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Research Article

Acute Alcohol Intoxication in Adolescents at an Austrian Paediatric Emergency Department-A Five-Year Development

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Abstract

Background: Determine trends in frequency of acute alcohol intoxication (AAI) cases in the emergency department (ED) at the Clinic for Paediatrics at the Medical University of Innsbruck.

Methods: All outpatient encounters (n = 104,397) in our paediatric ED from 01 January 2012 to 31 December 2016 were retrospectively filtered for relevant diagnoses and blood alcohol concentration (BAC) of ≥ 0.085‰. Further clinical data for the 873 encounters thus identified were evaluated.

Results: Average patient age was 16y5mo, with 537 male (61.5%) vs. 336 female (38.5%) patients. From 2012 to 2016, patient visits with AAI fell from 190/y to 143/y (-24.7 %) and the male to female ratio fell from 63.2%: 36.8% in 2012 to 54.5%: 45.5% in 2016. Over the same interval, average BAC rose from 1.55‰ to 1.76‰. Age and BAC were significantly correlated positively (male: p=0.048; female: p=0.001). A higher BAC was associated with significantly lower systolic blood pressure (male: p=0.003; female=p<0.001), oxygen saturation (male: p<0.001; female: p=0.005) and pH levels (male: p=0.006; female: p<0.001). In both sexes BAC and urgency correlated positively (Manchester Triage System; male: p=0.041; female: p=0.002).

Conclusions: A Europe-wide decline in frequency of AAI among adolescents is reflected in AAI ED encounters at our clinic. This decline is mainly due to a fall in numbers of male patients. Although more boys than girls were seen each year, the annual number of girls treated did not fall during the 5y studied: Male and female numbers with adolescent AAI in our ED are converging.

Keywords: Adolescent alcohol use; Alcohol consumption; Alcohol drinking habits; Blood alcohol level; Alcohol intoxication

Abbreviations: AAI: Acute alcohol intoxication BAC: Blood alcohol concentration; ED: Emergency department; ESPAD: European School Survey Project on Alcohol and other Drugs; ICD: International Classification of Diseases; KIS: Krankenhausinformationssystem (hospital information system)

Introduction

Alcohol is the most commonly used and misused drug in Western countries; the European Union, as a region, has the highest consumption rate in the world [1,2]. Since the 1970s average alcohol consumption in Austria has steadily decreased. In contrast, paediatric emergency departments (EDs) have faced continuously rising numbers of adolescents with acute alcohol intoxication (AAI) [3-8]. Within the last decade, though, this trend may be reversing: Various strategies targeting adolescents (marketing bans, sales and supply prohibitions, information campaigns) seem to have reduced alcohol consumption in this group [2,9-11]. Analysis of inpatient admissions for AAI between 2005 and 2009 at the Clinic for Paediatrics at the Medical University of Innsbruck showed an increase in numbers year on year without variation in average blood alcohol concentration (BAC) [12]. Our present study has examined AAI encounters at the ED of the same venue ~10y later, assessing sex, age, BAC and other parameters, to evaluate effects of societal interventions intended to lessen alcohol consumption by adolescents.

Material and Methods

This retrospective study carried out at the ED of the Clinic for Paediatrics at the Medical University of Innsbruck enrolled all encounters within 5y consecutively, from 1 January 2012 through 31 December 2016. The Section for Medical Statistics and Informatics of the Medical University of Innsbruck retrieved a data set from the Krankenhausinformationssystem (KIS, hospital information system) containing all information used for statistical analysis. Along with personal data (name, date of birth, age at presentation, sex, postal code, patient ID, ED service number), data on time of presentation (date, day of week [weekday/weekend/bank holiday], time of day) and data on type of encounter (International Statistical Classification of Diseases and Related Health Problems [ICD] version 10 [ICD-10] - coded ED, inpatient admission and discharge diagnoses) were collected from the KIS (Figure 1). Initial inclusion criteria were age <18y and self-referral to the ED (as distinct from referral by caregiver). Encounters were excluded that required surgical treatment or that took place on 29 February (aiming at eliminating leap year effects). From the remaining data we filtered all cases bearing ICD code F10.x (alcohol related disorders) or T51.x (toxic effect of alcohol) in the field "ED 4 diagnosis" (diagnosis assigned at the ED). Encounters lacking an ED diagnosis were included if they had been ICD-coded as F10.x or T51.x in the field "inpatient admission diagnosis" or "discharge diagnosis". We retrieved further parameters (blood pressure, pulse, oxygen saturation, blood pH, BAC, drug test results and Manchester Triage System urgency level) from the KIS and excluded all patients with a BAC <0.085‰. The individual records, as data sets, were then anonymized. We used t testing (with normal distribution) and Mann-Whitney U-testing (without normal distribution) to compare 2 separate sets of samples. To compare >2 groups ANOVA (in case of normal distribution) and Kruskal-Wallis testing (without normal distribution) were applied. Determinations of normal distribution were conducted via Kolmogorov-Smirnov testing and histogram construction. Correlations were calculated using Pearson- (r), Spearman- (rs), chi-square- or eta-coefficient testing. The significance threshold was set at $p<0.05$. Statistical analyses were performed using IBM SPSS Statistics 21 (IBM, Armonk, NY).

Ethics approval

The study protocol was approved by the Ethics Committee of the Medical University of Innsbruck (AN2017-0030 370/4.9 389/5.16 [4315a]).

Results

During the 5y observation, period 104,397 encounters were registered. After all inclusion and exclusion criteria were applied, 873 (0.93%) were enrolled (Figure 1). Changes year to year. Year to year, AAI presentations fell (except 2012-2013, with a rise from 190 to 192). The 190 cases in 2012 fell by 24.7% to 143 cases up until 2016, with 2015-2016 having the strongest proportional decline from one year to the next (16.9%). This decrease (Figure 2) mainly comprised male (M) patients (n=42; 35.0%), whereas the numbers of female patients declined only slightly (n=5; 7.1%). Age and sex distribution. The average age of patients with AAI was 16y5mo. Boys were significantly ($p=0.023$) older than girls (16y5mo vs. 16y4mo). The 2 youngest patients were aged 10y (male) and 11y (female). Most patients (69.0%) were 17- and 18-year-olds (Figure 3). Of 873, 537 (61.5%) were male and 336 female (38.5%). Over the interval studied, the male: Female ratio shifted from 63.2%: 36.8% in 2012 to 54.5%: 45.5% in 2016. Inpatient admissions. 562 encounters (64.4%) led to inpatient admission. Likelihood of admission did not vary significantly by sex ($p=0.177$). A higher BAC was positively correlated with a significantly higher likelihood of admission ($p\leq0.002$). On average, the BAC was 0.22‰ higher in encounters that led to inpatient admissions. Annual numbers of inpatient admissions dropped overall from 2012 to 2016 (respectively 115, 128, 108, 107, and 104). BAC. While numbers of AAI cases fell during the study period, average BACs rose. Males showed a significant increase ($p=0.002$) from 1.55‰ in 2012 to 1.78‰ in 2016; females' average BAC did not change significantly (from 1.55‰

to 1.73‰; p=0.102). The highest BAC was found in 2 boys (age 15y), each with 3.51‰ (Figure 4). A significant positive correlation was demonstrated between BAC and age (M: rs=0.086, p=0.048 vs. F: rs=0.184, p=0.001): The lowest average BACs were found in 13-year-olds (M: 1.36‰ vs. F: 1.23‰), and the highest average BACs were found in 18-year-olds (male: 1.73‰ vs. female: 1.72‰). Average BAC did not differ significantly between male and female (p=0.069). Further results. In both sexes a higher BAC was associated with significantly lower systolic blood pressure (male: p=0.003; female=p<0.001), oxygen saturation (male: p<0.001; female: p=0.005) and pH levels (male: p=0.006; female: p<0.001). Drug test results indicated mixed intoxication with other substances occurred in 9.9% of all patients with AAI. Those cases assigned a Manchester Triage System urgency level were mostly classed as very urgent (level 2; 29.7%) and urgent (level 3; 54.7%), with a significant positive correlation between BAC and urgency (male: p=0.041; female: p=0.002) in both sexes. Numbers of AAI encounters increased near-continuously from Monday to Sunday and peaked during weekends and bank holidays. AAI encounters were few during the day and increased through the evening, peaking at night (0100h).

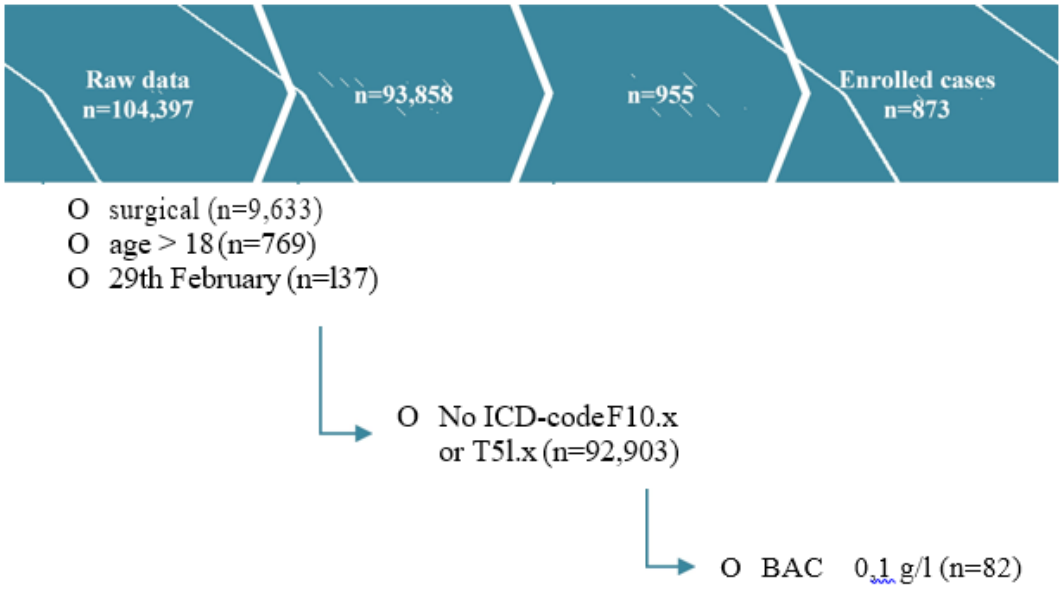

Figure 1: Flow diagram, data selection process.

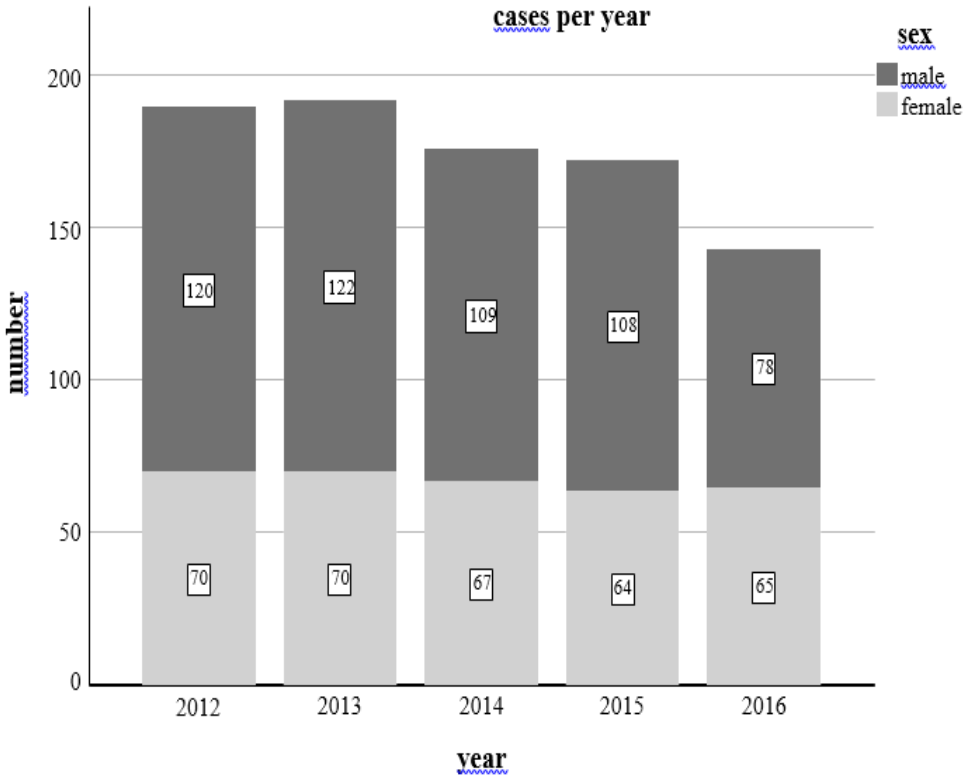

Figure 2: The columns represent cases per year with acute alcohol intoxication.

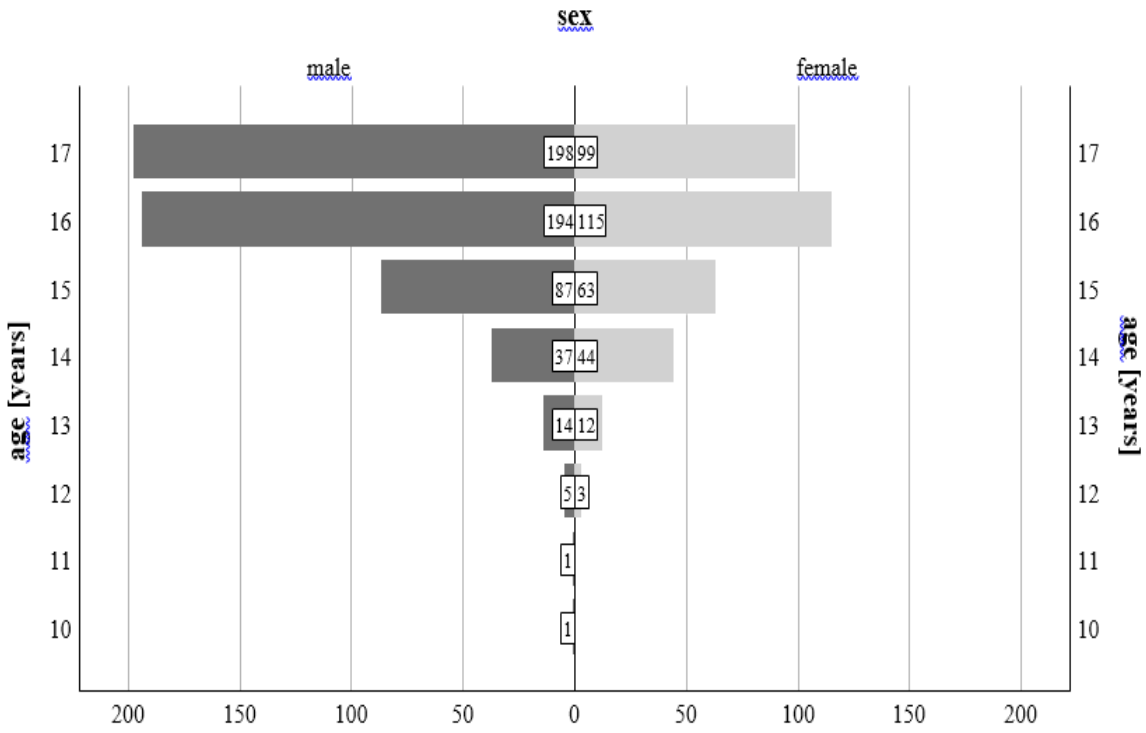

Figure 3: The columns represent cases divided by sex and age.

Figure 4: Blood alcohol concentration in all cases during the observation period with a linear trend curve. 10

Discussion

The main findings of our study were a decrease in frequency of adolescent AAI ED encounters 24.7% over 5y, with the fall predominantly among boys, and an increase in average BAC from 1.55‰ to 1.76‰. Whereas AAI inpatient admissions increased at our institution between 2005 and 2009 [12], the years 2012-2016 showed a year-to-year decrease in numbers not only of paediatric inpatients with AAI but also of paediatric ED patients with AAI. Our results correspond well to those of other European studies of frequency of AAI at paediatric EDs, reporting an increase within the interval from 1996 to 2011. Kuntz et al. [11] and Nienhuis et al. [13] respectively reported increases in frequency until 2009 and 2011, followed by stagnant numbers and (in the work of Kuntz et al.) decreasing numbers thereafter until 2013. The difference in sexes is particularly striking in respect of AAI encounter frequencies since 2012. While annual female encounters fell only by 7.1%, annual male encounters fell by 35.0%, thus principally underlying the 24.7% overall decrease. Although male > female at the end of the observation period in 2016, if the trend toward convergence between sexes has continued, the male: female ratio may already be in balance, or even <1. Such a trend would correspond to findings of the 2015 European School Survey Project on Alcohol and other Drugs (ESPAD 2015), with sex-specific differences decreasing rapidly in Austria [14]. Indeed, excessive drinking by girls may in 2015 already have overtaken that by boys [3]. We speculate that binge drinking is increasing in adolescent girls – reasons unknown – or that prevention and information campaigns targeting alcohol consumption and excessive drinking have been more efficacious in boys than in girls. AAI frequency increased sharply after age 15y onwards, peaking at age 17y. This most likely reflects Austria's prohibition of alcohol consumption by minors aged <16y [15]. The average age of AAI patients was 16.4y. Between 2005 to 2009 the difference between 15- and 16-year-old patients was smaller, the increase in AAI frequencies with age more gradual and the average age of patients with AAI was lower (16.0y) [12]. Despite the decrease in annual numbers, the average BAC in male AAI patients increased. Perhaps adolescents (including patients themselves, as well as their peers) seek medical help more readily at higher BACs due to a greater awareness of adverse consequences of severe AAI, and intoxicated individuals are taken to hospital more often. AAI frequencies at age <16y did not increase; we thus doubt that the increase in average BAC was due to an overall habituation effect. In contrast to our findings, ESPAD 2015 [14] found that average BACs in Austrian youth with AAI were increasing. The disparity might be due to differences in study subjects: While ESPAD aimed at analysing a representative sample of all adolescents, our data were retrieved from ED encounters. They thus may reflect more substantial alcohol consumption by adolescents than that engaged in overall. We found no significant difference in BAC between sexes. Girls' average BAC has already been reported to converge toward boys' BAC during the period of our study [12]. The increase of average BAC with age may suggest that younger adolescents (usually) have a more cautious approach towards alcohol consumption. With increasing age, habituation leads to tolerance of higher BACs and thus to greater consumption.

Limitations: Our data selection process excluded all encounters not ICD-coded F10.x or T51.x. We thereby may have overlooked some instances of AAI. The methods, including the selection process, of the antecedent study of AAI at our institution were not identical to those of our study [12]. We still consider the earlier

data to permit meaningful comparisons with our results.

Conclusion

A Europe-wide decline in frequency of AAI among adolescents is reflected in a decline in the number of ED AAI encounters in the Clinic for Paediatrics at the Medical University of Innsbruck. This decline is mainly due to a decrease in numbers of male patients. Even though the number of female cases is still below that of male cases, it is stagnant, thereby resulting in a gradual convergence in the male to female encounter ratio toward 1.

Footnotes

Contributors: N Beck, M Michel, and S Scholl-Bürgi drafted the manuscript. E Hinteregger, M Michel, and S Scholl-Bürgi developed the study conception and design. E Binder and K. Kapelari supervised data collection. C Mache and F Kuhlmann processed raw data and provided the final data set. All authors, especially D Karall, contributed substantially to its revision. M Michel takes responsibility for the work as a whole. We thank Dr AS Knisely for comments on the manuscript and G Umshaus for extracting additional data from the KIS.

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Competing interests: The authors declare that they have no conflict of interest.

Patient consent for publication: Not required.

Highlights

- Adolescents' frequency of presentation with alcohol intoxication dropped (2012-2016)
- Decrease in frequency of alcohol intoxication from 2012-2016: boys 35%, girls 7%
- Average blood alcohol concentration in adolescents rose from 2012-2016
- Age and average blood alcohol concentration correlate positively in adolescents
- 84% of presentations with alcohol intoxication are rated very urgent or urgent

References

1. Tõnisson M, Tillmann V, Kuudeberg A, Lepik D, Väli M (2013) Acute alcohol intoxication characteristics in children. Alcohol Alcohol (Oxford, Oxfordshire) 48: 390-395.
2. World Health Organization (2018) Global status report on alcohol and health 2018. Geneva: World Health Organization.
3. Fandler E (2019) Drinking until the emergency doctor arrives or: drinking in the intoxication of growing up. pediatrician paedologist. 54: 124-129.
4. Kuzelová M, Harárová A, Ondriasová E, Wawruch M, Riedel R, et al (2009) Alcohol intoxication requiring hospital admission in children and adolescents: retrospective analysis at the University Children's Hospital in the Slovak Republic. Clinical toxicol. (Philadelphia, Pa.) 47: 556-561.
5. Schoberl S, Nickel P, Schmutzer G, Siekmeyer W, Kiess W (2008) Acute ethanol intoxication among children and adolescents. A retrospective analysis of 173 patients admitted to a university children hospital. Klin Padiatr 220: 253-258.
6. Pawlowska-Kamieniak A, Mroczkowska-Juchkiewicz A, Kominek K, Krawiec P, Melges B, et al (2018) Alcohol intoxication among adolescents and children in urban and rural environments - a retrospective analysis. Ann Agric Environ Med 25: 1-3.
7. Bitunjac K, Saraga M (2009) Alcohol intoxication in pediatric age: ten-year retrospective study. Croat med j 2009; 50: 151-156.
8. Kaminska H, Gawlik A, Gawlik T, Malecka-Tendera E (2018) Hospitalizations due to alcohol intoxication among children and adolescents - data from one clinical hospital in Poland. Psychiatr Pol 52: 387-398.
9. Strizek J, Uhl A (2016) Bevölkerungserhebung zu Substanzgebrauch 2015. Band 1: Forschungsbericht. Wien: Gesundheit Österreich.
10. Fandler E, Scheer P, Rödl S, Müller W (2008) Alcohol abuse and dependence in children and adolescents. Monthly prescription paediatrics 156: 591-604.
11. Kuntz B, Lange C, Lampert T (2015) Alkoholkonsum bei Jugendlichen – Aktuelle Ergebnisse und Trends [Online-Dokument].
12. Panholzer L (2011) Epidemiology and acute effects of alcohol intoxication in children and adolescents in the years 2005-2009 at the University Clinic for Pediatrics and Adolescent Medicine Innsbruck [diploma thesis]. Innsbruck: Innsbruck Medical University.
13. Nienhuis K, van Hoof JJ, van Dalen WE, van der Lely N (2019) 10 jaar alcoholintoxicaties bij jongeren. Ned Tijdschr Geneeskd 163: D2384.
14. Strizek J, Anzenberger J, Kadlik A, Schmutterer I, Uhl A (2016) ESPAD Österreich. European School Survey Project on Alcohol and other Drugs. Band 1: Forschungsbericht. Wien: Gesundheit Österreich; 2016.
15. Oesterreich.gv.at (2019) Rauchen und Alkohol: Regelungen für Alkohol- und Tabakkonsum.