

doi: 10.3325/cmj.2009.50.151

Alcohol Intoxication in Pediatric Age: Ten-year Retrospective Study

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Aim To examine the changes in the number of children younger than 18 who were hospitalized due to alcohol intoxication at the Department of Pediatrics, University Hospital of Split, from November 1, 1997 to October 31, 2007.

Methods Data on children hospitalized due to intoxication were retrieved from hospital medical records. Children were classified into 4 age groups: 0-5, 6-9, 10-13, and 14-18 years, and their sex and type of intoxication were recorded. For children with alcohol intoxication, data on time of intoxication, reason for drinking, presence of injuries or suspected suicide attempts, and possible presence of other drugs in the organism were collected.

Results Out of 29 506 hospitalized children, 594 were hospitalized due to intoxications. Out of these, 239 (40.2%) were hospitalized due to intoxication by alcohol. More boys than girls were hospitalized (71.1%). The proportion of alcohol intoxication cases among all types of intoxication cases increased from 16.7% in 1997/98 to 66.3% in 2006/07. The proportion of patients hospitalized due to alcohol intoxication increased from 0.3% of all hospitalized children in the first year to 1.7% in the last year of the study ($P=0.015$, z test for comparison of two proportions). Eighty two per cent of alcohol intoxication cases were in the 14-18 age-group. The number of alcohol intoxication cases increased among girls from 1 case (6.3% of all intoxication cases among girls) in 1997/98 to 15 cases (45.5%) in 2006/07, while among boys it increased from 6 cases (23.1% of all intoxicated boys) in 1997/98 to 44 cases (78.6%) in 2006/07. Children usually drank outside their homes (79.4%) and mostly on weekends and holidays (73.2%).

Conclusion The alarming increase in the number of hospitalizations due to alcohol intoxication in children, especially among girls and in the adolescent age group, represents a serious problem, which requires further attention and research.

Received: March 5, 2009

Accepted: March 24, 2009

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Clinical intoxication is a condition characterized by sudden or gradual threat to one or more organic systems due to contact with poison (1). Acute intoxications are often urgent situations that require a specific medical procedure. The first signs of acute alcohol intoxication in terms of behavior changes appear when the concentration of ethanol in serum reaches approximately 0.5‰ (1). When the concentration rises to 2.5‰, mydriasis, diplopia, ataxia, hypothermia, nausea, and vomiting appear (1). Concentration over 4.5‰ can lead to disorders of consciousness (sopor to coma), as well as to death due to respiratory insufficiency. Hypothermia often coexists with the described symptoms (1). The development of chronic alcoholism in adults lasts 5-10 years (2). Therefore, the term "alcoholism" cannot be applied to children, but we rather use the term "problems with alcohol." The term includes all children who have social, psychological, or legal problems due to acute intoxication or regular excessive alcohol abuse or dependence (2).

Alcohol intoxication is a growing phenomenon all over the world, which develops independently of the political, economical, social, and health care situation in the country. Thus, alcoholism is a serious problem in many countries, such as the United States (3-6), Scandinavian countries (7,8), Switzerland (9), Brazil (10), Poland (11), and Croatia (2,2-15). In Croatia, alcoholism has been recognized as an important social problem in adolescence. Several studies and books investigated alcohol abuse in children, describing relations between adolescent risk behavior and abuse in family, as well as other problems with alcohol consumption in children (2,12-15). However, the last systematic analysis of trends of alcohol intoxication among children was performed more than 10 years ago (16) and investigated alcohol intoxication in children hospitalized in a single hospital in Zagreb in the period from 1982 to 1996 (16).

The aim of this study was to assess the number of children hospitalized due to intoxication in the 10-year period, from November 1, 1997 to October 31, 2007, with special emphasis paid to alcohol intoxication. We also analyzed other circumstances related to alcohol consumption, such as drinking locations, reasons leading to alcohol intoxication, suicide attempts, injuries, and the days of the week when there were more alcohol intoxications.

PATIENTS AND METHODS

Patients

This study included all children from 0 to 18 years hospitalized at the Department of Pediatrics, Universi-

ty Hospital of Split, in the period from November 1, 1997 to October 31, 2007 (n=29506). All alcohol-intoxicated children were admitted to the University Hospital in Split through our receiving department. Admission to the Pediatric Department was made based on the clinical presentation of acute alcohol intoxication. Afterwards, the level of alcohol in the blood was measured for each patient.

Data collection

After identifying all children hospitalized due to all types of intoxications (n=594), we collected their data from hospital medical records and medical histories (diagnostic category T 36-65) (17). In children hospitalized for alcohol intoxication (n=239) (diagnostic category T 51), we collected the data on age, sex, location where the child got intoxicated, date of intoxication, the reason for drinking, possible presence of other drugs in the organism (eg, opiates in urine), as well as presence of injuries and signs of suicide attempts.

Children were classified into 4 age groups: from 0 to 5 years (preschool children), from 6 to 9 years (elementary school, 1st-4th grade), from 10 to 13 years (elementary school, 5th-8th grade), and from 14 to 18 years (high school).

Statistical analysis

Data were analyzed using the Statistica 8.0 statistical software (StatSoft®, Inc, Tulsa, OK, USA). Statistical analysis was performed using z test for comparison of two proportions. *P* value <0.05 was considered as statistically significant.

RESULTS

Out of 29506 children hospitalized during the 10-year period, 594 were hospitalized due to various intoxications. Out of these, 239 were hospitalized due to alcohol intoxications (Table 1). Non-alcohol intoxications (n=355) that led to hospitalizations were caused by the following substances: medical drugs in 36.9% of cases; chemicals (acids, alkali, dyes and varnishes, detergents, dilutors) in 16.3% of cases; poisons (insecticides, pesticides, herbicides, rodenticides) in 3.9% of cases; plants, including mushrooms, in 2% of cases; non-medical drugs (cannabis and cocaine overdose) in 0.3% of cases; and carbon monoxide in 0.3% of cases. The proportion of alcohol intoxication cases among all intoxications cases was 40.2% (Table 2; Figures 1 and 2). Average age of children intoxicated by alcohol was 14.01 years. Out of 239 children hospitalized due to alcohol intoxication, 69 (28.9%) were girls and 170 (71.1%) were boys. There was an

TABLE 1. Age and sex comparison of children hospitalized for alcohol intoxications from November 1, 1997 to October 31, 2007 at the Department of Pediatrics, University Hospital of Split*

Year	Age groups [†]															Number of all hospitalizations
	0-5			6-9			10-13			14-18			total			
	tot	m	f	tot	m	f	tot	m	f	tot	m	f	tot	m	f	
1997/98	0	0	0	1	1	0	4	3	1	2	2	0	7	6	1	2630
1998/99	0	0	0	0	0	0	4	3	1	5	3	2	9	7	2	2590
1999/00	1	1	0	0	0	0	0	0	0	3	3	0	4	4	0	2636
2000/01	0	0	0	0	0	0	1	1	0	2	2	0	4	4	0	2599
2001/02	0	0	0	0	0	0	3	3	0	13	5	8	16	8	8	2830
2002/03	0	0	0	0	0	0	3	2	1	14	10	4	17	12	15	3010
2003/04	0	0	0	2	2	0	5	4	1	34	22	12	41	28	13	3104
2004/05	0	0	0	0	0	0	3	2	1	34	21	13	37	22	15	3396
2005/06	0	0	0	0	0	0	7	7	0	38	28	10	45	35	10	3296
2006/07	2	2	0	1	1	0	3	3	0	51	36	15	57	42	15	3415

*Abbreviations: tot – total; m – male; f – female.

†Unknown age data for 2 patients.

Table 2. Age and sex comparison of children hospitalized for non-alcohol intoxications from November 1, 1997 to October 31, 2007 at the Department of Pediatrics, University Hospital of Split*

Year	Age groups [†]															Number of all hospitalizations
	0-5			6-9			10-13			14-18			total			
	tot	m	f	tot	m	f	tot	m	f	tot	m	f	tot	m	f	
1997/98	32	19	13	1	1	0	1	0	1	0	0	0	34	20	14	2630
1998/99	38	20	18	4	2	2	3	1	2	4	2	2	49	25	24	2590
1999/00	24	12	12	5	3	2	2	0	2	0	0	0	31	15	16	2636
2000/01	22	12	10	0	0	0	0	0	0	4	2	2	26	14	12	2599
2001/02	33	17	16	2	0	2	1	0	1	2	0	2	38	17	21	2830
2002/03	30	17	13	3	3	0	3	2	1	4	3	1	40	25	15	3010
2003/04	20	12	8	0	0	0	5	3	2	14	1	13	39	15	24	3104
2004/05	11	8	3	2	1	1	2	1	1	16	4	12	31	14	17	3396
2005/06	14	9	5	4	4	0	3	1	2	13	0	13	34	14	20	3296
2006/07	14	8	6	2	1	1	3	2	1	11	4	7	30	15	15	3415

*Abbreviations: tot – total; m – male; f – female.

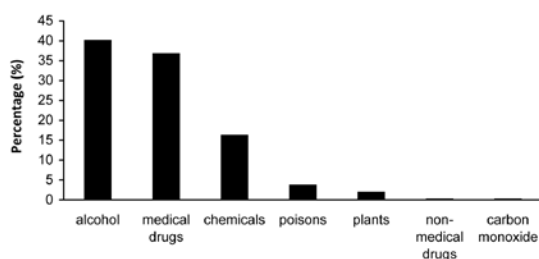
†Unknown age data for 3 patients.

increase in the number of alcohol intoxication cases between the first year of our study, with 7 intoxicated children (0.3% of 2630 the total of children hospitalized for various reasons) and the last year of our study, with 59 intoxicated children (1.7% of 3415 total of children hospitalized due to various reasons) ($P=0.015$, z test for comparison of two proportions). The proportion of alcohol intoxication cases among all cases of intoxications increased from 16.7% in the first year (7 alcohol-intoxicated children of 42 children hospitalized due to various intoxications) to 66.3% in the last year of the study (59 alcohol-intoxicated children out 89 children hospitalized due to various intoxications) ($P=0.496$, z test for comparison of two proportions) (Figure 2). The age group 14-18 was the most responsible for the increase in the number of hospitalization due to alcohol intoxication, comprising 82% of intoxication cases (Table 1), and was the major contributor in the increase in the total number of all intoxications. During the investigated peri-

od, only 2 relapses and 5 suspected suicide attempts were noticed, mostly because of negative interactions of alcohol with medical drugs (barbiturates, benzodiazepines, unknown pills). In 7 cases, children hospitalized for alcohol intoxication used other drugs (cannabis) and in 4 cases they had head lacerations and contusions as a consequence of a fall caused by the loss of consciousness. The number of hospitalizations due to alcohol intoxication increased among girls from 1 case (of 16 intoxicated girls) in the first year to 15 cases (of 33 intoxicated girls) in the last year of the study ($P=0.392$, z test for comparison of two proportions), while among boys it increased from 6 cases (of 26 intoxicated boys) in the first year to 44 cases (of 56 intoxicated boys) in the last year of the study ($P=0.555$, z test for comparison of two proportions).

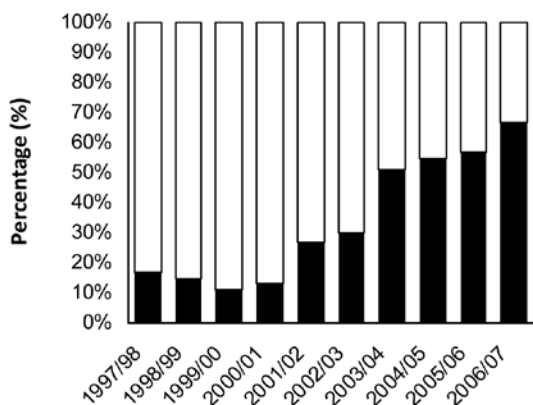
Twenty one children (8.8%) were hospitalized on Mondays, 17 (7.1%) on Tuesdays, 23 (9.6%) on Wednes-

Figure 1.



Percentages of different causes of intoxications in the total number of all intoxications (n=594) in children under age 18, hospitalized at the Department of Pediatrics, University Hospital of Split, during the 10-year period (November 1, 1997, to October 31, 2007).

Figure 2.



Percentages of alcohol intoxications among all intoxications, shown for each year separately in children under age 18, hospitalized at the Department of Pediatrics, University Hospital of Split, during the 10-year period (November 1, 1997, to October 31, 2007). Open bars – non-alcohol intoxications, closed bars – alcohol intoxications.

days, 15 (6.3%) on Thursdays, 37 (15.5%) on Fridays, 65 (27.2%) on Saturdays, and 61 (25.5%) on Sundays. Altogether, 175 children were hospitalized (73.2%) on weekends and holidays and 64 (26.8%) children were hospitalized on working days. In the first year of the study, 3 children were hospitalized on weekends and holidays, and 4 children were hospitalized on working days. In the last year of our study, 48 children were hospitalized on weekends and holidays and 11 children on working days. In 106 (44.4%) cases, the reason for intoxication was known: festive occasions (birthdays, weddings, holidays) in 67 cases (63.2% of all known reasons), escape from reality, and coexisting psychological problems, such as emotional disorders in 29 cases

(27.4%), peer pressure in 3 cases (2.8%), divorce of parents in 3 cases (2.8%), a bet in 1 case (0.9%), and other reasons in 3 cases (2.8%). The location where children got intoxicated was recorded in 97 (40.6%) cases. Out of these, 20 (21%) children got intoxicated in their homes and 77 (79%) outside their homes (19 in a club or a café, 15 on the beach, and 43 at other places such as park, playground, stadium, or stations). From 1997/98 to 2001/02, psychiatric and psychological help was not included in standard treatment of alcohol intoxication. In 2002/03, there was 1 psychiatric intervention (5.9% of all alcohol intoxicated children in that year), 2 (4.9%) in 2003/04, 5 (13.5%) in 2004/05, 10 (22.2%) in 2005/06, and 18 (30.5%) in the last year of the study.

DISCUSSION

Our study showed that there was a drastic increase in hospitalization of children intoxicated by alcohol at the University Hospital in Split. Although we analyzed the data for a single hospital in Croatia, our results may be representative of the whole Dalmatian region, as the University Hospital in Split is the only central health care institution in the Split-Dalmatia County. Our hospital is also the only hospital in the wider region (approximately 300 000 inhabitants), so we can presume that serious cases of alcohol intoxication were treated exclusively here. However, we cannot exclude the possibility that children who manifested minor signs of alcohol intoxication were treated at their homes. As there has not been any official change in our admission policy, we believe that our data show the actual trend of alcohol consumption in children and adolescents in our region.

There is a body of literature demonstrating an increase in alcohol consumption among children from 0 to 18 years of age. Younger children usually get intoxicated accidentally and older children on purpose (2-16,18,19). Complex medical, psychological, social, and economic causes and consequences of increasing alcohol consumption among children have also been addressed (6). In Europe, follow-up of alcohol intoxications was carried out in many European countries at 4 time points: 1995, 1999, 2003, and 2007. The European School Survey Project on Alcohol and other Drugs (ESPAD) compared alcohol consumption in school children between different European countries (including Croatia) (4,6,9). It seems that Croatian children between 0 to 16 years are still at the bottom of scale of alcohol consumption in Europe, meaning that in other countries the situation is even more alarming (18). In Finland, 53% of children hospitalized due to alcohol intoxication from 1971 until 2005 were 10-14 years old (8). In our study, the average

age of children intoxicated by alcohol was 14.0 years. Also, 82.0% of the hospitalizations due to alcohol intoxication were in the age group 14-18 and the number of hospitalized children in that age group has alarmingly grown over the years. Similar results were reported by a German study, with greatest increase in hospitalizations due to alcohol intoxication in the adolescents aged between 13 and 17 (20). A Polish study showed that 37% of children first tried alcohol when they were between 10 and 15 years old. As the most common reasons for alcohol intoxication they listed escape from reality and the desire to be accepted by their friends (11). These were the most frequently listed reasons for alcohol intoxications in our study as well. As in most cases the reason for alcohol consumption was not specified, it might be possible that drinking alcohol is socially accepted, even encouraged, in some countries.

A Finnish study in the period 1971-2005 reported a 1.7-fold increase in the number of alcohol intoxications in boys and 2.4-fold increase in girls (8). A Brazilian study showed that in the age group 10-13, 17% of boys and 19% of girls consumed alcohol, while the percentage was drastically higher in the age group 14-19 (58% in girls and 54% in boys). No significant difference between the sexes was found (10). In our study, although more boys than girls were hospitalized due to alcohol intoxication (71% vs 29%), the increase in alcohol consumption between the first and the last year of our study was greater among girls (15-fold increase, from 1 to 15, for girls and 7-fold increase, from 6 to 44, for boys).

A Brazilian study found that 32% boys and 17% girls suffered violence during acute alcohol intoxication (10), while a Canadian study found that 34% of children hospitalized due to alcohol intoxication had injuries, 42% of which were head injuries as a consequence of a fall (19). In this study, 4 hospitalized children had head lacerations and contusions caused by a fall due to a loss of consciousness.

Croatian study by Kružić-Lulić et al (14) found that more than a half of three-year (vocational) high schools students drank alcohol on weekends. These students usually drank anything they could find (47.8%), and more than 95% of them drank in company. Our study also showed that children were most often intoxicated by alcohol on weekends and holidays (73.2%).

We also found the greatest increase in the number of hospitalizations due to other intoxications in the 4-18 age group. The number of children in the 0-5 age group, in which there was the greatest number of other intoxica-

tions, decreased during the study period, which may be explained by increased awareness among parents and better protection of children in that age group.

In comparison with the research conducted by Ficnar and Huzjak (16), which ended in 1996, our study showed a significant increase in the proportion of children hospitalized due to alcohol intoxication. While Ficnar and Huzjak reported that alcohol intoxications made up only 15% of all intoxications, in our study they made up 40.2%. Additionally, the proportion of alcohol intoxication among all intoxications in this study increased from 16.6% in the first to 66.3% in the last year of our study. Because of this negative trend, compulsory psychologist's and psychiatrist's counseling was introduced in the treatment of intoxicated children at the University Hospital of Split.

An especially worrisome phenomenon is so-called binge drinking (13). This term refers to excessive drinking, eg, consumption of 5 or more hard drinks in a short period, leading to a loss of consciousness. Unfortunately, due to insufficient data, we were not able to show whether this phenomenon caused an increase in the number of hospitalizations. However, anamnestic data of some of the hospitalized children indicated that they had drunk large quantities of wine, beer, or hard drinks (rum, tequila, vodka, whiskey) in a short period of time. Children with various consciousness disorders were usually picked up by ambulance at various locations, from the beach to their own home. Out of 97 known cases, 77 of them got intoxicated outside their homes.

The imitations of this study include a lack of data from the first years of research due to inadequate collection at the hospital level. However, the data in the first year corresponded to those from the period just before our study (16). The data collected for later years of the study were collected adequately. Also, our data could not be compared with other Croatian towns, because similar studies have not been performed for alcohol but for drug-abuse (21,22) in other parts of Croatia. Therefore, we can only speculate that similar alcohol problems in children population exist not only in our county but all over Croatia, and that increase in hospitalizations for alcohol intoxication is a reflection of increased alcohol consumption among children.

In conclusion, our study found an increasing number of alcohol intoxications among children, as well as an increasing proportion of alcohol intoxications among all types of intoxications, which requires further investigation. 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. Achieving equality between the sexes has also had negative consequences, because girls have started to drink as much as boys. The solution for this problem may lie in the introduction of preventive measures, especially primary health care interventions, such as health education campaigns, media campaigns, and school and pre-school educational programs, as well as stricter implementation of the current law, forbidding selling of alcohol to those under 18 years.

The fact that preventive work has significantly reduced the number of non-alcohol intoxications in children in the age group 0-5 brings hope that preventive actions in the age-group 14-18 may also reduce the number of children hospitalized due alcohol intoxication and reverse the alarming trend shown in this study.

Acknowledgments

We are grateful to Prof. Mirna Saraga-Babić for the critical reading of the manuscript, Mr Ante Elez, for the technical support and Mr Duje Strukan for the assistance in statistical data processing.

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