

Features of Clinical Manifestations Depending on the Concentration of Ethanol in the Blood of Children with Acute Alcohol Poisoning

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Abstract

Acute alcohol poisoning in childhood is second among all exogenous poisonings. From 2007 to 2019, the Department of toxicology of the Filatov state clinical hospital received 3,674 patients with acute alcohol poisoning. The article analyzes clinical and laboratory data in patients with acute alcohol poisoning. Alcohol poisoning is most common in children over 15 years of age, and according to the results of chemical and Toxicological studies, the concentration of ethanol in the blood of children varies from 0.8 to 5.4 g/l. The severity of clinical manifestations of alcohol intoxication does not always directly correlate with the content of ethyl alcohol in the blood.

Keywords: Toxicological Effects; Acute Alcohol Poisoning; Children

Introduction

Acute alcohol poisoning is one of the most frequently reported pathologies, both in terms of the number of emergency hospitalizations and the causes of death from all poisoning [1]. At the same time, the use of alcoholic beverages by children and adolescents tends to increase [2-4].

Thousands of cases of alcohol poisoning of children under age of 6 years are registered in US toxicology centers every year [1]. The percentage of children hospitalized annually in the children's toxicology center of Moscow for acute alcohol poisoning before 2009 was 11 - 12% of all types of acute exogenous poisoning in persons under the age of 18 [5].

According to the forensic medical examination in 2016, 57 corpses of children were found to contain ethyl alcohol in concentrations from 0.3 to 5.3%. In 19.3% of cases, they were found to have non-violent death (death from diseases), and in 80.7% - violent, i.e. death from external causes (falling from a height, drowning, hanging, road accident, hypothermia, etc.) [6]. Thus, the problem of the toxic effect of ethyl alcohol on the young body remains one of the most important medical and social problems in modern society.

Materials and Methods

We conducted a retrospective analysis of statistical data of the Department of toxicology of the Filatov state clinical hospital for the period from 2007 to 2019 and medical records of children (n = 3674) who were treated with a diagnosis of acute alcohol poisoning.

Inclusion criteria

- Age 10 - 17 years 11 months.
- Deliberate alcohol.

All patients were evaluated for clinical and laboratory data upon admission to the hospital. The study of clinical blood analysis was performed on a hematological analyzer ADVIA-2120 Bayer HealthCare LLC, biochemical parameters - on an automatic biochemical analyzer AU680. The study of the acid-base and gas composition of blood was performed on the ABL 800 FLEX device.

The concentration of ethyl alcohol in the blood was determined by thin-layer chromatography on the Kristall-2000 device.

Statistical data processing was performed using the STATISTICA 7.0 software package (StatSoft. Inc.). Quantitative indicators are presented as a median (25th and 75th percentiles).

Results and Discussion

From 2007 to 2019, the Department of toxicology of the Filatov state clinical hospital received 3,674 patients with acute alcohol poisoning, which is from 16 to 28% of all poisonings (Figure 1 and 2). The causes of acute poisoning are shown in figure 1.

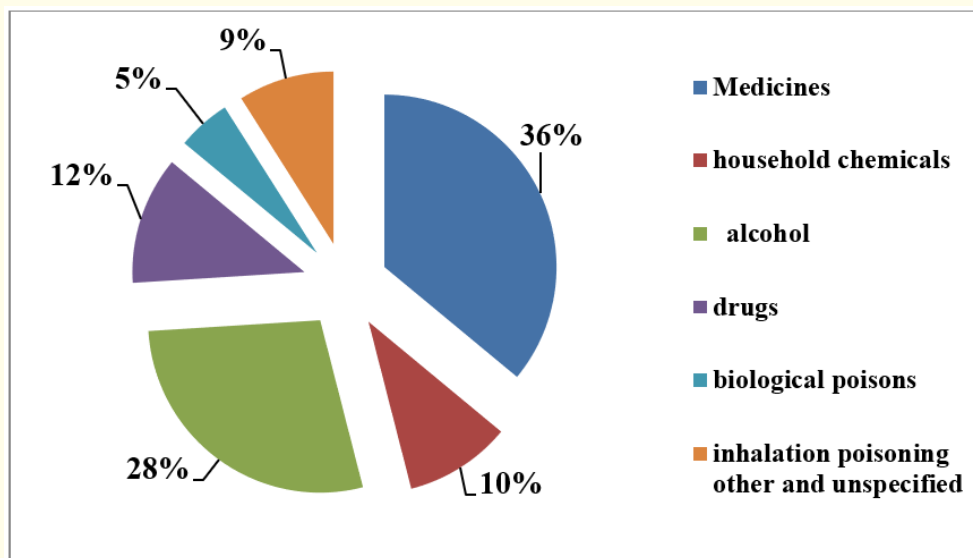


Figure 1: Causes of acute chemical poisoning in childhood.

As shown in figure 2, there has been a downward trend in the number of victims of alcohol poisoning since 2012. However, since 2017, there has been a steady increase in the incidence of this pathology.

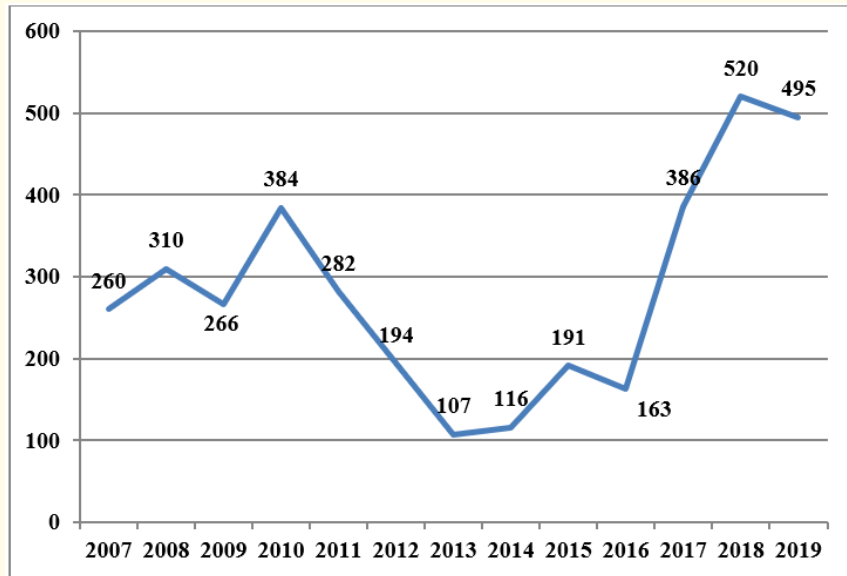


Figure 2: Number of children (n = 3674) hospitalized with acute alcohol poisoning (2007 - 2019).

It should be noted that if at the beginning of the 21st century children under the age of 15 prevailed, by 2018 the number of children affected by alcohol poisoning over the age of 16 increased (Figure 3).

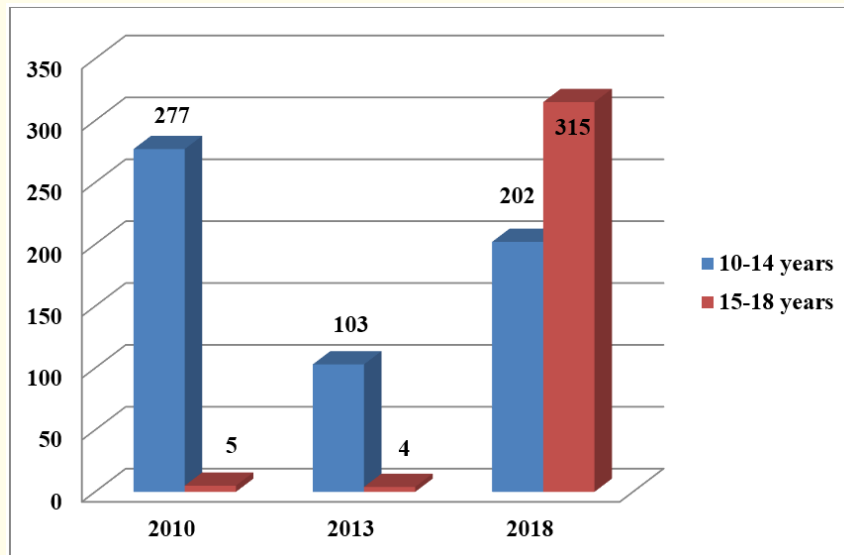


Figure 3: Distribution of children with alcohol poisoning by age.

In 2010, 98% of children with alcohol poisoning were between the ages of 10 and 15, and in 2018, 68% of those affected were over the age of 15.

All children with alcohol poisoning who sought specialized medical care needed intensive care. According to the severity of the condition, the patients were in 2 groups: moderate and severe poisoning.

Alcohol poisoning of moderate severity corresponded to the concentration of ethanol in the blood from 0.9 to 1.9 g / l, severe - from 1.64 to 5.4 g/l.

Moderate alcohol poisoning was accompanied by severe lethargy, muscle hypotension in 87% of patients and ataxia in 65% of cases. Every fifth patient had manifestations of pathological intoxication in the form of aggression and psychomotor agitation. In 36% of cases, poisoning was accompanied by nausea and repeated vomiting.

Severe alcohol poisoning occurred with depression of consciousness from SOPOR (60%) to coma (35%), with suppression of tendon reflexes. These neurological symptoms were accompanied by changes in hemodynamics in the form of arterial hypotension of 91 ± 2.34 mm Hg and microcirculation disorders. In 18% of cases, hypothermia was registered up to 35.2°C. in more than 68% of cases, children had metabolic acidosis (pH 7.25 ± 0.01 , BE -10.1 ± 0.99 , lactate 3.8 ± 0.32).

In 3% of patients with severe disease, poisoning was accompanied by liver damage in the form of an increase in transaminases ALT to 80 - 178 E/l (norm 0 - 40 E/l), AST to 120 - 225 E/l (norm 0 - 40 E/l).

Table 1 shows the range of ethanol concentrations in the blood serum of children (n=250).

Clinical symptoms	Concentration of ethanol in the blood (g/l)
Stun, Sopor	0,4 - 2,0
Coma 1	0,8 - 2,5 - 3
Coma 2-3	2,5 - 5,4
Muscle hypotension	0,4 - 2,4
Hyporeflexia, ↓ pain sensitivity	2,5 - 5,4
Miosis	1,2 - 3,4
Respiratory failure	2,2 - 3,5
Ventilator	3,8 - 5,4
Changes in hemodynamics	0,8 - 5,4

Table 1: Clinical symptoms of alcohol poisoning and the concentration of ethanol in the blood of children aged 0 to 17 years 11 months (n = 250).

The table shows that children have a wide range of ethanol concentrations, which indicates individual tolerance to the influence of alcohol on various functional systems of the child's body. During childhood, with an equivalent concentration of ethanol in the blood serum, poisoning can have a severe course with Central nervous system depression (0,8 - 2,5 - 3 g/l) and a violation of hemodynamics (0.8 - 5.4 g/l), and proceed in a mild form without depression of consciousness (0.4 - 2.0 g/l).

Thus, the severity of clinical manifestations of alcohol intoxication is not always directly correlated with the quantitative content of ethyl alcohol in the blood.

Detoxification therapy was performed in all clinical cases of ethanol poisoning. After relieving the symptoms of poisoning and stabilizing the General condition, the children were discharged for outpatient treatment with recommendations under the supervision of a district pediatrician.

Conclusion

Acute alcohol poisoning in childhood ranks second among all exogenous poisonings. Alcohol poisoning is most common in children over 15 years of age, and according to the results of chemical and Toxicological studies, the range of ethanol concentration in the blood of children varies widely-from 0.8 to 5.4 g/l. The severity of clinical manifestations of alcohol intoxication is not always directly correlated with the content of ethanol in the blood.

The obtained statistical data indicate that acute alcohol poisoning in childhood is one of the most urgent medical and social problems in the Russian Federation. The recent dynamics of acute alcohol poisoning among children and adolescents dictates the need to improve preventive measures to reduce alcohol consumption by minors, develop a healthy lifestyle and provide social and psychological assistance to adolescents of the "risk" group and their family members.

Conflicts of Interest

The authors confirm the absence of conflicts of interest.

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