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Risk of violence-related injury from alcohol consumption and its burden to society in Latin America and the Caribbean

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ABSTRACT

Objective. *To determine the relative risk (RR) and societal burden of injury related to alcohol-attributable intentional interpersonal violence (alcohol-attributable fraction or AAF), and the dose–response relationship, in Latin America and the Caribbean (LAC), where both the RR and AAF for violence-related injuries are believed to be particularly high.*

Methods. *A probability sample of 1 024 emergency department patients from 10 LAC countries who reported an intentional interpersonal violence–related injury (IVRI) was analyzed using case-crossover fractional polynomial analysis of the number of drinks consumed prior to the event.*

Results. *A dose–response relationship with a sixfold increase in risk (RR = 5.6) for up to two drinks prior to injury was observed. Risk was higher for 1) females versus males at more than 10 drinks and 2) males and females 30+ years old versus those younger than 30 at all volume levels. Overall, 32.7% of the 1 024 intentional IVRIs were attributable to alcohol. The AAF was three times larger for males (38%) than for females (12.3%).*

Conclusions. *A dose–response relationship between the volume of alcohol consumed prior to the event and the risk of intentional IVRI was found. Risk was not uniform across gender or age. Females were at greater risk of injury compared to males at higher volumes of drinking but had a lower AAF due to their lower prevalence of drinking at higher levels.*

Keywords Violence; wounds and injuries; risk; alcohol drinking; Latin America; Caribbean region.

In the estimates for the Global Burden of Diseases, Injuries, and Risk Factors Study 2010 (GBD 2010), alcohol is the fifth leading risk factor for Latin America and the Caribbean (LAC) (1). Injuries constitute one-third of alcohol-attributable disability-adjusted life years (DALYs) in the LAC region (versus 42% in the Americas), and 12% of them are from intentional interpersonal violence (versus 19.5% in the Americas) (1, 2).

Relative risk (RR) of injury from alcohol consumption is an important factor to consider when estimating the alcohol-attributable fraction (AAF) of injury. Risk is usually derived from 1) mortality data (rather than morbidity data) and 2) measures of chronic consumption of alcohol (rather than acute consumption) (3), with the latter measure more relevant when the research interest is the immediate effect of drinking on an event, such as injury (4). In addition, most risk estimates do not examine the dose–response relationship. Finally, risk estimates typically assume uniform risk across different alcohol consumption levels, gender and age groups, causes of injury, and countries or regions, so most research on the AAF of injury derived from RR estimates does not consider the effects of these potentially important moderating variables.

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A stronger association has been found between alcohol consumption and injuries resulting from intentional interpersonal violence than for injuries from any other causes (5, 6). Much of the literature documenting this association has come from studies conducted in hospital emergency departments (EDs) (7, 8), using either case–control studies, in which noninjured patients serve as quasi-controls (9), or case-crossover studies, in which injured patients serve as their own controls (10, 11).

In addition, a stronger dose–response relationship has been found for injuries resulting from intentional interpersonal violence than for injuries from any other causes (11–14). A meta-analysis found 1) the risk of injury from acute alcohol consumption was greater for intentional interpersonal violence–related injury (IVRI) than for injury from any other causes, and 2) there was a 1.38 increase in risk for that type of injury for each drink consumed prior to the event (14). Analysis of ED data across 18 countries found the RR of intentional IVRI increased monotonically with an increase in the amount of alcohol consumed in the six hours prior to the event (from 3.5 for 1 drink to 32.9 for 30 or more drinks) (13).

The AAF has also been found to be greater for intentional IVRI than for injuries from any other causes (9, 15, 16). A six-country case–control study found 43% of intentional IVRIs occurred after drinking in the six hours prior to the event and 27% occurred among frequent heavy drinkers, compared to 6% of injuries from other causes for both risk factors (9). A Swiss ED study found an AAF of 33% for intentional IVRI and an AAF of 17% for injuries from other causes (15), and a study across EDs from 18 countries found an AAF of 40.1% for intentional IVRI compared to an AAF of 12% for injuries from other causes (16).

Country-level drinking patterns have been found to predict alcohol-related injury in ED studies (17, 18), and both the RR of injury and the AAF have been found to vary by drinking pattern; countries with higher detrimental drinking patterns (DDPs) (19) (exemplified by heavy episodic drinking) have been found to have a larger risk of injury at lower levels of consumption (13), and a higher AAF (9, 16). Countries with similar DDPs often cluster in a given region, and those in Central America tend to exhibit more DDPs than those in other areas of the Americas.

Drinking patterns have been found to contribute to the large burden of alcohol-attributable disease in LAC countries, where they result in the largest burden of alcohol-attributable injuries worldwide (2, 20, 21). A comparison of intentional IVRIs in female ED patients in developing countries and those in developed countries found women in developing countries were more likely to report frequent and heavy drinking patterns and more likely to have injuries related to intentional interpersonal violence than those in developed countries (22).

The purpose of this report was to determine the RR and societal burden of injury related to intentional interpersonal violence attributable to drinking (the AAF), and the dose–response relationship, in LAC countries, where both the RR and AAF are believed to be particularly high. The dose–response relationship of alcohol and intentional IVRI was modeled separately by gender, and age group, using the fractional polynomial approach. Risk of injury from drinking within the six-hour timeframe preceding the event was estimated using case-crossover analysis. These data are essential for determining the burden of disease from intentional IVRI in the LAC region, much of which is avoidable (18, 23).

MATERIALS AND METHODS

Samples

The analyzed data were from 18 ED sites in 10 LAC countries and were collected according to the protocols developed for the Emergency Room Collaborative Alcohol Analysis Project (ERCAAP) and the World Health Organization (WHO) Collaborative Study on Alcohol and Injuries (17). The majority of EDs were in public hospitals in large metropolitan areas, generally the capital city of the country. Identical protocols were used across the 10 studies, which included probability samples of patients 18+ years old who had arrived at the ED within six hours of an injury event. Sampling was based on ED admission forms for injury patients (ambulatory, and nonambulatory, brought by ambulance). At each site, a sampling strategy was implemented in which every "nth" injury patient (2nd, 3rd, 4th, etc., depending on how many were admitted to the ED), based on order of admission, was selected. If a patient refused to participate or could not be interviewed for some other reason the next "nth" patient was selected. This sampling strategy was designed this way to provide equal representation of each shift and day of the week.

Sampled patients were approached by the research team members who requested their informed consent to participate in the study, and those consenting were administered a 25-minute structured questionnaire (24) by trained interviewers, usually off-duty ED staff or students from psychology or health sciences departments or other related areas. Completion rates averaged 72% across all studies (n = 5 176). Reasons for noninterviews included patient 1) refusal of informed consent, 2) incapacitation/hospitalization, 3) departure from hospital before completing the survey questions, 4) in police custody, and 5) language barriers. Some patients who could not provide consent during their admission to the ED due to incapacitation/hospitalization were approached after their condition had stabilized and, if consent was provided, interviewed. Of those completing the interview, 20% (n = 1 037) had an intentional IVRI (Table 1).

Measures

Among other questions, patients were asked about the injury for which they were seeking ED treatment. Patients responding positively to the question "Did you get into a fight, or were you beaten, attacked, or raped?" were considered to have an intentional IVRI. As the purpose of the study was to explore the relationship between alcohol consumption and intentional interpersonal violence, injuries related to other types of violence, such as motor vehicle crashes, were not included. All patients with an injury related to intentional interpersonal violence were included in the sampling regardless of whether they were the victim or the perpetrator of the event.

Patients were also asked if they had consumed any alcohol during 1) the six hours leading up to the injury event or 2) the same six-hour period the week before. If patients reported drinking during either time period they were asked to report the number and size of container of drinks consumed, by beverage type, for each one. The amount of absolute alcohol for each beverage was then calculated,

summed across all beverage types for each time period, and converted to standard drinks, defined as 16 ml (12.8 g) of pure ethanol.

Data analysis

Case-crossover analysis (25) was used to compare each injury patient's drinking in the six-hour period before injury to their drinking within the same six-hour period the week before. Using this method, each patient served as his or her own control, reducing the effect of individual-level factors that could affect the relationship between alcohol and the injury.

Using the fractional polynomial approach, the dose–response relationship for alcohol (with the volume of consumption as a continuous measure) and risk of intentional IVRI were modeled (26), based on the conditional logistic equation below (where p and q are designated as –2, –1, –0.5, 0, 0.5, 1, 2, or 3 ($x^0 = \ln(x)$) and x is some transformed form of volume consumption) (13):

$$\text{logit}(\text{Prob}(\text{injury})) = b_0 + b_1 x^p + b_2 x^q \ (\text{or } b_0 + b_1 x^p + b_2 x^p (\ln x) \text{ if } p = q)$$

The fracpoly command from Stata Statistical Software version 13 (27) was used to fit all models.

Next, the population AAF (the proportion of intentional IVRI cases attributable to alcohol for all levels of consumption) and the specific-volume AAFs or SVAAFs (the AAFs for each specific volume of alcohol consumption shown in the first column of Table 2) were calculated. The SVAAFs were obtained using RR estimates for the mean volume and prevalence of drinking during the six hours before injury in each volume category, as shown in the equation below (where i refers to a volume category):

$$AAF_i = P_i(Alcohol \mid injury) \times (1 - \frac{1}{RR_i}) \ (28)$$

The population AAF was calculated by summing the SVAAFs, using the equation below:

$$AAF_{pop} = \sum P_i(Alcohol \mid injury) \times (1 - \frac{1}{RR_i}) (28)$$

The RR, SVAAFs, and population AAFs were estimated for the total sample and by gender and age group (18–30 years versus 30+ years). The estimates of risk and SVAAF for 30 or fewer drinks (and up to 10 drinks, for females, in a subgroup analysis, due to sparse data for that group at higher consumption levels) are shown in Tables 2–4. Age was dichotomized at 30 years because people 18–30 years old have been found to report higher rates of alcohol consumption and alcohol-related problems than those 30+ years old (29).

RESULTS

Table 1 lists the 10 countries in the study sample, the year of data collection, the number of ED sites in each country, and the cities where the data were collected. Table 1 also shows the proportion of injuries that were intentional interpersonal violence–related (20%), and alcohol-related (38%), based on injury patients' self-reported alcohol consumption during the six hours before the injury event. In some countries, data were collected at more than one site due to the demographic diversity and/or size of the population served in the respective locales. The proportion of intentional IVRI and alcohol-related injury varied greatly across countries, with the values for the first criterion ranging from 9% in Brazil and Costa Rica to 44.7% in Guyana and those for the second criterion ranging from 25.5% (in Trinidad and Tobago) to 52.3% (in Argentina). As shown in Table 1, a larger proportion of injury patients reported drinking during the six hours before the injury event in countries with a lower versus a higher prevalence of intentional IVRIs.

Estimates of 1) the RR of intentional IVRI for each volume level of drinking before injury, 2) the proportion of injuries attributable to alcohol at each SVAAF, and 3) the total population AAF (for the sample overall) are shown in Table 2. The results indicated a dose–response relationship between the amount of alcohol consumed before the injury event and risk of

TABLE 1. Number and proportion (%) of emergency department (ED) injury cases (n = 5 176) related to intentional interpersonal violence, and prevalence of drinking before injury (%), at 18 EDs in 10 countries, Latin American and the Caribbean, 2001–2015

Country (cities)	Year of study	Number of EDs studied	ED injury cases			
			Total	Intentional interpersonal violence–related		
				No.	% of total injury cases	Prevalence of drinking before injury (%)
Argentina (Mar del Plata)	2001	1	452	55	10.1	52.3
Brazil (São Paulo)	2001	1	496	45	9.1	35.6
Mexico (Mexico City)	2002	1	456	72	15.8	50.0
Dominican Republic (Santo Domingo)	2010	2	501	95	19.0	30.1
Guatemala (Guatemala City)	2011	1	513	130	25.3	43.1
Guyana (Georgetown)	2010	1	485	217	44.7	30.0
Nicaragua (Managua)	2010	2	518	187	36.1	37.8
Panama (La Chorrera, Colón, and Veraguas)	2010	3	490	90	18.4	46.1
Costa Rica (San José)	2012	2	1 013	90	8.9	40.9
Trinidad and Tobago (Mt. Hope, San Fernando, Port-of-Spain, and Scarborough)	2015	4	252	56	22.2	25.5
Total	–	18	5 176	1 037	19.9	37.9

Source: Compiled by the authors based on the study data.

[a] Prevalence rates are not an exact match to sample numbers because the Argentina data were weighted to adjust for uneven sampling.

TABLE 2. Estimated relative risk (RR) and alcohol-attributable fraction (AAF) of intentional interpersonal violence–related injuries (IVRIs) (*n* = 1 024), with 95% confidence intervals (CIs), by volume of alcohol consumed pre-injury, Latin America and the Caribbean,[a] 2001–2015

Alcohol intake before injury (number of drinks)	No. of intentional IVRIs	Prevalence of drinking before injury (%)[b]	Relative risk (RR)[c]	AAF (%)[d]	95% CIs
0	634	–	–	–	–
≤ 2	54	5.18	5.59	4.25	2.89, 5.59
2.1–4	65	6.27	7.23	5.40	3.91, 6.88
4.1–6	50	4.82	7.83	4.20	2.89, 5.50
6.1–8	43	4.30	8.02	3.76	2.50, 5.01
8.1–10	28	2.71	8.15	2.37	1.38, 3.36
10.1–15	44	4.30	8.21	3.78	2.53, 5.01
15.1–30	42	4.14	8.29	3.64	2.41, 4.86
> 30	46	4.45	8.70	3.94	2.67, 5.18
Missing[e]	18	1.72	4.90	1.37	0.59, 2.14
Total[f]	1 024	37.88		32.72	

Source: Compiled by the authors based on the study data.

[a] Argentina, Brazil, Costa Rica, Dominican Republic, Guatemala, Guyana, Mexico, Nicaragua, Panama, Trinidad and Tobago.

[b] Prevalence rates are not an exact match to sample numbers because the Argentina data were weighted to adjust for uneven sampling.

[c] Fractional polynomial estimates based on the mean volume of each volume category (e.g., 1.35 drinks, for the ≤ 2 drinks volume category).

[d] Specific-volume AAF (SVAAF): $P_i*(1–1/RR_i)$, in which P_i is the prevalence of drinking at a given volume level among total injured patients (cases) and RR_i the relative risk of injury for a given volume level compared to no drinking.

[e] Those who reported drinking before injury but didn't report specific volume of consumption. As a conservative estimate, the RR for 1 drink is used for this missing group.

[f] The total includes the sum of the prevalence and SVAAF across dose levels among all patients for which drinking data were available.

intentional IVRI, with a sixfold increase in risk for up to two drinks, and a nearly ninefold increase for more than 30 drinks. While risk of injury increased at each volume level, the SVAAF estimates—which ranged from 2.4 for 8.1–10 drinks prior to injury to 5.4 for 2.1–4 drinks prior to injury—did not. Among the ED sample, the prevalence of drinking before an intentional IVRI was 37.9%, and the AAF was 32.7%. Therefore, the "exposed" AAF (the proportion of injuries attributed to alcohol among those who reported drinking during the six hours before their injury) was 32.7/37.9 or 86%.

The RR, SVAAF, and population AAF estimates are shown separately by gender in Table 3. The risk of injury for "up to 10 drinks" was similar for males and females, but beyond 10 drinks, the RR was higher for females. However, due to a smaller prevalence of females compared to males drinking at higher volume levels (more than 10 drinks), females' estimated population AAF (12.3%) was only one-third of males' (38%). Males showed a slightly higher "exposed" AAF compared to females (38.0/43.9 or 86.5% versus 12.3/14.8 or 83.1%).

Table 4 shows the RR, SVAAF, and population AAF estimates for injury patients 30+ years old and 18–30 years old. Risk was higher for the first group at all volume levels over two drinks, with a threefold greater risk at more than 30 drinks. At each volume level, risk of injury appeared to continue to increase for people 30+ years old, while RR estimates dropped after 30 drinks for those who were younger. The population AAF was slightly higher for those 30+ years old (34.3%) compared to those who were younger (32%), and the "exposed" AAF was also slightly higher (88.6% versus 85.1%).

DISCUSSION

In the LAC region, a dose–response relationship was found between alcohol consumed during the six hours before the injury event and alcohol-related injury, with a population AAF of 32.7% and an "exposed" AAF of 86%. A study in a Swiss ED using a case–control design found an AAF of 36% for drinking during the 24 hours preceding the event, close to the proportion found in this study (15). A similar, prior analysis of 18 countries (including all countries studied in the research reported here except Costa Rica and Trinidad and Tobago) found a population AAF of 40.1% and an "exposed" AAF of 90.7% for intentional IVRIs (16); both measures were somewhat higher than those found in this study, and the first one was considerably higher than the AAF for injuries from motor vehicle crashes (11.1%), falls (14.3%), and other causes of injury (9.8%). The population AAF found in this study is also lower than the one found in an earlier case–control study of ED patients across six countries (43%) (9).

In this study, risk of intentional IVRI was similar for males and females at lower volume levels but greater for females at higher levels (more than 10 drinks). The population AAF for females was only one-third of males' (12.3% versus 38%), due to females' lower prevalence of drinking at higher levels, but the "exposed" AAF was only slightly higher, suggesting that intentional IVRI was similarly attributable to alcohol for both males and females who reported drinking prior to the injury event. Other ED studies have found gender differences in drinking and intentional IVRIs, with a significantly greater association for males compared to females in some, but not all, countries (30).

Risk of intentional IVRI was found to be greater at all volume levels exceeding two drinks for those older than 30 years, compared to those who were younger, and continued to increase at each successive volume level for the older age group, while dropping after 30 drinks before injury for those who were younger. However, for those more than 30 years old, the population AAF was only slightly larger, as was the "exposed" AAF, suggesting that among those reporting drinking prior to their injury, regardless of age, intentional IVRI was similarly attributable to alcohol. While other studies have found that younger individuals have certain characteristics (e.g., risk-taking, impulsivity and sensation-seeking dispositions, and other

TABLE 3. Estimated relative risk (RR) and alcohol-attributable fraction (AAF) of intentional interpersonal violence–related injuries (IVRIs) (*n* = 1 024), with 95% confidence intervals (CIs), by volume of alcohol consumed pre-injury for males (*n* = 814) and females (*n* = 210), Latin America and the Caribbean,[a] 2001–2015

Alcohol intake before injury (number of drinks)	No. of intentional IVRIs	Prevalence of drinking before injury (%)[b]	Relative risk (RR)[c]	AAF (%)[d]	95% CIs
Male					
0	455				
≤ 2	47	5.66	5.64	4.65	3.07, 6.21
2.1–4	63	7.65	7.31	6.60	4.76, 8.41
4.1–6	44	5.32	7.92	4.65	3.11, 6.17
6.1–8	35	4.42	8.11	3.88	2.44, 5.29
8.1–10	27	3.28	8.24	2.89	1.67, 4.09
10.1–15	41	5.04	8.31	4.44	2.92, 5.92
15.1–30	40	4.96	8.38	4.37	2.86, 5.85
> 30	45	5.47	8.80	4.85	3.29, 6.39
Missing	17	2.04	4.94	1.63	0.68, 2.57
Total	814	43.85		37.95	
Female[e]					
0	179				
≤ 2	7	3.32	4.06	2.50	–0.04,4.98
2.1–5	6	2.87	5.39	2.34	–0.01, 4.64
5.1–10	11	5.27	6.62	4.47	1.27, 7.58
> 10[f]	6	2.87	10.04	2.59	0.24, 4.88
Missing[g]	1	0.48	3.62	0.35	–0.57, 1.25
Total[h]	210	14.82		12.26	

Source: Compiled by the authors based on the study data.

[a] Argentina, Brazil, Costa Rica, Dominican Republic, Guatemala, Guyana, Mexico, Nicaragua, Panama, Trinidad and Tobago.

[b] Prevalence rates are not an exact match to sample numbers because the Argentina data were weighted to adjust for uneven sampling.

[c] Fractional polynomial estimates based on the mean volume of each volume category (e.g., 1.35 drinks, for the ≤ 2 drinks volume category).

[d] Specific-volume AAF (SVAAF): $P_i*(1–1/RR_i)$, in which P_i is the prevalence of drinking at a given volume level among total injured patients (cases) and RR_i the relative risk of injury for a given volume level compared to no drinking.

[e] Given the small size of the female sample, some alcohol volume categories had to be collapsed.

[f] The RR estimate for volume >10 drinks became very unstable for females, so the RR for that group was estimated based on a volume = 10 drinks.

[g] Those who reported drinking before injury but didn't report specific volume of consumption. As a conservative estimate, the RR for 1 drink is used for this missing group.

[h] The total includes the sum of the prevalence and SVAAF across dose levels among all patients for which drinking data were available.

attributes) that may put them at higher risk of intentional IVRI (31), the data from this study do not support that contention.

Regional variations in overall volume and patterns of consumption considered harmful to one's health have been observed (2), and other ED studies have found that drinking patterns predict alcohol-related injury (17, 18), with DDPs predicting AAF estimates across all injury causes (9). While harmful drinking patterns are prevalent in the Americas, where adult per capita consumption is 24% higher than the global average (2), findings from this report suggest that the AAF for intentional IVRIs in the LAC region, although high, may not be higher than that found in other countries or regions.

Differences in intentional IVRIs associated with drinking across countries and cultures may also be related to factors other than country-level DDPs, however, and the meaning of "drinking" has been found to vary across cultures, which may have an important effect on research results (32). For example, differences between societies related to both the physical context of drinking (avoidance of risky environments while drinking, etc.) and the social context of drinking (how one handles oneself while drinking or with "drunken comportment," etc.) (33), and whether or not alcohol is used as an excuse for behavior that, without it, would be socially unacceptable (e.g., disinhibition) (34), may play an important part in intentional IVRI. Although a formal rank-ordering analysis of the data shown in Table 1 was not carried out, visual examination suggests that a larger proportion of the intentional IVRIs were alcohol-related in countries with a lower prevalence of intentional IVRIs. This appears to provide support for the contention that alcohol may be used as an excuse for engaging in violent events in some societies, while in other societies in which intentional interpersonal violence–related incidents are more prevalent, alcohol may play a less prominent role. This suggests possible lines for future research on the association between alcohol and intentional IVRI, including examining the potential moderating effects of situational factors like inhibitory cues and triggering events (35), and dispositional factors like risk taking/impulsivity and sensation seeking (36).

Alcohol control policies may be another important factor affecting the study findings. Prior analysis found that alcohol policy, which differs across countries, predicted alcohol-related injury when controlling for usual drinking patterns and country-level DDPs (17), with the more stringent the policy the lower the risk of alcohol-related injury. This suggests the importance of country- and regional-level implementation of alcohol control policies such as those regulating availability of alcohol, drinking and driving, advertising, and server training

TABLE 4. Estimated relative risk (RR) and alcohol-attributable fraction (AAF) of intentional interpersonal violence–related injuries (IVRIs) (*n* = 1 024), with 95% confidence intervals (CIs), by levels of volume consumed pre-injury, age < 30 years (*n* = 586) and age ≥ 30 years (*n* = 428), Latin America and the Caribbean,[a] 2001–2015

Alcohol intake before injury (number of drinks)	No. of intentional IVRIs	Prevalence of drinking before injury (%)[b]	Relative risk (RR)[c]	AAF (%)[d]	95% CIs
Age < 30					
0	364				
≤ 2	30	5.10	5.59	4.18	2.38, 5.95
2.1–4	42	7.16	7.36	6.19	4.05, 8.28
4.1–6	29	4.81	7.88	4.20	2.47, 5.90
6.1–8	26	4.48	7.94	3.92	2.22, 5.59
8.1–10	16	2.67	7.86	2.33	1.03, 3.60
10.1–15	27	4.59	7.71	4.00	2.29, 5.68
15.1–30	20	3.45	7.17	2.97	1.47, 4.44
> 30	20	3.36	4.81	2.66	1.09, 4.20
Missing	12	1.98	5.06	1.59	0.48, 2.67
Total	586	37.59		32.02	
Age ≥ 30					
0	262				
≤ 2	24	5.40	4.88	4.30	2.16, 6.38
2.1–4	23	5.20	7.61	4.52	2.42, 6.57
4.1–6	21	4.94	9.37	4.42	2.33, 6.46
6.1–8	17	4.15	10.44	3.75	1.80, 5.66
8.1–10	11	2.59	11.39	2.36	0.84, 3.86
10.1–15	17	4.00	12.04	3.67	1.79, 5.51
15.1–30	21	4.94	13.16	4.57	2.49, 6.60
> 30	26	6.04	15.79	5.66	3.39, 7.87
Missing[e]	6	1.41	3.84	1.04	–0.05, 2.13
Total[f]	428	38.68		34.28	

Source: Compiled by the authors based on the study data.

[a] Argentina, Brazil, Costa Rica, Dominican Republic, Guatemala, Guyana, Mexico, Nicaragua, Panama, Trinidad and Tobago.

[b] Prevalence rates are not an exact match to sample numbers because the Argentina data were weighted to adjust for uneven sampling.

[c] Fractional polynomial estimates based on the mean volume of each volume category (e.g., 1.35 drinks, for the ≤ 2 drinks volume category).

[d] Specific-volume AAF (SVAAF): $P_i^*(1–1/RR_i)$, in which P_i is the prevalence of drinking at a given volume level among total injured patients (cases) and RR_i the relative risk of injury for a given volume level compared to no drinking.

[e] Those who reported drinking before injury but didn't report specific volume of consumption. As a conservative estimate, the RR for 1 drink is used for this missing group.

[f] The total includes the sum of the prevalence and SVAAF across dose levels among all patients for which drinking data were available.

in preventing intentional IVRIs as well as other alcohol-related harm.

To the best of the authors' knowledge this is the first study to document the dose–response AAF for injuries related to intentional interpersonal violence, by gender and age group, in a large number of countries from the LAC region, where intentional interpersonal violence due to alcohol is thought to be high (37). A dose–response relationship was observed, with alcohol attributable for the injury in one-third of the patient samples, and the AAF was considerably smaller for females who, although at greater risk of injury than males at higher levels of consumption, drink at lower levels. No difference in the AAF was found by age, although people under age 30 were more likely to be heavier drinkers and report more alcohol-related problems than those who more than 30 years old (29). Alcohol appeared to be more likely to be involved in intentional IVRI in countries with a lower level of interpersonal aggression.

Strengths and limitations

Case-crossover analysis was used to estimate the dose–response relationship between intentional IVRI risk and alcohol, and the AAF at each volume level, a method that takes into account individual-level, "stable" characteristics such as demographic attributes, risk-taking disposition, and drinking patterns. Some caveats apply to this analytic method, however. For example, patient recall was found to deteriorate the longer the recall period in some studies (38) but not in others (39). The context in which drinking occurs prior to injury is also important to consider, as context may be associated with both the likelihood of drinking and the risk of injury from a specific cause (e.g., being in a bar or other drinking venue prior to a intentional IVRI, versus home alone, the previous week, could result in an overestimation of risk of intentional IVRI from drinking).

Also, while probability samples of patients were selected in each ED, a method designed to generate samples representative of the injured patient population in the respective ED, in more than half of the countries included in the study, only one ED was sampled, so in those countries, patient samples can not be considered representative. Even in countries where more than one ED was included, patient samples were not necessarily representative beyond the ED where the data were collected, an important consideration in interpreting the AAFs found in the study. In addition, EDs where data were collected were primarily located in large metropolitan areas, so relationships

found here between alcohol consumption and intentional IVRI may not apply to the more rural areas of the country, where demographic profiles may be different.

In addition, while most of the data were collected over a period spanning five years, at three of the country sites, the data were collected in the more distant past. Therefore, although the data were cross-sectional at each site, the study findings for those three countries may be more reflective of past, versus current, associations. Also, general population studies have found that those reporting being treated in the ED for an injury tend to be heavier drinkers than those reporting obtaining treatment from other sources or not obtaining any treatment for their injury, and the former group of individuals has been found to have larger RRs and AAFs for injury (40).

Another potential limitation is that the RR and AAF for intentional IVRI may have been underestimated, as the calculations were based solely on the self-reported alcohol consumption of the patient before the injury (i.e., they did not include the potential contribution of others' drinking prior to the event, which has been found to be substantial). In prior analyses of intentional IVRI across 14 countries, a 62% increase was found in the AAF when perpetrators of the event who had been drinking and whose drinking was causally associated with the event, according to the patients, were included in the analysis, along with the patients who believed the event would not have occurred if they, themselves, had not been drinking (41). Thus, only part of the alcohol-attributable intentional interpersonal violence problem is being analyzed here—that resulting in an injury that requires ED treatment, for either the victim or the offender—leaving out alcohol-attributable intentional interpersonal violence affecting additional victims or perpetrators who did not sustain injuries requiring ED admission.

Conclusions

While RR and AAF values for intentional IVRI in the LAC region may not exceed those of other regions, they are still high. The results of this analysis support the claim that the estimated RR and AAF of injury due to alcohol cannot be assumed to be uniform across different gender and age groups, especially for injuries related to intentional interpersonal violence. The findings here also indicate that the AAF for intentional IVRI is no greater at higher levels of consumption of alcohol before injury than at lower levels, because even though the risk is greater at higher consumption levels, the prevalence of consumption at higher levels is smaller. These data suggest the importance of screening and brief intervention or referral to treatment for problem drinking among ED cases with evidence of alcohol involvement in the injury event, especially those admitted with a intentional IVRI for which alcohol involvement has been found to be considerable. The findings here and elsewhere also 1) suggest that females may be more vulnerable to risk of injury, especially at higher levels of consumption, and may require more in-depth screening to identify those who could benefit from an intervention, and 2) underscore the importance of applying intervention and prevention strategies that target those consuming alcohol at lower or moderate levels as well as those with higher levels of consumption.

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RESUMEN

Riesgo de traumatismos relacionados con la violencia producto del consumo de alcohol y su carga social en América Latina y el Caribe

Objetivo. Determinar el riesgo relativo (RR) de la carga social de los traumatismos relacionados con actos de violencia interpersonal intencional atribuibles al alcohol (fracción atribuible al alcohol o AAF) y la relación dosis-efecto en América Latina y el Caribe, donde se cree que tanto el RR como la AAF por traumatismos relacionados con la violencia son particularmente altos.

Métodos. Se estudió una muestra probabilística de 1 024 pacientes que ingresaron al servicio de urgencias de 10 países de América Latina y el Caribe y que declararon un traumatismo relacionado con un acto de violencia interpersonal (IVRI) intencional, usando para ello un análisis polinomial fraccionario con cruce de casos del número de bebidas consumidas antes del incidente.

Resultados. Se observó una relación dosis-efecto con un aumento de seis veces el riesgo (RR = 5,6) con hasta dos bebidas antes del traumatismo. El riesgo fue mayor para: 1) las mujeres respecto de los hombres con más de 10 bebidas y 2) los hombres y mujeres mayores de 30 años de edad frente a los menores de 30 años en todos los niveles de volumen. En términos generales, 32,7% de los 1 024 IVRI intencionales fueron atribuibles al alcohol. La AAF fue tres veces mayor para los hombres (38%) que para las mujeres (12,3%).

Conclusiones. Se observó una relación dosis-efecto entre el volumen de alcohol consumido antes del incidente y el riesgo de IVRI intencional. El riesgo no fue uniforme entre los dos sexos ni en todas las edades. Las mujeres tuvieron un riesgo mayor de traumatismo en comparación con los hombres a volúmenes mayores de consumo, pero tuvieron una AAF más baja debido a una prevalencia más baja del consumo de alcohol en mayores cantidades.

Palabras clave Violencia; heridas y lesiones; riesgo; consumo de bebidas alcohólicas; América Latina; Región del Caribe.

RESUMO

Risco de lesões resultantes da violência associada ao uso de álcool e o ônus à sociedade na América Latina e no Caribe

Objetivo. Determinar o risco relativo (RR) e o ônus à sociedade de lesões intencionais resultantes da violência interpessoal atribuível ao uso de álcool (fração de risco atribuível ao consumo de álcool, FAA) e a relação de dose-resposta na América Latina e no Caribe (ALC). Acredita-se que o RR e a FAA de lesões resultantes da violência sejam particularmente altos na região.

Métodos. Foi estudada uma amostra probabilística englobando 1.024 pacientes atendidos no setor de emergência de 10 países da ALC por lesão intencional resultante de violência interpessoal (LIVI). Foi realizado um estudo de caso-cruzado com análise polinomial fracionada do número de doses de bebida alcoólica consumidas antes do evento.

Resultados. Verificou-se uma relação de dose-resposta com aumento do risco de seis vezes (RR = 5,6) associado a duas doses ou menos de bebida alcoólica consumidas antes da ocorrência das lesões. O risco foi maior: 1) no sexo feminino em comparação ao masculino com o consumo acima de 10 doses de bebida alcoólica e 2) em indivíduos do sexo masculino e feminino com acima de 30 anos em comparação aos indivíduos com idade abaixo de 30 anos em todos os níveis de consumo. De modo geral, 32,7% das 1.024 LIVI foram atribuíveis ao consumo de álcool. A FAA foi três vezes maior no sexo masculino (38%) que no feminino (12,3%).

Conclusões. Observou-se uma relação de dose-resposta entre o nível de consumo de álcool antes do evento e o risco de LIVI. O risco variou por sexo ou idade. Em comparação aos homens, as mulheres apresentaram maior risco de lesão nos níveis mais elevados de consumo de álcool, porém com FAA menor devido à baixa prevalência do consumo de álcool nestes níveis.

Palavras-chave Violência; ferimentos e lesões; risco; consumo de bebidas alcoólicas; América Latina; Região do Caribe.