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Alcohol as a trigger for medical emergencies

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Abstract

Our goal is to report relative risks of the impact of alcohol consumption six hours prior to medical emergencies presenting in the emergency department for 8,346 patients in seven countries using data from the Emergency Room Collaborative Alcohol Analysis Project. We found that alcohol increased the risk of a medical emergency by 2.17 times (Confidence Interval=1.78–2.65) and those without a regular pattern of heavy drinking and those younger showed greater risk. Acute alcohol is associated not only with injury but also with medical emergencies. More studies are needed on the acute role of alcohol in medical emergencies, preferably with data on type of medical emergencies.

Keywords

Alcohol use; case–crossover; emergency department; epidemiology; risk

Introduction

Alcohol is a primary cause of disease and injury worldwide (Rehm et al., 2009; Room, Babor, & Rehm, 2005). Both chronic and acute alcohol consumption impact many disease outcomes and injuries (Rehm et al., 2010); however, little is known about the impact of acute alcohol use on the onset (triggering) of a disease. Despite the clinical wisdom that acute alcohol use is associated with medical emergencies (non-injuries) (Lockhart et al., 1986), such as upper gastrointestinal bleeding (Kelly et al., 1995) or persistent anemia (Lewis, Wise, Poynton, & Godkin, 2007), and that episodes of heavy drinking or intoxication increase the risk of ischemic heart disease (Roerecke & Rehm, 2010), few epidemiological studies exist to substantiate or contradict this wisdom. The case-crossover methodology (Maclure, 1991) allow us to study the acute effect of alcohol use on injury risk (Borges et al., 2004; Borges et al., 2006b; Vinson et al., 1995), but has not been used for medical emergencies. Reported here are relative risk (RR) estimates of the impact of alcohol consumption six hours prior to medical emergencies for 8,346 patients presenting in the emergency department (ED) in seven countries from the Emergency Room Collaborative Alcohol Analysis Project (ERCAAP) (Cherpitel et al., 2003).

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Material and Methods

The ERCAAP data reported here include 16 ED studies across seven countries that collected data on medical emergencies (Argentina, Canada, Italy, Mexico, Poland, Spain and the United States), with the number of EDs per study ranging from one in most countries to eight in the Mexico City study, between 1984 to 2002. Probability samples of patients aged 18 years and older, reflecting consecutive arrivals to the ED across a representative range of each shift for each day of the week (24 hours, 7 days), were approached with an informed consent to participate in the study. Patients were interviewed as soon as possible after admission to the ED by a group of trained interviewers. Completion rates for the ERCAAP studies averaged 72%. A fuller description of ERCAAP may be found elsewhere (Cherpitel et al., 2003).

Measures

Interviewers inquired about demographic characteristics, the reason for the ED visit (injury or illness), drinking in the 6 hours prior to the illness event, and quantity and frequency of usual drinking. Heavy drinking was assessed by the frequency of drinking five or more drinks on one occasion at least weekly (5 + drinks). Demographic variables included sex, age (<30 and ≥30 years) and education (primary, secondary, some college and more). Use of a prior ED service was also ascertained. Some medical illnesses were excluded including psychiatric emergencies, alcohol and drug overdose.

Analysis

The same strategy for data analyses using the usual frequency case-crossover design is used as that reported elsewhere in a group of 11,536 injured patients (Borges et al., 2006a). The first step is to obtain the observed odds of exposure during the hazard period; that is, whether the patients had consumed alcohol within 6 hours prior to the illness. The second step is to calculate the expected odds of exposure. The amount of expected person-time exposed to alcohol was estimated by multiplying the reported usual annual frequency of drinks by the effect period (one hour) on a drinking day. We then calculated unexposed person-time by subtracting the estimated exposed person-time from the number of total hours in one year (8466 hours). The ratio of the observed exposure frequency in the hazard period to the expected frequency (from the control information) is used to calculate estimates of the relative risk. Techniques for handling sparse person-time data analyses are appropriate to calculate the RR and 95% confidence intervals (CI), as described by Maclure (1991). We used the formula from Rothman & Greenland (p. 270) (1998) for the calculation of the RR. The numerator of this RR is the summation of unexposed hours in the control period (last 12 months) among the illness cases, which reported exposure during the hazard period (6-hour prior). The denominator of the RR is the summation of exposed hours in the control period (last 12 months) among the illness cases that reported no exposure during the hazard period (6-hours prior). After obtaining the RR estimate for each study site, a pooled RR was obtained across studies. Using meta-analysis, results for both fixed and random effects are reported along with tests of homogeneity. Tests of homogeneity for the pooled effects were calculated for the resulting RRs and their associated standard errors with P - values by the χ^2 test of homogeneity of the RR, as presented by Rothman & Greenland (p. 275) (1998).

Results

Table 1 presents the estimated relative risk for a medical emergency for each country and for the total of 8,346 patients. Overall 12.7% of the patients with medical emergencies reported drinking six hours prior to the event that brought them to the emergency department, ranging

from 5.3% in Poland to 25.9% in Italy. The relative risk for the total cases was 2.09 (2.14 in the fixed effect calculations), ranging from 1.40 (Spain) to 2.93 (Mexico). In all sites the RR was always above the null and statistically significant. Due to the heterogeneity found in the individual relative risks, the random pooled effect estimate (RR=2.17 [1.78–2.65]) is preferred as a summary estimate of the impact of alcohol consumption six hours prior to the medical emergency in the pooled sample of patients.

Table 2 shows the pooled random RR estimates for the total sample of medical emergencies according to key possible effect modifiers. Significant differences ($p \leq 0.05$), that is heterogeneity in RR, were found for those reporting no 5+drinking at least weekly compared to those reporting 5+ drinking at least weekly (RR = 2.87 vs. 1.55), and those under 30 compared to those older (RR=2.91 vs. 1.91).

Discussion

In this study, the first to report the relative risk of a medical emergency after an episode of drinking using a case-crossover methodology, alcohol was found to increased the risk of a medical emergency by 2.17 times and those without a regular pattern of heavy drinking (no 5+/weekly drinking) and those younger (age < 30 yr) appeared to be at a greater risk, with RRs of 2.87 and 2.91, respectively.

Studies of alcohol involvement among patients in the ED have focused on the analyses of injury cases (accidents and violence), while keeping medical emergencies as a comparison or quasi control group for the injured (Cherpitel, Ye, & Bond, 2004). Consequently, few studies have reported RR estimates for acute alcohol use and medical emergencies (Borges, Cherpitel, Medina-Mora, Mondragon, & Casanova, 1998), or the impact of chronic alcohol use on non-injury emergencies (Borges et al., 1998; Cherpitel, 1992, 1995). Prior analysis of medical emergencies include studies of the effect of acute alcohol use on specific disorders such as acute myocardial infarction using the case-crossover design, with conflicting results (Gerlich et al., 2009; Mukamal, Muller, Maclure, Sherwood, & Mittleman, 1999). In a population based case-control study in Pachuca, Mexico (Borges et al., 1998), the authors reported an OR of 1.09 (95% CI=0.53–2.22) for alcohol use six hours prior to the medical emergency among ED patients when compared to a sample of general population residents in the Pachuca area, suggesting no association between drinking in the event and medical emergencies. In additional analyses restricted to the sample of 524 patients in the three EDs in the city of Pachuca (included in the data for Mexico in Table 1), we found a RR of 3.56 (2.41–5.25). This estimate was considerable greater than that obtained from the case-control study using the general population of the city of Pachuca as a control group. At least three explanations are likely to account for this difference in RR estimates between the case-control study and the case-crossover analyses in Pachuca. First, case-crossover studies of non-motor vehicle accident injury obtained overall higher risks than case-control studies (Borges et al., 1998; Borges et al., 2006a; Taylor et al., 2010) and this may also apply to medical emergencies. Second, as fully elaborated elsewhere (Herbert, Delaney, Hemmelgarn, Levesque, & Suissa, 2007; Maclure, 2007), there are fundamental differences in case-control and case-crossover studies. For example, the case-control study attempts to answer the epidemiological question “why me”, while the case-crossover study attempts to answer the epidemiological question “why now” (Maclure, 2007) and they do not include the same respondents (cases are compared to controls in the case-control study while different times are compared among the same cases in the case-crossover study). Case-control analysis may test both chronic and acute use of alcohol while case-crossover analysis only tests acute use. Finally, acute and chronic alcohol use may just involve different pharmacological mechanisms on a medical emergency. Third, the population based case-control study from Borges et al. (1998) was not bias-free. It clearly had a limitation in the

non-matched control group that was interviewed regarding their six-hour drinking prior to the household interview in times and days of the week more acceptable for an interview than the cases, a limitation that was acknowledged by the authors and dealt with the use of multivariate methods. In summary, case-control studies are not, per-se, a gold standard to compare the results of a case-crossover study. More studies with testable hypotheses to explain the possible reasons for differences in results among these types of epidemiological studies are clearly needed.

In this study we found some evidence of heterogeneity in results among those with less alcohol involvement and among those younger. In a prior case-crossover study among injured cases, a higher risk for injury was also found for those with less alcohol involvement (Borges et al., 2006b). Experienced drinkers may develop tolerance and metabolize alcohol faster, and while less experienced drinkers and those younger may have an overall lower risk of illness than those with heavier chronic alcohol use and older patients, acute episodes of drinking among inexperienced and younger drinkers may put them under more physiologic stress and may render them unable to quickly process ethanol from their bodies with sudden increases in their risk for a medical emergency (Zakhari, 2006). Since the metabolism of alcohol is also related to many other factors, such as ethnicity, genetics and the length of drinking episodes, more research in this area is clearly needed before a clear statement of heterogeneity is formulated.

This study has some limitations. Most importantly, although case-crossover studies are well suited to control for between-person (i.e. time invariant) confounders (such as sex), as cases are used as their own controls, the possibility remains that within-person (i.e. time varying) confounders may exist (such as drug use while drinking) and this may affect the alcohol-medical emergency association. This study is limited in that we analyzed only the total medical emergencies. As in the analyses of the relationship between alcohol and injuries, where the link between alcohol and traffic accidents may differ when compared to alcohol and violence, we can expect, for example, that medical emergencies from the gastrointestinal system may differ from disorders of the circulatory system in their relationship to acute alcohol use. Future work from our group will delve into these likely differences. Another limitation of this research is related to the fact that while the study design across all sites provides a representative sample of patients from the participating facilities, patients are not necessarily representative of other ED facilities in their locale, and cases cannot be assumed to be representative of patients with emergencies who do not seek medical attention. The persons attending the emergency department for a medical condition are a very heterogeneous group of people, with different histories, disease conditions and willingness to participate in making efforts to remember past episodes of drinking while in a stressful situation of attending an emergency room. This is even more so in a large study that pooled patients from different countries, with different health care characteristics. Even when a common methodology was applied across countries and emergency department sites in order to minimize the impact of these baseline conditions and characteristics, it is possible that they may have played a role on our results. More research on the quality of data on alcohol consumption collected in emergency rooms is thereby recommended. Also, the patients from these EDs do not necessarily represent the country's drinking patterns. All analyses reported here are based on the patients' self-reported alcohol consumption. Recent reports of alcohol as a risk factor for coronary events have found that case-crossover analysis is sensitive to how exposure probabilities are assigned (Marshall, Wouters, & Jackson, 2000), that may be affected by differences in the recall periods used in our analyses (both usual drinking and six-hour drinking). Our group of cases also mixed patients coming to the emergency department for a medical emergency that could have a more acute or a more insidious presentation, and alcohol use may play a different role in these conditions. More research on the type of medical emergency is thereby needed.

Despite these limitations, the RR estimates across several countries reported in this study suggest that acute alcohol use may trigger a disease process and lead to an important and costly medical emergency. This may increase alcohol's role in the global burden of disease (Rehm et al., 2010), but requires further study before clear recommendations can be made.

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Table 1

Relative risk (RR) and 95% confidence intervals (CI) for alcohol use six hours prior an the risk of medical condition, by country

Country	n	Exposed (n, %)	RR	95% CI
US	4,800	629, 13.1%	2.01	(1.85–2.20)
Mexico	1,020	126, 12.4%	2.93	(2.44–3.53)
Canada	852	101, 11.9%	2.90	(2.36–3.57)
Spain	647	87, 13.4%	1.40	(1.09–1.79)
Italy	162	42, 25.9%	2.02	(1.40–2.92)
Argentina	376	46, 12.2%	1.82	(1.32–2.50)
Poland	489	26, 5.3%	2.48	(1.54–4.00)
Total	8,346	1057, 12.7%	2.09	(1.95–2.23)
Pooled effect size				
Fixed effect			2.14	(2.00–2.29)
Random effect			2.17	(1.78–2.65)
Test of homogeneity of the relative risk			$\chi^2_6 = 34.3$	$p < 0.001$

Table 2

Relative risk (RR) and 95% confidence intervals (CI) for alcohol use six hours prior and the risk of medical condition, by possible modifiers- All sites combined

Possible Modifier	RR	95% CI	p value for homogeneity
Age			
Age < 30 yr	2.91	(2.25–3.77)	0.013
Age ≥ 30 yr	1.91	(1.55–2.35)	
Sex			
Female	2.39	(1.69–3.37)	0.484
Male	2.08	(1.74–2.49)	
Education			
Education primary	1.91	(1.50–2.43)	0.368
Education secondary	2.29	(3.09–2.29)	
Education some college+	2.44	(1.90–3.13)	
Heavy drinking			
No drink at least 5+ wk	2.87	(1.91–4.31)	0.028
Drink at least 5+ wk	1.55	(1.07–2.24)	
Prior ED use			
No previous ED use	2.32	(1.84–2.94)	0.401
Previous ED use	1.96	(1.41–2.71)	