

ORIGINAL ARTICLE

Evolution of patients visiting the emergency department due to alcohol intoxication

Stephane Deman^{1*}, Sandra Verelst², Ives Hubloue³

ABSTRACT

Background: Only a few studies investigated the evolution of characteristics of patients presenting at the emergency department (ED) due to alcohol intoxication. The aim of this study was to investigate the evolution of three patient characteristics: age, gender, and blood alcohol concentration (BAC).

Methods: A retrospective review of medical records of patients visiting the ED at two large university hospitals in Belgium was performed. All patients older than 16 years, presenting to the ED with a primary diagnosis of alcohol intoxication in 2009 were compared with those presenting in 2014.

Results: Both hospitals had a marked increase in visits due to alcohol intoxication. Male-to-female ratio in one hospital showed a redistribution toward women, whereas this remained stable in the other hospital. Average BAC remained stable in both sexes and hospitals. More severe BAC-levels (>3 g/l) diminished in male patients of one hospital but kept stable in women. The other hospital showed no change in more severe BAC-levels (>3 g/l) of both sexes.

Conclusion: Since total alcohol consumption in Belgium decreased, but total number of alcohol intoxicated patients increased in both hospitals, there probably has been a change in alcohol consumption pattern. Changes in the characteristics of patients visiting the ED due to alcohol intoxication still turns out to be demographic dependent, since the tendency of more young patients presenting could only be observed in one out of two hospitals. Implementing a screening method for alcohol abuse should be considered at the ED.

Keywords: Alcohol abuses, evolution of characteristics, age distribution, gender, blood alcohol concentration, alcohol consumption pattern, high-risk groups and trends.

Introduction

According to the World Health Organization (WHO), the definition of intoxication is the following: “Intoxication is a condition that follows the administration of a psychoactive substance and results in disturbances in the level of consciousness, cognition, perception, judgement, affect, or behavior, or other psychophysiological functions and responses.” Therefore, the acute alcohol intoxication results from the consumption of large amounts of alcohol [1,2].

Alcohol-related problems are a major health care problem for which patients often seek help at the emergency department (ED). 2%-40% of patients presenting to the ED are having alcohol-related problems, depending on the used methodologic criteria [3,4]. The annual increase in alcohol-related visits places a burden on an often already saturated ED. The past decade there has been a shift in the characteristics

of patients visiting the ED due to alcohol intoxication. Patients are becoming younger, and more women are presenting [5,6].

Following published data by Verelst et al. [7], we aimed to analyze and compare similar data from 2009 and 2014 in order to investigate trends in characteristics of patients and identifying high risk groups.

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Survey data remains a critical mean for monitoring alcohol consumptions patterns and trends although there is still limited work done about this topic. The knowledge about trends can be used by health care policy makers to focus on high risk groups. It can also help (para)medics to identify patients with alcohol-related problems more easily.

Materials and Methods

This observational study involved a retrospective medical record review of all patients presenting to the ED in 2009 or 2014 because of alcohol intoxication. Using physician discharge diagnosis codes, we identified all ED visits that appeared to be made primarily for alcohol intoxication. If the patient co-ingested other substances, the case was excluded.

The WHO International Classification of Diseases, 10th Revision, codes that were considered to be indicative of such a visit, when used as primary diagnosis, were acute alcohol intoxication (code F10.0) and dependence syndrome (code F10.2). 1,428 cases of University Hospital of Leuven (UHL) were obtained and 832 cases of University Hospital of Brussels (UHB).

Every case was then checked by the investigator to be sure all cases fulfilled the inclusion criteria. As a result, 484 UHL-cases and 440 UHB-cases were excluded.

The study was conducted at the ED of two tertiary referral academic teaching hospitals, in Leuven and Brussels (Belgium). Both ED's have an annual census of approximately 55,000 (UHL) and 68,000 (UHB) patients, with an average hospital admission rate of, respectively, 36% and 21%. In general, the treating physician routinely asks the patients about their alcohol consumption level. If alcohol use is suspected, blood alcohol concentration (BAC) levels are usually routinely obtained.

All patients older than 16 years with a primary diagnosis of alcohol intoxication were included. If a patient presented multiple times within the study period, with each presentation meeting the inclusion criteria, each visit was considered as a separate case. Patients with co-ingestion of alcohol were excluded from the study.

The following patient characteristics were extracted from both hospital information systems: age, gender and BAC levels.

Further analysis was done by transferring the retrieved data to a Microsoft Excel® spreadsheet. Statistics were performed using Statistical Package for the Social Sciences (IBM, New York). Descriptive statistics for continuous data included central tendency measures (mean and median) and the percentage frequency of occurrence was used for categorical-level data. Student's *t*-test and χ^2 test were used for comparison of the groups. For multiple group comparisons, we used analysis of variance.

Results

UHL included 423 patients in 2009 (137 women and 286 men) versus 521 patients in 2014 (208 women and 313 men), respectively, 0.77% and 0.96% ($p = 0.01$) of all ED visits. UHB included 155 patients in 2009 (54 women and 101 men) versus 237 patients in 2014 (89 women and 148 men), respectively 0.23% and 0.33% ($p = 0.01$) of all ED visits. Age range of included patients was 16-88 years, with an equal median age of 39 years old (Figure 1).

Male-to-female ratio (M/F) in UHL-patients showed a significant redistribution toward women: 2.09 in 2009 versus 1.50 in 2014 ($p = 0.02$). This was due to a rise in following age groups: 16-20, 31-40 and 51-60 years old. M/F-ratio remained stable for UHB-patients: 1.87 in 2009 versus 1.66 in 2014 ($p = 0.59$), although we noticed

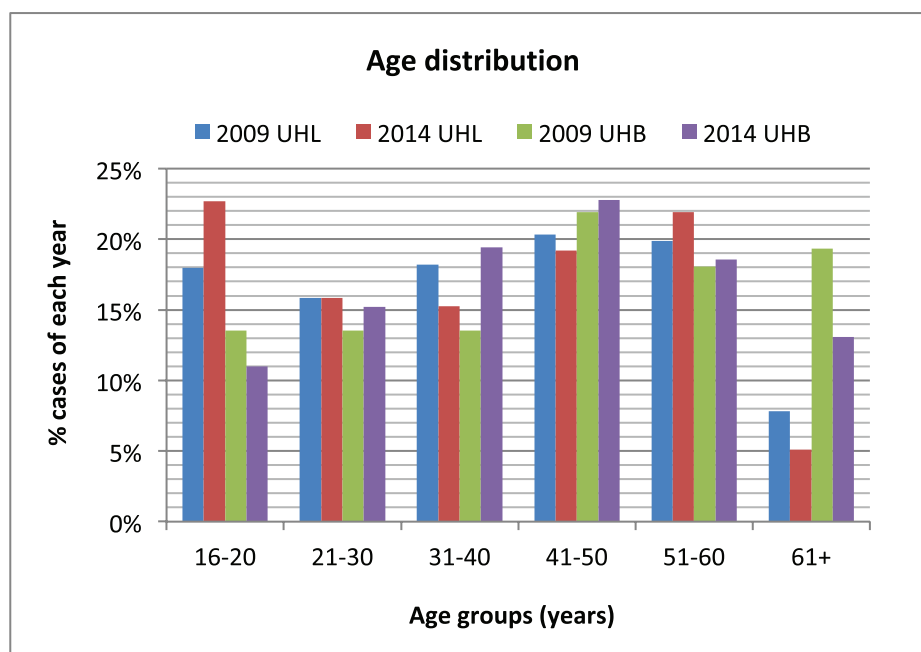


Figure 1. Age distribution of included patients.

a significant increase in age groups 21-30 and 31-40 years old (Figure 2).

As for the male age distribution, a relative redistribution toward the younger age groups 16-20 years old and 21-30 years old was seen in UHL. In contrast, a decrease was seen in the age group 31-40 years. Younger age groups remained stable in UHB-patients (Figure 3).

Mean BAC remained stable in both sexes and hospitals: 2.47 g/l for women and 2.62 g/l for men. Median female BAC in both hospitals was 2.45 g/l in 2009 versus 2.48 g/l in 2014. A significant increase in female BAC was seen in age groups 31-40 and 41-50 years old. More severe BAC-levels (>3 g/l) diminished in male patients of UHL ($p = 0.01$), but kept stable in women. This trend was not seen in UHB-patients. UHB showed no change in more severe BAC-levels (>3 g/l) of both sexes.

Median male BAC was 2.64 g/l in 2009 versus 2.60 g/l in 2014. A significant increase in male BAC was seen in age groups 16-20 years old (2.10 g/l in 2009 versus 2.21 g/l in 2014) and 51-60 years old (2.52 g/l in 2009 versus 2.66 g/l in 2014). A significant relative increase in male BAC was seen for alcohol levels between 2 and 2.99 g/l, which was not the case for higher BAC-levels.

Discussion

Over the last decades, caregivers and authorities mainly focused on the effect of illegal drugs and their influence on the ED, thereby ignoring the magnitude of alcohol. However, the alcohol is still the most favorable drug [8].

This survey showed in both hospitals a marked increase in number of patients presenting at the ED with a primary diagnosis of alcohol intoxication. These results are

consistent with earlier studies in the US (47% between 2006 and 2014), England (50% between 2002 and 2014) and Canada (35% between 2003 and 2016) [4,9,10].

Although men continue to have much higher ED visits due to alcohol intoxication, visit rates rose faster in women. The significant increase in women can be explained by a possible escalation in harmful alcohol consumption amongst women or the rising health issue of 'binge drinking' although further investigation is needed. Binge drinking is defined as drinking at least four drinks for women and five drinks for men within a period of 2 hours [14-16]

This trend is worrisome since binge drinking during adolescence has been proved to be related to alcohol dependence during adult age, which is the cause of chronic alcohol use and alcohol addiction [17-19].

We did not observe a significant increase in adolescents, which is not consistent with global trends. This could implicate that the global trend of more young alcohol intoxicated patients presenting at the ED is demographic dependent although this should first be confirmed by further investigation [7,11,12].

Since alcohol consumption decreased by 18% over the last 20 years in Belgium, but total number of ED visits due to alcohol intoxication increased, we can assume that there has been a change in alcohol consumption pattern [8,12,13].

Middle-aged people, and particular men, represent a large group of alcohol intoxicated patients in our study. This suggests that middle aged patients might be more vulnerable to heavy episodic drinking or chronic alcohol use/abuse [17-19].

Possible strategies for reducing the number of ED admissions due to alcohol intoxication could include: prohibiting alcohol advertisements, raising alcohol

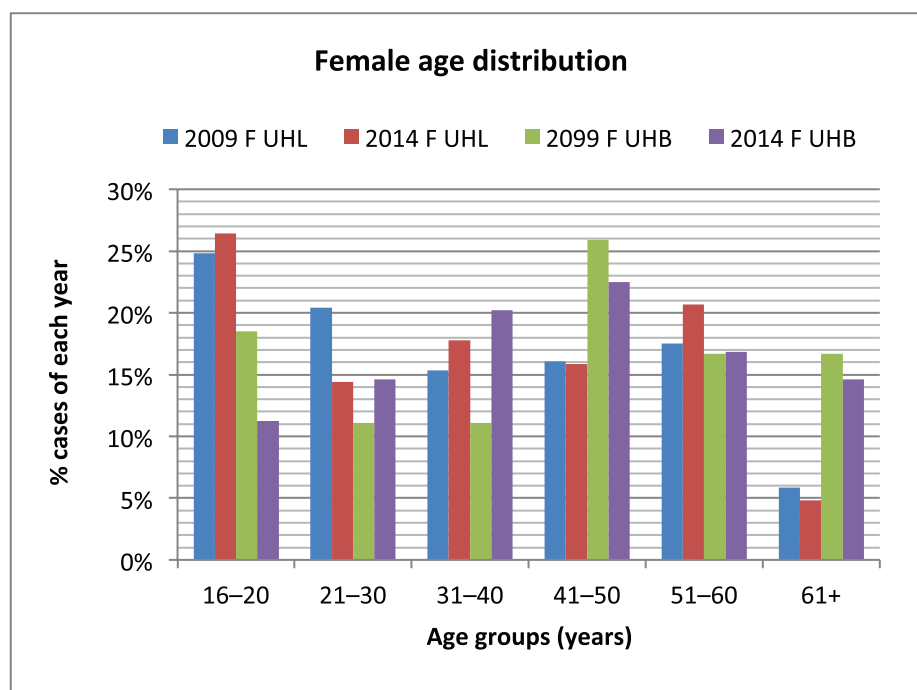


Figure 2. Age distribution of included female patients.

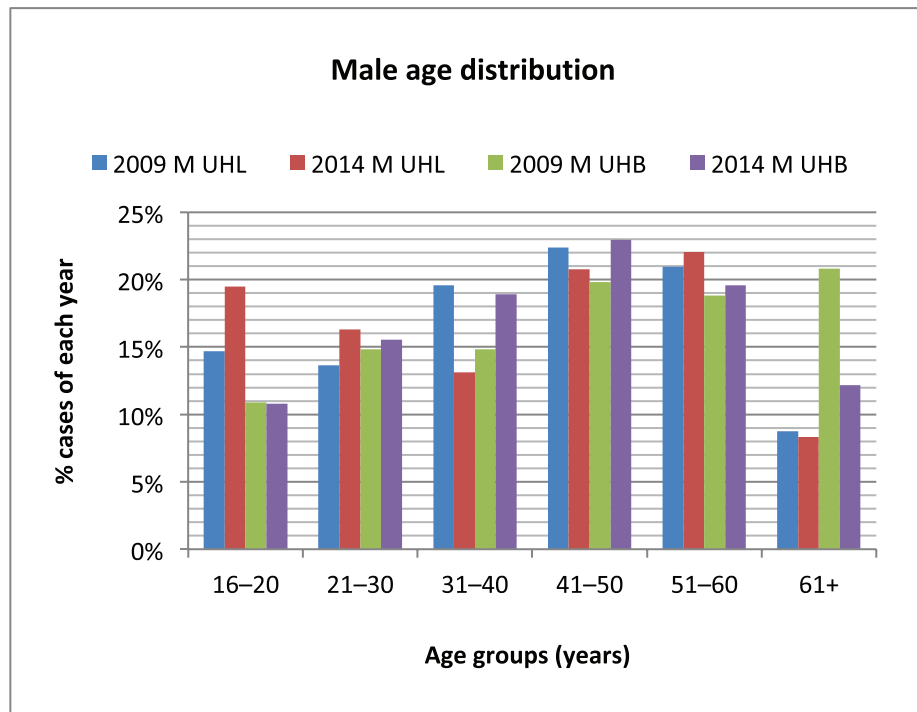


Figure 3. Age distribution of included male patients.

taxes, putting restrictions on the availability of alcohol, organizing information campaigns, identifying problem drinkers earlier by for example screening persons who committed violence, random breath testing, implementation of screening tests, effective treatment by doing early counseling, and offering follow-up contacts or self-helping strategies.

ED's should consider implementing a screening tool such as the Paddington Alcohol Test (PAT) or Cut-Annoyed-Guilty-Eye (CAGE) test for every patient visiting the ED or for the population identified as high risk group in this study. This would contribute to a more efficient detection of alcohol-related problems in an earlier state, for which intervention by a psychiatrist can be implemented. Contact with the primary physician is very important in handling this problem and ensuring close follow-up. These are all topics for debate [20-23].

Limitations

The results of this study are subject to some limitations. First, since the selection of cases depends on the accuracy of the discharge diagnostic codes, the selection of cases might be incomplete. This limitation was minimized by starting from a large pool of 2,260 cases and then excluding 924 cases who did not matched the inclusion criteria. The reason for admission of each patient was manually rechecked for minimizing registration bias. Second, the study was performed in only two university hospitals in Belgium. The estimation of prevalence rates in Belgium or worldwide is, therefore, impossible. Third, some alcohol intoxicated patients might be undetected when presenting at the ED, since physicians might have missed the symptoms of alcohol intoxication. Moreover, no screening test was performed which makes missing patients more likely.

Fourth, the study took place in two hospitals with a referral center for patients with alcohol use disorders, in contrast to other surrounding hospitals, because it has a psychiatric service which is available 24/7. However, the availability of the psychiatric service has already been long-standing. Therefore, it is unlikely that the availability of this service is responsible for the increase in intoxicated patients over the 5-year period. Fifth, incomplete medical records which are the result of the retrospective study design could cause important data to be missed.

Sixth, both hospitals did not use a screening tool for detecting alcohol abuse. This way some cases could have been missed.

Finally, comparison of this study with other studies investigating the epidemiology of alcohol intoxication at the ED is difficult, since epidemiology of alcohol intoxication is multifactorial.

Conclusion

There has been a change in population drinking pattern, since total alcohol consumption in Belgium decreased, but total number of alcohol intoxicated patients increased. The rising phenomenon of social media and binge drinking could be an explanation for this change in consumption pattern, although further investigation is needed to confirm this.

This study confirms the rising burden of alcohol intoxicated patients on the ED and identified the most vulnerable groups.

Changes in the characteristics of patients visiting the ED due to alcohol intoxication still turns out to be demographic dependent, since the tendency of more

young patients presenting could only be observed in one out of two hospitals. On the other hand, the rising tendency of more women presenting was observed in both hospitals, but only significant in one out of two. Further studies should focus on identifying the causes behind those patient groups and policy-makers should consider more focusing their interventions on the identified high risk groups to reduce harmful alcohol use.

These findings highlight the importance of the detection of alcohol misuse in the ED and early interventions to prevent the development of dependency. Therefore, the ED should consider a screening tool such as the PAT or CAGE-test. This would contribute to a more efficient detection of alcohol-related problems in an earlier stage, for which brief intervention by the psychiatrist can be implemented. Bearing in mind that ED admissions are only the tip of the iceberg, well-coordinated strategies against unhealthy alcohol use are urgently needed.

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List of Abbreviations

BAC	Blood alcohol concentration
ED	Emergency Department
M/F	Male-to-female ratio
UHB	University hospital of Brussels
UHL	University hospital of Leuven

Conflict of interest

The authors declared that they have no conflict of interest.

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Consent for publication

Given the observational design of the study, informed consent was waived.

Ethical approval

Ethical approval was granted by Ethics Committee of University Leuven (mp06451) on 30/11/2015. Ethical approval was granted by Ethics Committee of University Hospital Brussels (BUN 143201732854) on 02/08/2017.

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References

1. World Health organisation. Management of substance abuse. Alcohol intoxication; 2020. Available from: https://www.who.int/substance_abuse/terminology/acute_intox/en/

2. Vonghia L, Leggio L, Ferrulli A, Bertini M, Gasbarrini G, Addolorato G et al. Acute alcohol intoxication. *Eur J Intern Med.* 2008;19(8):561–7. <https://doi.org/10.1016/j.ejim.2007.06.0333>.
3. Calle PA, Damen J, De Paepe P, Monsieurs KG, Buylaert WA. A survey on alcohol and illicit drug abuse among emergency department patients. *Acta Clin Belg.* 2006;61(4):188–95. <https://doi.org/10.1179/acb.2006.0334>.
4. Rood PP, Haagsma JA, Boersma SM, Tancica A, Van Lieshout EM, Mulligan T, et al. Psychoactive substance (drugs and alcohol) use by Emergency Department patients before injury. *Eur J Emerg Med.* 2016;23(2):147–54; <https://doi.org/10.1097/MEJ.0000000000001865>.
5. Holzer BM, Minder CE, Schätti G, Rosset N, Battegay E, Müller S, et al. Ten-year trends in intoxications and requests for emergency ambulance service. *Prehosp Emerg Care.* 2012;16(4):497–504. <https://doi.org/10.3109/10903127.2012.6954376>.
6. Green MA, Strong M, Conway L, Maheswaran R. Trends in alcohol-related admissions to hospital by age, sex and socioeconomic deprivation in England, 2002/03 to 2013/14. *BMC Public Health.* 2017;17(1):412. <https://doi.org/10.1186/s12889-017-4265-07>.
7. Verelst S, Moonen PJ, Desruelles D, Gillet JB. Emergency department visits due to alcohol intoxication: characteristics of patients and impact on the emergency room. *Alcohol Alcohol.* 2012;47(4):433–8. <https://doi.org/10.1093/alcalc/ags0358>.
8. Sassi F. Tackling harmful alcohol use: economics and public health policy (Trends in alcohol consumption in OECD countries, no. 1). Paris, France: OECD publishing; 2015. 240 p.9.
9. Allely P, Graham W, McDonnell M, Spedding R. Alcohol levels in the emergency department: a worrying trend. *Emerg Med J.* 2006;23(9):707–8. <https://doi.org/10.1136/emj.2005.03408210>.
10. White AM, Slater ME, Ng G, Hingson R, Breslow R. Trends in alcohol-related emergency department visits in the United States: results from the Nationwide Emergency Department Sample, 2006 to 2014. *Alcohol Clin Exp Res.* 2018;42(2):352–9. <https://doi.org/10.1111/acer.1355911>.
11. Haberkern M, Exadaktylos AK, Marty H. Alcohol intoxication at a university hospital acute medicine unit-with special consideration of young adults: an 8-year observational study from Switzerland. *Emerg Med J.* 2010;27(3):199–202. <https://doi.org/10.1136/emj.2008.06548212>.
12. Bertholet N, Adam A, Faouzi M, Boulat O, Yersin B, Daeppen JB, et al. Admissions of patients with alcohol intoxication in the Emergency Department: a growing phenomenon. *Swiss Med Wkly.* 2014;144:w13982. <https://doi.org/10.4414/smw.2014.1398213>.
13. Murphy JG, Correia CJ, Barnett NP. Behavioral economic approaches to reduce college student drinking. *Addict Behav.* 2007;32(11):2573–85. <https://doi.org/10.1016/j.addbeh.2007.05.01514>.
14. Plant M, Miller P, Plant M, Gmel G, Kuntsche S, Bergmark WK, et al. The social consequences of binge drinking among 24- to 32-year-olds in six European countries. *Subst Use Misuse.* 2010;45(4):528–42. <https://doi.org/10.3109/1082608080248717615>.

15. McCarty CA, Ebel BE, Garrison MM, DiGiuseppe DL, Christakis DA, Rivara FP. Continuity of binge and harmful drinking from late adolescence to early adulthood. *Pediatrics*. 2004;114(3):714–9. <https://doi.org/10.1542/peds.2003-0864-L16>.
16. Myran DT, Hsu AT, Smith G, Tanuseputro P. Rates of emergency department visits attributable to alcohol use in Ontario from 2003 to 2016: a retrospective population-level study. *CMAJ*. 2019;191(29):E804–10. <https://doi.org/10.1503/cmaj.18157517>.
17. Naimi TS, Brewer RD, Mokdad A, Denny C, Serdula MK, Marks JS. Binge drinking among US adults. *JAMA*. 2003;289(1):70–5. <https://doi.org/10.1001/jama.289.1.7018>.
18. Pitkänen T, Lyyra AL, Pulkkinen L. Age of onset of drinking and the use of alcohol in adulthood: a follow-up study from age 8-42 for females and males. *Addiction*. 2005;100(5):652–61. <https://doi.org/10.1111/j.1360-0443.2005.01053.x19>.
19. Kuntsche E, Knibbe R, Engels R, Gmel G. Drinking motives as mediators of the link between alcohol expectancies and alcohol use among adolescents. *J Stud Alcohol Drugs*. 2007;68(1):76–85. <https://doi.org/10.15288/jsad.2007.68.7620>.
20. Ritson B. Treatment for alcohol related problems. *BMJ*. 2005;330(7483):139–41. <https://doi.org/10.1136/bmj.330.7483.139>
21. Plant M. The alcohol harm reduction strategy for England. *BMJ*. 2004;328(7445):905–6. <https://doi.org/10.1136/bmj.328.7445.905>
22. Saitz R. Clinical practice. Unhealthy alcohol use. *N Engl J Med*. 2005;352(6):596–607. <https://doi.org/10.1056/NEJMc042262>
23. Huntley JS, Blain C, Hood S, Touquet R. Improving detection of alcohol misuse in patients presenting to an accident and emergency department. *Emerg Med J*. 2001;18(2):99–104. <https://doi.org/10.1136/emj.18.2.99>