used Student’s T-test. We used $\chi^2$ test with Yates’s correction for the comparison of the proportions and Odds ratio (OR) for mortality assessment.

A $p$ value of <0.05 was considered statistically significant. Estimates are presented with 95% confidence intervals (CI).

### 3. RESULTS

During the study period, out of 5714 children hospitalized at our PICU, 280 cases were admitted because of acute poisonings, which accounted for 5% of the total number of patients. The largest percentage of poisoning was recorded in the period 2007, 2008, 2009, followed gradually by a significant decline in subsequent years (Table 1).

Table 1. Place of poisonings versus admissions

<table>
<thead>
<tr>
<th>Year</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admissions</td>
<td>463</td>
<td>493</td>
<td>576</td>
<td>596</td>
<td>560</td>
<td>615</td>
<td>478</td>
<td>659</td>
<td>620</td>
<td>654</td>
</tr>
<tr>
<td>Poisonings (no of cases)</td>
<td>20</td>
<td>27</td>
<td>47</td>
<td>47</td>
<td>33</td>
<td>29</td>
<td>18</td>
<td>20</td>
<td>16</td>
<td>23</td>
</tr>
<tr>
<td>%</td>
<td>4.30%</td>
<td>5.40%</td>
<td>8.10%</td>
<td>7.90%</td>
<td>5.90%</td>
<td>4.70%</td>
<td>3.70%</td>
<td>3%</td>
<td>2.60%</td>
<td>3.50%</td>
</tr>
</tbody>
</table>

The mean age of poisoning’s presentation was 5.4 ± 4.1 years (95% CI 4.8 to 5.85). In relation to the age, the majority of cases belongs to age group 0-5 years with 185 cases (66% of cases) with a statistically significant predominance ($p <0.01\); $\chi^2 = 144.95$), followed by age group 6-12 years - 69 cases (24.6% of cases) and a few cases for the age group ≥13 years - 26 cases (9.4% of cases).

Regarding gender was observed a statistically significant predominance of males: M/F = 1.55/1. ($p=0.0007, 95\% \text{ CI} (9.451\% \text{ to } 32.549\%)$). This predominance was visible steadily over the years and not only in total. The three age groups have males predominance, but this predominance is statistically significant only for the age group: 0-5 years.

By assessing the route of exposure to poison: 99.6% was ingestion, 0.3% with inhalation and no case with dermal and ophthalmic route.

Regarding the category of poisoning agent we found out that drugs were the main agent with 140 cases (50% of cases) with a statistically
significant difference compared with the other causes (estimated with Chi-square test: $P < 0.0001$, $\chi^2 = 264.69$), followed by pesticides with 70 cases (25% of cases) and alcohol with 32 cases (11.45 of cases) (Table 2).

Table 2. Etiology of poisoning by age-group.

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>%</th>
<th>0-5 years</th>
<th>6-12 years</th>
<th>≥13 years</th>
<th>P</th>
<th>$\chi^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drugs</td>
<td>140</td>
<td>50%</td>
<td>109</td>
<td>19</td>
<td>12</td>
<td>&lt;0.0001</td>
<td>125.4</td>
</tr>
<tr>
<td>Pesticide</td>
<td>70</td>
<td>25%</td>
<td>44</td>
<td>23</td>
<td>3</td>
<td>&lt;0.001</td>
<td>36.02</td>
</tr>
<tr>
<td>Alcohol</td>
<td>32</td>
<td>11.4%</td>
<td>6</td>
<td>20</td>
<td>6</td>
<td>0.0022</td>
<td>12.25</td>
</tr>
<tr>
<td>Hydrocarbon</td>
<td>15</td>
<td>5.4%</td>
<td>13</td>
<td>1</td>
<td>1</td>
<td>0.0001</td>
<td>19.2</td>
</tr>
<tr>
<td>Caustic</td>
<td>11</td>
<td>3.9%</td>
<td>9</td>
<td>1</td>
<td>1</td>
<td>0.003</td>
<td>11.63</td>
</tr>
<tr>
<td>Mushrooms</td>
<td>11</td>
<td>3.9%</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>0.69</td>
<td>0.72</td>
</tr>
<tr>
<td>Toxic gases</td>
<td>1</td>
<td>0.35%</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Methanol</td>
<td>0</td>
<td>0%</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 3. Trend of poisoning during the two five years evaluated at our study.

<table>
<thead>
<tr>
<th></th>
<th>2005-2009</th>
<th>2010-2014</th>
<th>P</th>
<th>$\chi^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drugs</td>
<td>82</td>
<td>58</td>
<td>$P = 0.05$</td>
<td>3.779</td>
</tr>
<tr>
<td>Pesticide</td>
<td>50</td>
<td>20</td>
<td>$P = 0.0005$</td>
<td>12.014</td>
</tr>
<tr>
<td>Alcohol</td>
<td>14</td>
<td>18</td>
<td>$P = 0.5959$</td>
<td>0.281</td>
</tr>
<tr>
<td>Hydrocarbon</td>
<td>14</td>
<td>4</td>
<td>$P = 0.0339$</td>
<td>4.500</td>
</tr>
<tr>
<td>Caustic</td>
<td>5</td>
<td>7</td>
<td>$P = 0.7728$</td>
<td>0.083</td>
</tr>
<tr>
<td>Mushrooms</td>
<td>9</td>
<td>2</td>
<td>$P = 0.0704$</td>
<td>3.273</td>
</tr>
<tr>
<td>Methanol/ethylenglycol</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>174</td>
<td>109</td>
<td>$P = 0.0001$</td>
<td>14.473</td>
</tr>
</tbody>
</table>

![Figure 1. Trend of poisonings during years.](image)
Number and trend of intoxication during these 10 years has changed significantly. (Figure 1) We found a statistically significant reduction in the second period (2010-2014) for the total number of poisonings. (P= 0.0001). On the other side comparing the two period 2005-2009 and 2010-2014, we noticed in the 2nd period a significantly reduction as for pesticides and for drugs that have had a powerful peak in the first five years, as well as for hydrocarbons. Respectively: P= 0.05; P= 0.0005; P= 0.033 (Table 3).

Etiology of poisonings varies according to different age groups. The results of our paper coincide with the psychological development of the child. It seems clear that in the age group 0-5 years drugs, pesticides and hydrocarbons are the main toxic agents with statistically significant difference with the other two age groups.

In the 2nd age group 6-12 years old, the role of drugs falls, to be substituted with alcohol, the "masculine" element of this age. In the 3rd age group ≥13 years, although the number of intoxications is significantly reduced, drugs regain the first place, as one of the possible agent of suicide for this delicate age group.

Since drugs constitute the majority of poisonings we analyzed the type of drug as a cause of poisoning in our patients. It is important emphasizing that the group of undefined drugs dominates with 30.7% of the cases (43 cases).

In the group of determined drugs poisoning, antidepressant/antipsychotic are more frequent (17% of cases), followed by the barbiturate/BDZ (12.8% of cases). It should be noted a substantial number of cases from paracetamol (11.4% of cases) and naphazoline (8.6% of cases).

By doing the comparison between the two periods regarding the most frequent drugs, in the 2nd period we observed:
- A significant increase of Paracetamol poisoning (from 4 cases in 12 cases) on the borders of significance. P =0.08, χ²= 3.063.
- Significant reduction of antipsychotics (from 18 cases in 6 cases) statistically significant. P =0.02, χ² = 5.042.
- Naphazoline poisoning reduction (from 8 cases in 3 cases), but not statistically significant: P = 0.22, χ² = 1.455.
- Increase of BDZ poisoning (from 3 cases in 8 cases) but not statistically significant: P = 0.22, χ² = 1.455.
- A new problem was methadone poisoning.

Assessing the severity of intoxication under "Poisoning Severity Score" it was estimated that 71% of cases (201 cases) does not appear in serious condition, which means they weren’t indication for treatment in PICU and probably if it would exist a National Centre for Poisonings would not be required hospitalization and for further transfer from regional hospitals in our University Hospital Center.

Severity of our cases:
NONE (0): – 5% (14 cases)
MINOR (1): – 24% (67 cases)
MODERATE (2):– 42.8% (120 cases)
SEVERE (3): – 25.7% (72 cases)
FATAL (4): – 2.5% - 7 (cases).

In 85.7% of cases route of exposure was accidental, in 10% of cases suicidal tentative, while 4.3% of the cases were iatrogenic. In suicidal poisonings predominates females, but without statistical differences with males (54% versus 47%, P=0.965, χ²= 14.473). By Odds ratio comparison for accidental and suicidal mortality we found OR=3.61, 95%CI(0.66 to 19.57).

Despite that, and as we saw above, the majority of poisonings do not show a severe degree of gravity, poisoning remain an important problem in intensive care due to mortality rate with 2.5% of cases in our study. Cases with fatal outcome have been 2 cases from hydrocarbon, 2 cases from mushrooms and 3 cases from drugs where it is important to underline that two of them were by paracetamol. Compared the two periods: 2005-2009 with 2010-2014 no reduction was observed for mortality rate: P= 0.82, OR = 1.186, 95% CI (0.2652 to 5.3039), but it is worth to be noted that compared with a previous study of our country for the period 1997-2002, when mortality rate has been 11.5%, we have a statistically significant reduction of mortality rate (p=0.001, OR=0.19; 95%CI (0.07 to 0.54).

4. DISCUSSION

Acute poisoning is considered as one of the most common medical emergencies in children [1,2]. By our study, acute poisoning in children accounted for 5% of admissions, suggesting that poisonings are still an important issue to us. Poisoning has been reported to range differently from country to country: 0.21 to 6.2% in Turkey, 0.28% in Spain, 0.74 to 3% in Iran [6, 9, 10]. In developed countries the percentage of admissions for poisonings is lower 0.28% to 0.66% [6, 10].

Although pediatric poisoning are considered emergencies, more than 85% of cases need no medical intervention, because the ingested material is not toxic or the amount swallowed is not clinically significant [11]. So in USA only 13.3% of cases are admitted in hospital [12]. According Benturi et al. most patients with poisoning could be observed at home (66.6%), because exposures were found to be asymptomatic or mild [13]. Seventy one per cent of cases had minor or mild symptoms in our study, that’s a part due to the lack of a national center for poisoning in our country (37% of cases despite not in serious situation are transferred from regional hospitals). Even though severity of presentation depends from country to country. So, Uziel et al. [5] reported that 95% had no symptoms and 85% were discharged after several hours of observation...
However, children of Arab population differently from Jewish origin, presented with severe clinical manifestations, because of a high rate of pesticide poisoning [5].

In our study we observed a significant reduction of the total number of poisoning (38%), statistically significant. Similarly and in Greece, Tsakidis revealed a 20% reduction in frequency of poisoning during 2005-2009 [14]. The pattern of poisonings varied by age and sex and complies with the psychological development of the child [2]. It is not strange that drugs as in other studies are the most responsible for acute poisoning [3, 5, 9, 10, 12, 15-17]. It is important emphasizing that the group of undefined drugs dominates with 30.7% of the cases (43 cases), since the fact that in a large part parents do not witness the event, another part deny the event, while toxicological data rarely has been helpful. It should be noted that as in Greece, the incidence of paracetamol poisoning has increased in the recent years in our country. (10.4% in Greece, 7.1% in our study) [14]. Paracetamol was the leading cause of unintentional childhood ingestion of medication even in Spain [9]. A high rate is reported also in Saudite Arabi, Egypt, Israel and Australi [13, 17-19]. This is maybe due to the publicity of the drug between all family members and placing the drug in easily accessible places. On the other hand given that Paracetamol exists in many pharmaceutical names (tachipirine, daleron, Calpol, Tylelom, algotropil, etc), we’re in front of lack of necessary information by family members, who believe they are providing various medications to stabilize the temperature of their child. Sedative/hypnotics/antipsychotics exposures, as described and before, has increased most rapidly even in our country [20].

Opioides poisoning is a new concern for us. Drug addicts should be noted is not a new phenomenon in our country. The data show that already there are boys, who are users of opioids for 20 years. The number of drug addicts in our country is about 30,000. Ten thousands of them belong only to the area of Tirana. There are cases of drug addiction even at a very young age (14 years). We should consider that the number of registered normally represents 10% of the real number. (top tip of the iceberg).

If in our country methadone is a new problem, probably not yet very suspected by pediatrician, it is a big problem in other countries. Haghigat et al. reported opium as the most prevalent poison in Iran [23,5, of cases] [11]. Fallahzadeh also in their study reports an increase of methadone poisoning [10]. According Flanagan, opioids have now superseded antidepressants as the commonest agents encountered in fatal poisoning with drugs in children and they constitutes the third largest group of poisoning in Poland [21, 22].

Pesticides the second causative agent with 25% of cases in our study, during the 2010-2014 period had a 60% reduction. We think that the high number for the first period is due to a large demographic change in our country.

Alcohol is the 3rd most important agent in our study. Alcohol intoxication is a growing and serious problem all over the world (United States, Scandinavian countries, Switzerland, Brazil, Poland), which develops independently of the political, economical, social and health care situation of the country [18, 23]. Data from Croatia report an alarming increase in the number of hospitalization due to alcohol intoxication in children to 40.2% of all poisonings [23]. Complex medical, psychological, social and economic causes and consequences of this increase alcohol consumption among children have been addressed [23]. We agree with Bitunjac’s [23] conclusions that one of the reasons for such an increase may be liberalization in education and upbringing, which have led to children spending increasingly more time outside their homes without parental supervision. Situation is not the same in every country. So alcohol consumption is prohibited in Iran legally and socially, that’s why ranked sixth as a cause of acute poisoning [11].

During years with economic changes, hydrocarbons poisoning has decreased in our country. It still remains an important factor in developing countries [24].

In our study in 66% of cases are involved children under 5 years of age. Similar findings are reported from developed and developing countries , 63.6% in Turkey, 67% in Spain, 80% in Iran [6, 9, 10]. There is a male predominance statistically significant in our study, consistent with most of the studies [24, 25].

Most of exposures were unintentional (85.7%). Similar data are reported and by other authors [6, 7, 13, 22-24, 26]. In our study only 10% of cases were suicidal. Regardless that in general female sex seem more sensitive in front of delicate emotional situations and go toward a suicide, in our paper was not observed statistically significant difference between males and females. Differently from our results, Mutly et al. [16] in their study assessed that the suicidal poisoning rates for males and females were 30% and 70%, respectively [16]. Even though intentional poisoning is low we would like to underline the necessity of psychological consultation to avoid a repetition of suicide attempt.

As reported in the literature, our study revealed that the most common route of exposure was ingestion with 99.6% of cases [3, 6, 17]. During years the mortality rate due to acute poisoning in children has decreased dramatically, because of establishing control centers in developed
countries, in addition of child – resistant packing. Early recognition of exposure and improved medical management has lead to decreased mortality for acute poisoning even in developing countries.

The mortality rate due to acute poisonings ranges from 7.6% to 0.4% [3, 6]. In 2013, The AAPCC reported 29 case fatalities in children <6 years old, 6 in the 6-12 years age group and 64 in 13-19 year age group [2, 20]. Mortality rate in studies from India is reported to be as high as 11.6%, while it ranged from 2.5% to 13.6% in studies from Pakistan [1]. In our study, mortality rate was 2.5%. Though during the last five years we don’t have a significant reduction of mortality in years, with previous data of our PICU, reduction has been statistically significant (from 11% to 2.5%). Several factors are implicated such preventive measures taken, cultural practice changed and improved suspicion and medical management.

5. CONCLUSION

Demographic change as well economic and cultural levels have impacted the epidemiological profile of acute poisoning in children in our country. With the large immigrant movement in Europe during last years, we think that even in other countries, characteristics of poisoning may have changed and it is important for doctors knowing the cultural practices of immigrant people.

The implementation of treatment protocols and the establishment of a National Poisoning Control Center are important elements in reducing the mortality of acute poisoning in children.

REFERENCES