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Hospitalizations due to alcohol intoxication among children and adolescents – data from one clinical hospital in Poland

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Summary

Aim. To determine the frequency of hospitalizations due to alcohol intoxication (AI) at the Pediatric Health Center, and to attempt to identify factors contributing to the occurrence of intoxication in the population of children and adolescents.

Material and methods. Medical documentation of 227 patients hospitalized due to AI. 108 (48%) patients were girls and 119 (52%) patients were boys. The mean age of the study group was 14.9 years ±2.1. Data regarding patients, their families and the circumstances of intoxication underwent analysis.

Results. Alcohol intoxication constituted 2.8% of all hospitalizations. The number of hospitalizations between 2000 and 2011 showed an increasing tendency with some fluctuations within years. Spirits were predominant alcohol beverages. Over 10% of patients required a short-term hospital stay at the Department of Anesthesiology and Intensive Care. In 13% of children, coexisting medicine or drug intoxication was observed and 10% of patients presented with alcohol-related injury to the head or extremities. Risky sexual behaviors were noted in 25% of girls. The majority of children were raised by two parents who had received primary education. Alcoholism was present in over 20% of the families. In single-parent families, fathers were more frequently absent and a lack of a regular source of income was more often related to mothers.

Conclusions. There are no uniform standards of multi-specialist medical care for children hospitalized due to AI. Identification of children consuming alcohol is recommended. It should be done by primary physicians, pediatricians, teachers and psychologists. Minor patients hospitalized due to AI should be provided with a long-term and comprehensive care.

Key words: children and adolescents, alcohol intoxication, PSS scale

Introduction

Harmful alcohol consumption has a multidimensional influence on the quality of health in the society, public safety, domestic violence, disturbed family relations, development of children and adolescents, unemployment and poverty [1–8]. In 2005, the average worldwide alcohol consumption was 6.13 liters of pure alcohol per person at the age of 15–59 years and 13.3 liters per person in Poland [2]. According to the World Health Organization (WHO), the alcohol-attributable mortality rate in children and adolescents <20 years of age is reported to be at the level of 1.8/100,000. Excessive alcohol consumption generates considerable costs related to the removal of consequences of such consumption. In 2006, the United States Centers for Disease Control and Prevention (CDC) estimated the above costs to be over 223 billion dollars [9]. Currently, in the literature more attention is paid to the phenomenon of alcohol abuse in the population of children and adolescents [10–14].

The direct reason for conducting the present study was a small number of reports on hospitalizations due to alcohol intoxication (AI) in the population of Polish children and adolescents. The aim of the study was to determine the frequency of hospitalizations at the Clinical Hospital (CH) due to alcohol intoxication in the population of children and adolescents between 2000 and 2011. The study included the analysis of the severity of alcohol intoxications in minors hospitalized at CH and risk-taking behaviors related to alcohol intoxication and the attempt to identify factors influencing alcohol intoxication in the population of children and adolescents.

Methods

After the approval of the Bioethics Committee (10 May 2011), this retrospective study was performed on the basis of medical documentation of patients hospitalized at the Department of Pediatrics between 2000 and 2011.

Patient data

The patient data included: age, gender, educational level, number of hospitalizations, and psychological profile determined on the basis of the retrospective analysis of psychological and psychiatric consultations, with consideration given to the individual features of the patient. These were the following: emotional sensitivity, emotional immaturity, lowered mood, presence/absence of depressive features, a tendency toward emotional suppression, the manner of establishing contact during psychological assessment, the type of relationship between the patient and their parents, presence/absence of family conflicts, occurrence of physical or psychological violence at home, presence/absence of difficulties at school, influence of the peer group, presence/absence of a previous contact with alcohol.

Data concerning patient's family

Data concerning patient's family included: the educational level of the parents, family structure, history of alcoholism/addictions within the family.

Data concerning the event (intoxication)

Data concerning the event (intoxication) regarded the following: the etiological factor – the type and the amount of the consumed substance; concentration of the toxic substance in body fluids (blood, urine); the place and circumstances of intoxication; time of intoxication (season of the year, month, day of the week, time of the day); presence/absence of alcohol-attributable injuries; imaging examinations; assessment of intoxication severity based on the Poisoning Severity Score – PSS; assessment of consciousness level based on the AVPU (Alert, Verbal, Pain, Unresponsive scale); hospitalization/lack of hospitalization at the Department of Anesthesiology and Intensive Care; the length of hospitalization; presence/absence of risky sexual behaviors at the time of intoxication.

Variables characterizing the severity of intoxication

From the above-mentioned parameters, the following variables were considered to be characteristic of the severity of intoxication: blood alcohol concentration (g/l), the length of hospital stay, hospitalization at the Department of Anesthesiology and Intensive Care, the assessment of consciousness level based on the AVPU scale, the severity of intoxication assessed using the PSS, and related injuries. The results underwent statistical analysis and for each variable the following values were determined: mean value, standard deviation (SD), minimum values, maximum values, and median. The differences were considered statistically significant if the significance level was at $p < 0.05$.

Results

Between 2000 and 2011 the number of urgent hospitalizations at the Department of Pediatrics was 8,889, including 995 patients (11.19%) admitted due to intoxication. Alcohol intoxication was confirmed in 250 patients (2.8%). The total number of hospitalizations due to AI in the subsequent years, stratified by gender, is presented in Figure 1.

Due to incomplete data, medical records of 227 patients underwent a detailed analysis. We also excluded infants ($n = 2$) intoxicated with alcohol through breastfeeding by the mother who was under the influence of alcohol. The group of 227 alcohol-intoxicated patients consisted of 108 girls (47.6%) and 119 boys (52.4%). 29 cases (12.8%) of mixed intoxication were observed in the study group (alcohol and medicine – 17 cases (7.5%); alcohol and drugs – 12 cases (5.3%)). The mean age of hospitalized patients was 14.9±2.1 SD years (min. age 1.6 years, max. 17.9 years, median = 15.2

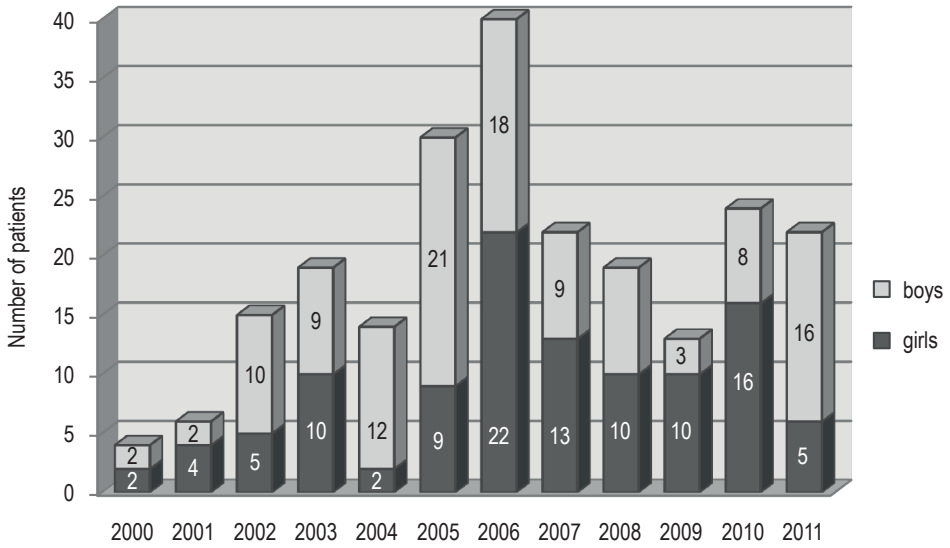

Figure 1. **Hospitalizations due to AI between 2000 and 2011**

years). The mean age of girls was 15.3±1.7 SD years (min. age 2.7 years, max. 17.9 years, median = 15.3 years) and the mean age of boys was 14.7±2.3 SD years (min. age 1.6 years, max. 17.9 years, median = 14.9 years). The difference between the mean age of girls and boys was statistically significant ($p = 0.017$).

The greatest number of patients hospitalized due to AI was observed in the age group of 14–16 years – 99 patients (43.6%) – which corresponds to the 2nd or the 3rd grade of junior high school. In the youngest group of patients intoxications were accidental. The mean length of hospitalization in the group of girls and in the group of boys was 2±1.6 SD days (min. 1 day, max. 8 days, median = 2 days). Parameters characterizing the severity of intoxication are presented in Table 1.

Table 1. **Parameters characterizing the severity of intoxication**

Parameter	No. of patients/ no. of boys (n)	% of all analyzed patients
1. The level of intoxication severity based on the PSS		
a. no symptoms	0	0%
b. minor intoxication	155 / 78	68.3%, including boys 50%
c. moderate intoxication	72 / 41	31.7%, including boys 57%
d. severe intoxication	0	0%
2. The assessment of consciousness level based on the AVPU scale		
a. allo – and autopsychic orientation	92	40.5%
b. verbal response	66	29.1%

table continued on the next page

c. pain response	51	22.5%
d. unresponsive	18	7.9%
3. Imaging examinations		
a. unnecessary	171	75.3%
b. done	56	24.7%
4. Psychological consultation		
a. provided	120	52.9%
b. not provided	107	47.1%
5. Psychiatric consultation		
a. provided	17	7.5%
6. Intoxications with suicidal intent	16	7.0%
7. Accidental intoxications	10	4.4%
8. Hospitalization at the Department of Anesthesiology and Intensive Care		
a. yes	26	11.5%
b. no	201	88.5%

Each patient had more than one specialist consultation on average (mean 1.2±1.1 SD, min.0, max.6). The multifactorial analysis did not demonstrate a statistical relationship between blood alcohol concentration (BAC) (g/l) and age or gender ($p = 0.9$, $p = 0.59$, respectively). Additionally, neither gender nor BAC (g/l) significantly influenced the length of hospitalization of patients ($p = 0.83$, $p = 0.96$, respectively).

The mean BAC on admission was 1.55±0.7 SD g/l (min. 0.1 g/l, max. 4g/l). Statistical analysis confirmed that BAC in the group of patients classified to grade 2 (1.9±0.8 SD g/l) –moderate intoxication – based on the PSS was statistically signifi-

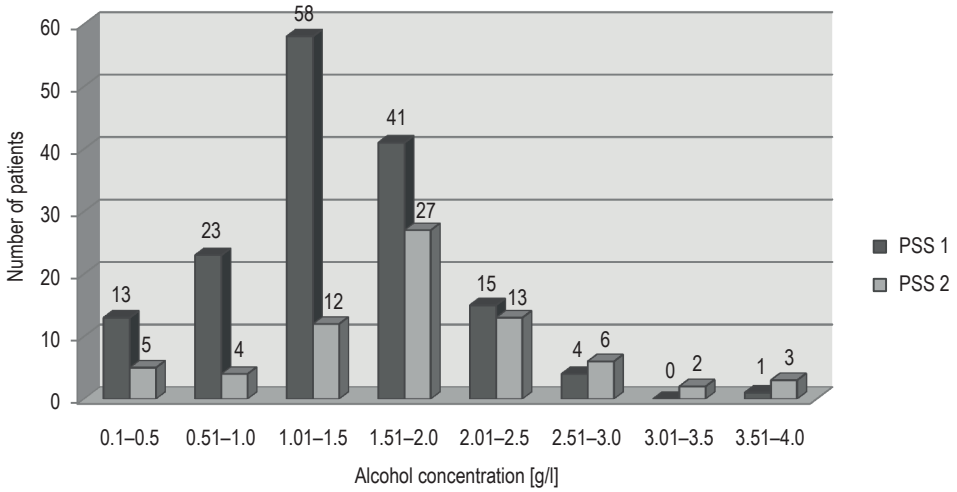

Figure 2. **Numerical distribution of patients depending on BAC (g/l) and the degree of intoxication based on the PSS – (Poisoning Severity Score) (p < 0.0001)**

cantly higher than in the group of patients classified to grade 1 (1.4±0.6 SD g/l) – minor intoxication ($p < 0.0001$, Figure 2).

The mean BAC in patients classified on the basis of the AVPU scale was the following: in group 1 – alert 1.3 g/l; in group 2 – verbal response 1.6 g/l; in group 3 – pain response 1.9 g/l; and in group 4 – unresponsive 1.7 g/l. The differences between mean BACs in groups of patients with different levels of consciousness assessed using the AVPU scale were statistically significant ($p < 0.0001$). Additionally, the type of consumed alcohol affected the level of BAC of hospitalized patients. Consumption of low-alcohol beverage (beer) resulted in statistically significantly lower blood alcohol concentrations as compared to patients intoxicated with liquor ($p = 0.0019$). Abnormal laboratory test results were observed in 80 children (35%) from the study group. Hypertransaminasemia was noted in 5 children (2%). Hypoglycemia was observed in 1 patient (0.5%). The criteria for acidosis were met in 74 cases (33%).

Intoxication outside of the patient's place of residence was noted in 212 cases (93%).

Two intoxicated female patients (1%) admitted to the department had escaped from the Therapeutic Rehabilitation Center for addicted persons in which they had stayed due to abuse of alcohol, medication and drugs. Gynecological consultations conducted in 26 female patients (24%) confirmed the occurrence of risky sexual behaviors at the time of intoxication, including 2 cases (1%) of sexual abuse. Alcohol-related injuries occurred in 21 patients (9%), predominantly in the form of head and extremity trauma. Alcohol intoxications usually occurred during the daytime, between 6:00 am and 10:00 pm (53% of cases), the remaining intoxications (47%) occurred between 10:00 pm and 6:00 am. A greater number of patients were hospitalized at weekends, especially those aged 15–18 years. We observed an increased number of intoxications in the spring and summer period.

In the study group, the mean age of the mother was 41.2±6.1 SD years (min. age 30 years, max. 58 years) and the father 42.6±6.2 SD years (min. age 32 years, max. 65 years). The mean number of persons per household was 4.0 (SD = 1.2, min. 2 people, max. 9 persons). 147 children (65%) were raised in two-parent families, 63 patients (28%) in single-parent families, 8 (3.5%) in foster families and 4 (2%) in orphanages. In the majority of cases parents had primary education (mothers *vs.* fathers: 45% *vs.* 44%). A lack of a regular income was more frequently reported in the case of mothers of intoxicated children (mothers *vs.* fathers: 34% *vs.* 14.1%). Paternal alcoholism was confirmed in 51 patients (23%), and maternal alcoholism in 22 patients (9%). Alcoholism in both parents was observed in 15 patients (7%). Parameters characterizing the family structure of patients are presented in detail in Table 2.

Table 2. **Characteristics of the family structure of patients**

Parameter	No. of patients (%)
1. Father	
a. present	156 (68.7%)
b. absent	64 (28.2%)
c. no data	7 (3.1%)
2. Mother	
a. present	199 (87.6%)
b. absent	21 (9.3%)
c. no data	7 (3.1%)
3. Income – father	
a. regular source of income	143 (63.0%)
b. lack of a regular source of income	32 (14.1%)
c. no data	52 (22.9%)
4. Income – mother	
a. regular source of income	120 (52.9%)
b. lack of a regular source of income	78 (34.3%)
c. no data	29 (12.8%)
5. Education – father	
a. primary	101 (44.5%)
b. secondary	41 (18.1%)
c. higher	21 (9.3%)
d. no data	64 (28.1%)
6. Education – mother	
a. primary	103 (45.4%)
b. secondary	57 (25.1%)
c. higher	28 (12.3%)
d. no data	39 (17.2%)
7. Addictions – father	
a. alcoholism	51 (22.5%)
b. drugs	1 (0.4%)
c. none	130 (57.3%)
d. no data	45 (19.8%)
8. Addictions – mother	
a. alcoholism	22 (9.8%)
b. drugs	1 (0.4%)
c. none	176 (77.5%)
d. no data	28 (12.3%)

Psychological assessment was performed in 120 patients (53%), most frequently on day 2 or 3 of hospital stay. A detailed retrospective analysis of psychological consultations was conducted on the basis of 102 (45%) available test results. Twenty one patients (9%) were discharged at the request of their parents before the completion of diagnostic and therapeutic process. Based on the psychological assessment (*n* of consultations =

102 (100%)), individual features of patients were distinguished. High emotional sensitivity, increased tension and emotional anxiety were reported in 46.1% of patients. Mood swings with a tendency toward low mood occurred in 52.0% of patients. Suppression of emotions, especially the negative ones, such as aggression, anger or annoyance was noted in 52.0% of patients. Emotional immaturity was observed in 14.7% of patients. In the direct contact, 58.8% of patients were emotionally closed, withdrawn and reluctantly established contact. Patients who admitted to drinking alcohol earlier constituted 43.1% of the assessed patients. Based on psychological consultations (n = 102), it was also established that in 42 patients (41%) family relations between the child and both parents were disturbed. In 53 cases (52%), patients and their parents reported the presence of conflicts within the family. Paternal physical violence was reported in the families of 10 patients (10%). Difficulties at school occurred in 32 cases (31%). A negative influence of the peer group was observed in 54 patients (53%).

17 patients (8%) required additional psychiatric consultation.

A suicide attempt as a situational response occurred in all patients who underwent psychiatric consultation (ICD-10, F43). Oppositional defiant disorder (F91) was diagnosed in 12 (70%) of 17 (100%) patients who underwent consultation. One patient (5.9%) was diagnosed with emotional anxiety disorder, 1 (5.9%) with bipolar affective disorder (F31), 1 (5.9%) with psychotic disorder (F23). Two patients were monitored for alcohol abuse (F10.1).

Discussion

Between 2001 and 2011, three phases of changes concerning the number of children hospitalized due to AI were noted. We observed the greatest number of patients with symptoms of AI between 2005 and 2006, with the peak in 2006. Both the World Health Organization and the Central Statistical Office in Poland periodically publish data on consumption volumes, sales figures and price levels of alcohol. Based on the provided data, reduction in the excise duty in 2006 was probably responsible for the increase in alcohol consumption both in adults and minors [1, 2, 11, 15]. The reports of the WHO and the CSO also indicate the increase in alcohol availability due to an increase in the density of alcohol outlets [1, 2, 11, 15]. In 2006, the number of licenses issued for running liquor stores increased, which improved the availability of alcohol. This is certainly the second factor contributing to a significant increase in AI among minors in 2006.

Hospitalizations due to AI constituted 2.8% of all urgent admissions to the Department of Pediatrics between 2000 and 2011. Values lower than these presented in our study were obtained by Kuželová et al. [16] (1.5%), Bitunjac and Saraga [17] (0.8%) as well as Skotnicka-Klonowicz et al. [18] (0.2%). Significantly higher values were noted in a 4-year retrospective study conducted at a medical center in Bialystok, Poland (11.2%) [19]. The highest percentage of hospitalizations due to AI was presented by Sieniewicz et al. (26.3%) [20].

In the study group, the mean age of hospitalized children was 14.98±2.09 years. Adolescents aged 14–16 years constituted the largest group of patients in the study.

The obtained results are consistent with the data available in the literature [16–23]. The analysis of the collected data reveals an increasing number of intoxications among girls in the second half of the investigated period. A similar tendency was reported by Kuželová et al. and Skotnicka-Klonowicz et al. [16, 18]. Slightly different data are reported by Bitunjac and Saraga [17]. In our study and in the literature, the vast majority of intoxications are intentional. Single accidental intoxications occur only in the youngest age group [16–25]. The obtained data enable to observe alcohol preferences depending only on the gender and age. In our study, beer was slightly more frequently chosen by girls and younger patients (junior high school students *vs.* high school students).

The study group was also assessed with regard to the severity of intoxications by analyzing BAC test results in venous blood. These concentrations were always assayed with the same method in the same laboratory in the Center for Acute Intoxications. The mean BAC in the study group was 1.55 g/l. The lowest concentration was 0.1 g/l and the highest was 4 g/l. The results presented by authors from other countries are similar [19–21, 23]. Three authors reported higher maximum BACs in intoxicated children [16, 18, 22]. The highest alcohol concentration (5 g/l) was noted in a group of Danish children [22].

Based on the data from the medical documentation, it was possible to classify intoxicated minors using the PSS (Poisoning Severity Score) and AVPU (Alert Verbal Pain Unresponsive). In the present study, BAC statistically significantly correlated with the degree of intoxication measured using the PSS ($p < 0.0001$). The majority of hospitalized children were classified as grade 1 – minor intoxication (PSS1). In the study of Kuželova et al. [16] slightly more children presented with minor intoxication as compared to moderate intoxication (PSS1 *vs.* PSS2: 47.7% *vs.* 46.5%). Only 3.9% of patients were classified to the severe intoxication grade (PSS3). In other reports from the literature on AI among minors, other research tools such as the Glasgow Coma Scale were used or elements of consciousness level were not assessed using standardized questionnaires. Mick et al. did not report a significant correlation between BAC and the consciousness level assessed using the Glasgow Coma Scale [26, 27]. There is no possibility to compare study groups from different reports due to various types of used questionnaires or the fact that some researchers did not use any questionnaires at all.

The analysis of the circumstances related to AI in the study group revealed that only in 7% of cases intoxication occurred at patients' homes. The vast majority of intoxications occurred outside home and the increased incidence was related to summer months. Similar observations were reported by other authors investigating AI in children [16–18].

Trauma is a serious result of alcohol consumption by minors [27–29]. In the present study, alcohol-associated injuries occurred in 21 patients (9%) and were predominantly related to extremities. Weinberg and Wyatt [23], in their study on the population of Canadian children hospitalized due to AI, indicated that 34% of patients suffered from injury. In this subgroup, 45% of patients were diagnosed with head trauma, which was predominantly the consequence of a fall. Hicks et al. [29] indicate that adolescents who consume alcohol in a risky manner present with head trauma more frequently.

Moreira et al. [30] indicate in their study that 32% of boys and 17% of girls became victims of violence at the time of intoxication. Alcohol consumption by children and adolescents is associated with earlier sexual initiation and leads to promiscuous behaviors. In the present analysis, gynecological consultations confirmed the presence of alcohol-attributable risky sexual behaviors in 11.4% of female patients, including 2 cases of sexual abuse. Champion et al. [31] in their study on a group of drinking girls aged 16–20 years observed that this age group was three times more susceptible to unwanted sexual contacts as compared to their non-drinking peers.

In the present study 53% of patients underwent a psychological assessment. The detailed analysis of consultations with a psychologist was possible only in 45% of cases. No standardized questionnaire was used. Recurring observations of specialists performing the psychological assessment of patients' individual features deserve attention. Over 50% of children had lowered mood. Additionally, more than 50% of patients presented with a tendency toward the suppression of negative emotions, such as aggression, anger and annoyance. During the assessment, children were withdrawn and reluctantly established emotional contact with the psychologist. In the literature on AI among minors, psychological assessment receives the least attention. In the study of Bitunjac and Saraga [17] on a group of Croatian children between 1997 and 2007, psychological or psychiatric consultations were not part of the standard procedure in the case of AI in the initial stages of the study. In the subsequent years, psychological assessment was introduced and an increasing number of children requiring psychological and psychiatric assistance were gradually observed. Kuželova et al. [16], in their study on the population of 537 children, based on the analysis of medical documentation, observed that 82 patients (15%) required psychological or psychiatric assessment. In the present study, 17 children (7.5%) underwent psychiatric consultations. In all children who underwent psychiatric consultations, AI was a form of a suicide attempt as a situational response.

Interestingly, in the analysed material there are no standardized algorithms of the procedure in the case of children intoxicated with alcohol. No coherent criteria exist for diagnostic investigations, a practical use of intoxication scales and the range of medical consultations or psychological/psychiatric assistance. The following deserve attention: poor access to children's psychologists specializing in alcohol addiction as well as a lack of toxicology departments in multi-specialist medical centers which could provide comprehensive assistance.

Conclusions

1. There are no uniform standards of multi-specialist medical care for children hospitalized due to AI.
2. Early identification of children particularly predisposed to alcohol consumption is recommended. Such identification should be done by primary physicians, pediatricians, teachers and psychologists.
3. Minors hospitalized due to AI should be provided with a long-term and comprehensive care.

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