



ORIGINAL ARTICLE

Comparative Study of the Impact of Intoxication on Injuries in China and Korea

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Abstract

Objectives: Alcohol misuse has been widely studied as a substantial contributor to injured patients' visits to emergency departments. The current research studied differences in alcohol-related injury variables in China and Korea.

Methods: Data were collected from a sample of 4,509 patients (2,862 males and 1,667 females) reporting at emergency departments in China and Korea using the World Health Organization collaborative study on alcohol and injuries protocol.

Results: More injuries were reported by men, young people aged 25–34 years, employed individuals, and persons who had at least a high-school education. The proportion of injury cases among intoxicated patients was 14% for Chinese and 20% for Koreans. The odds of intentional injuries to intoxicated patients increased significantly when the perpetrator had been drinking, especially for severely intoxicated victims in both countries. The odds of injuries for intoxicated persons in both countries were high during sports and leisure activities; odds ratio (OR) = 3.93, 95% confidence interval (CI) = 2.76–5.59 for Chinese and OR = 10.97, 95% CI = 6.06–19.85 for Koreans.

Conclusion: These findings are a contribution to research in the two Asian countries about the effect of intoxication on injuries especially when both victim and perpetrator are intoxicated.

1. Introduction

Alcohol misuse has been cited as a contributor to the worldwide burden of disease and injury [1]. The World Health Organization (WHO) reports that in 2012,

alcohol misuse accounted for 5.1% of the global burden of disease and injury as measured in disability-adjusted life-years (DALYs) and 5.9% of global deaths. More than a quarter (30.7%) of all alcohol-attributable DALYs were as a result of intentional and

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unintentional injuries [2]. Although alcohol-related injuries might not all be causally linked to drinking, the rate of injury is an important measure of the burden of injury attributable to alcohol in a society [3,4]. The assumption is that as alcohol intoxication results in emotional changes and decreased responsiveness to social expectations, persons exposed to alcohol may place themselves in dangerous situations by becoming more aggressive and less averse to risk taking, leading to both unintentional and intentional injuries as either perpetrators or victims [4,5].

Studies from hospital emergency departments (EDs) have shown associations between alcohol and injuries (fatal and nonfatal) [6]. Reports showed that the aggregate percentage of intoxicated cases with a blood alcohol concentration (BAC) $\geq 0.10\%$ was 31.5% among homicide deaths, 22.7% among suicide cases, and 31.0% among nontraffic unintentional deaths [7]. Although the risk of alcohol related injury has been found to be related to a person's usual drinking pattern [8], risk relationships of unintentional injuries vary by place and time, with confounding factors such as conditions of roads and vehicles, seatbelt usage, per-capita consumption, legal drinking age, and legal BAC [9–11]. Prior research intimates that violence-related events are likely to have been caused by persons who may have been intoxicated at the time of the injury event [12]; however, previous studies in EDs have only focused on self-reports of the victim's own drinking. Drinking by others has the propensity to affect a person through risk taking, clumsiness and inattentiveness resulting in accidents or intentional harm. A relatively new area of alcohol research reviews victims' reports of perceived alcohol intoxication by perpetrators of intentional injuries [13].

Distinct differences have been found between drinking patterns in China and South Korea. Although South Koreans consumed an average of 12.3 L of pure alcohol (2008–2010), Chinese consumed 6.7 L [2]. Reports also show that the prevalence of alcohol use disorders for males was 4.5% for Chinese and 7.8% for Koreans. These differences in drinking patterns have also been reflected in alcohol-related injuries in China and Korea [4,14,15]. The current study will examine the differences in sociodemographic characteristics of patients reporting in EDs in China and South Korea; explore associations between intentional injuries and selected variables; and compare odds of alcohol intoxication and injury variables in both countries.

2. Materials and methods

2.1. Sample

A cross-sectional study of injured patients visiting EDs in China and Korea was done using the WHO collaborative study on alcohol and injuries protocol.

Data were collected from 2008 to 2009 from five EDs in China and four EDs in geographically diverse regions in South Korea. A total of 4,509 patients participated in this study. The total sample consisted of 2,520 Chinese and 1,989 Koreans. The study was approved by the Sahmyook University Institutional Review Board (IRB# SYU08-00001).

2.2. Sociodemographic characteristics

Sociodemographic characteristics assessed were gender (male vs. female), age in years (18–24, 25–34, 35–44, 45–54 and 55+), education level, which recorded completed years of formal education (elementary, high school, some college) and employment status (currently employed for more than 30 hours and otherwise).

2.3. Alcohol intoxication

Classification of the level of intoxication was based on the clinical assessment of the degree of alcohol intoxication by a trained ED nurse or doctor using the principles of International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10) Y91 coding. For purposes of these analyses, the original four ICD-10 Y91 codes categories of mild alcohol intoxication, moderate alcohol intoxication, severe alcohol intoxication, and very severe alcohol intoxication were recategorized into three where severe alcohol intoxication and very severe alcohol were combined into a single category. A no-alcohol intoxication category was created for patients who had not consumed any alcohol 6 hours prior to the injury. Alcohol-related, injury-related variables used for this analysis included reason for injury (unintentional and intentional injuries), cause of injury (traffic accident, blunt force, lesions, falls and other unintentional injuries that included burns, poisoning, sexual assault, choking), location at the time of injury (own home, other's home, street, pubs/bars) activity at time of injury (paid job, commuting, sports/leisure, doing nothing), intoxicated or sober perpetrator, and perpetrator known or unknown.

2.4. Statistical analysis

All analyses were conducted using SPSS version 18 (SPSS, Chicago., IL). Basic statistics were done on categorical data to examine differences between the characteristics of the patients recruited from the two countries using Pearson Chi-square (not shown). A *p* value less than 0.05 was accepted as statistically significant. Characteristics compared included demographics and the RAPS4 for alcohol dependence. Injury-related variables used for this analysis included type of injury, cause, perpetrator, location, and activity at time of injury. Regression models determined the odds ratio (OR) estimates for intentional injuries for sociodemographic variables, level of intoxication, and dependence.

3. Results

The current analysis focused on 4,529 injured patients reporting at Chinese and Korean EDs. Of the total sample, 56.1% were Chinese whereas the remainder was Korean. Males represented 63.2% of the total sample. More than a quarter of the total sample was aged 25–34 years. This age group was highest in both countries: more than a quarter of the Chinese and 22% of the Korean sample. Whereas 20.4% of the Korean sample was intoxicated, 14.1% of the Chinese were intoxicated. A greater majority had completed at least high school education in both countries. Relatively few injuries were reported by females, people who had completed elementary school, and the unemployed in both countries. Report of intentional injuries among the Chinese was more than twice that of the Koreans (389 patients vs. 170 patients) (Table 1).

Table 2 shows the association between intentional injuries and injury variables in the total sample. Generally the odds of an intentional injury caused by an intoxicated person were higher in both countries in all the variables except employment. Korean males were

three times more likely to suffer intentional injuries [OR = 3.08, 95% confidence interval (CI) = 2.16–4.39]. Chinese men also had an increased odds of intentional injuries (OR = 1.69, 95% CI = 1.33–2.16). The odds of an intentional injury caused by an intoxicated person was slightly higher in the Korean males (OR = 1.89, 95% CI = 1.19–3.01) than Chinese males (OR = 1.50, 95% CI = 1.03–2.17). Compared with unintoxicated patients, intoxicated patients from both countries showed greater odds of intentional injuries. Moderately intoxicated Chinese patients had the greatest odds of suffering from an intentional injury (OR = 4.98, 95% CI = 3.25–7.64) compared with those who were severely intoxicated (OR = 4.55, 95% CI = 1.48–14.01) or mildly intoxicated (OR = 3.93, 95% CI = 2.91–5.30). Severely intoxicated patients showed higher odds of intentional injuries among the Korean sample (OR = 12.74, 95% CI = 6.06–26.79) than mildly intoxicated (OR = 8.54, 95% CI = 5.84–12.55) and moderately intoxicated (OR = 7.84, 95% CI = 4.70–13.06). The odds of an intentional injury caused by an intoxicated patient was

Table 1. Characteristics of respondents in China and Korea N (%).

	China (<i>n</i> = 2,540)	South Korea (<i>n</i> = 1,9898)	Total
Sex			
Male	1,642 (64.6)	1,220 (61.3)	2,862 (63.2)
Female	898 (35.4)	769 (38.7)	1,667 (36.8)
Age (y)			
18–24	609 (24)	314 (15.8)	923 (20.4)
25–34	760 (29.9)	438 (22)	1,198 (26.5)
35–44	566 (22.3)	420 (21.1)	986 (21.8)
45–55	316 (12.4)	399 (20.1)	715 (15.8)
55+	289 (11.4)	418 (21)	707 (15.6)
Education			
Elementary	338 (13.3)	206 (10.4)	544 (12)
High school	1,388 (54.6)	872 (43.8)	2,260 (49.9)
Some college	814 (32)	911 (45.8)	1,725 (38.1)
Employment status			
Employed	1,641 (65)	1,065 (53.8)	2,706 (60.1)
Otherwise	885 (35)	914 (46.2)	1,799 (39.9)
Level of intoxication			
Not intoxicated	2,181 (86)	1,561 (79.6)	3,742 (83.2)
Mildly intoxicated	238 (9.4)	244 (12.4)	482 (10.7)
Moderately intoxicated	98 (3.9)	108 (5.5)	206 (4.6)
Severely intoxicated	20 (0.8)	49 (2.5)	69 (1.5)
Perpetrator			
Known	139 (5.5)	74 (3.7)	213 (4.7)
Unknown	2,401 (94.5)	1,915 (96.3)	4,316 (95.3)
Intoxicated perpetrator			
Yes	150 (5.9)	98 (4.9)	248 (5.5)
No	2,390 (94.1)	1,891 (95.1)	4,281 (94.5)
Reason for injury			
Intentional	389 (15.5)	170 (8.6)	559 (12.5)
Unintentional	2,119 (84.5)	1,805 (91.4)	3,924 (87.5)

Table 2. Association between intentional injuries and selected variables.

	China			Korea		
	Intentional	Intentional inflicted by another		Intentional	Intentional inflicted by another	
	OR (95% CI)	Intoxicated OR (95% CI)	Unintoxicated OR (95% CI)	OR (95% CI)	Intoxicated OR (95% CI)	Unintoxicated OR (95% CI)
Sex (Female ^{ref})						
Male	1.69* (1.33–2.16)	1.50** (1.03–2.17)	0.67 (0.46–0.97)	3.08* (2.16–4.39)	1.89* (1.19–3.01)	0.53 (0.33–0.90)
Age (50+ ^{ref})						
18–29	4.78* (2.90–7.87)	4.34** (1.31–14.34)	0.51* (0.35–0.75)	1.81* (1.13–2.89)	2.29* (1.23–4.28)	0.43* (0.23–0.81)
30–49	4.67* (2.84–7.68)	2.86 (0.87–9.55)	0.50* (0.34–0.74)	2.26* (1.48–3.47)	2.49* (1.39–4.48)	0.40* (0.22–0.72)
Education (elementary ^{ref})						
High	2.15* (1.46–3.18)	3.24* (1.49–7.06)	0.31* (0.14–0.67)	2.47* (1.22–4.99)	3.20* (1.15–8.96)	0.31* (0.11–0.87)
Some college	1.36 (.89–2.08)	3.15* (1.41–7.04)	0.32* (0.14–0.71)	1.95 (0.96–3.96)	2.53 (0.90–7.12)	0.40 (0.14–1.12)
Employment status (unemployed ^{ref})						
Employed	1.38* (1.08–1.74)	0.78 (.56–1.10)	1.28 (0.91–1.80)	1.12 (0.81–1.53)	1.29 (0.83–1.90)	0.80 (0.53–1.20)
Intoxication level (not intoxicated ^{ref})						
Mildly intoxicated	3.93* (2.91–5.30)	8.39* (5.71–12.34)	0.12* (0.08–0.18)	8.54* (5.82–12.55)	16.69* (9.85–28.27)	0.06* (0.04–0.10)
Moderately intoxicated	4.98* (3.25–7.64)	5.72* (3.18–10.26)	0.18* (0.10–0.31)	7.84* (4.70–13.06)	12.17* (6.18–23.95)	0.08* (0.04–0.16)
Severely intoxicated	4.55* (1.48–14.01)	11.72* (3.59–38.25)	.09* (0.03–0.28)	12.74* (6.06–26.79)	17.49* (6.91–44.28)	0.06* (0.02–0.15)

** $p < 0.05$; * $p < 0.01$. CI = confidence interval; OR = odds ratio; ref = reference.

Table 3. Association between alcohol intoxication and injury variables.

	China		Korea	
	<i>n</i> (SE)	OR (95% CI)	<i>n</i> (SE)	OR (95% CI)
Sex				
Male	285 (0.14)	2.34 (1.79–3.06)*	338 (0.13)	2.89 (2.25–3.72)*
Female	74 (0.12)	ref	90 (0.11)	ref
Age				
18–24	84 (0.29)	2.92 (1.66–5.16)*	58 (0.20)	1.47 (0.98–2.19)**
25–34	125 (0.28)	3.60 (2.07–6.26)*	109 (0.18)	2.14 (1.50–3.06)*
35–44	86 (0.29)	3.27 (1.85–5.78)*	107 (0.18)	2.21 (1.55–3.16)*
45–54	49 (0.31)	3.35 (1.84–6.12)*	98 (0.19)	2.11 (1.46–3.02)*
55+	15 (0.26)	ref	56 (0.14)	ref
Education				
Elementary	30 (0.19)	ref	28 (0.20)	ref
High	203 (0.20)	1.76 (1.18–2.63)*	201 (0.22)	1.90 (1.24–2.92)*
Some college	126 (0.21)	1.88 (1.24–2.86)*	199 (0.22)	1.78 (1.16–2.73)*
Location				
Own home	43 (0.16)	ref	69 (0.14)	ref
Other home	12 (0.37)	3.70 (1.79–7.67)*	9 (0.19)	1.53 (1.05–2.23)**
Street	115 (0.19)	1.48 (1.032–1.4)**	163 (0.42)	3.86 (1.68–8.83)*
Pubs	118 (0.21)	12.38 (8.21–18.67)*	132 (0.17)	2.34 (1.69–3.52)*
Activity at time of injury				
Paid job	45 (0.15)	ref	13 (0.28)	ref
Commuting/traveling	73 (0.19)	1.50 (0.98–2.14)	160 (0.30)	5.35 (2.98–9.59)*
Sports/leisure	153 (0.18)	3.93 (2.76–5.59)*	146 (0.30)	10.97 (6.06–19.85)*
Doing nothing	36 (0.24)	1.97 (1.24–3.13)*	62 (0.32)	4.95 (2.65–9.23)*
Type of injury				
Traffic accident	53 (0.21)	1.46 (0.97–2.21)	58 (0.26)	1.06 (0.63–1.77)
Blunt force injury	48 (0.19)	2.12 (1.46–3.08)*	145 (0.24)	3.91 (2.42–6.31)*
Lesions	77 (0.18)	1.84 (1.30–2.61)*	61 (0.26)	1.65 (0.99–2.76)
Falls	108 (0.19)	1.76 (1.21–2.27)*	141 (0.24)	2.53 (1.57–4.07)*
Other unintentional	64 (0.14)	ref	8 (0.22)	ref

** $p < 0.05$; * $p < 0.01$. CI = confidence interval; OR = odds ratio; ref = reference; SE = standard error.

significantly greater among the Koreans with the highest odds among the severely intoxicated patients (OR = 17.49, 95% CI = 6.91–44.28).

The association between alcohol intoxication, demographic, and injury variables are shown in Table 3. These analyses represent patients with a positive BAC estimate (BAC \geq 0.01) or those who self-reported alcohol consumption within 6 hours prior to their injury. Among intoxicated patients, men were more likely to present at EDs in both countries with Korean men having a slightly higher odds (OR = 2.89, 95% CI = 2.25–3.72) compared with Chinese men (OR = 2.34, 95% CI = 1.79–3.06). Chinese who had a college degree were more likely to report at EDs intoxicated (OR = 1.88, 95% CI = 1.24–2.86). However, Koreans who had completed at least high school more often reported to EDs intoxicated (OR = 1.90, 95% CI = 1.24–2.92). Intoxicated Chinese reported greater odds of injuries at pubs (OR = 12.38, 95% CI = 8.21–18.67). Koreans, however, sustained injuries on streets and highways. The odds of sustaining an injury during leisure and sports increased in both countries among intoxicated patients.

Compared with working during the time of injury, the Koreans had a tenfold increase in the odds of injuries at sports and leisure activities (OR), and a fivefold increase when they were traveling. The Chinese were three times more likely to sustain an injury during sports (OR = 3.93, 95% CI = 2.76–5.59).

4. Discussion

This study was designed to examine reports of injuries among patients visiting Korean and Chinese EDs. The samples from both countries were almost homogeneous: injured patients were more likely to be male, younger, and employed; males reported a greater number of injuries than females with more than 60% of patients from both countries being men; the number of intoxicated males in the two countries was relatively high. In recent years, increases in alcohol consumption in Asian countries such as China, Korea, and Japan have been blamed on rapid economic growth coupled with urbanization and westernization [2,16]. The findings here show that the proportion of injury cases among

intoxicated patients was 14% for Chinese and 20% for Koreans (with a combined proportion of 16%). This is consistent with previous studies that have estimated that the prevalence of drinking prior to injury ranges from 6.3% to 46.4%. Analysis of two other Asian countries from one such study showed that the prevalence of consuming alcohol 6 hours prior to an injury were 38.5% in New Zealand and 21.7 in India [4].

The burden alcohol misuse poses on EDs has been studied extensively. These studies show that an increase in ED visits by intoxicated patients puts a strain on ED resources [17–19]. In their study of how alcohol increases diagnostic testing, procedures, charges, and the risk of hospital admission, O’Keeffe et al showed that intoxicated patients were more likely to require high level in-hospital care [17]. The findings of this study were consistent with prior studies, which indicated that the odds of alcohol-related injuries were positively associated with age and the amount of alcohol consumed within 6 hours prior to injury [20,21]. The role of drinking (either by the victim and/or perpetrator) in triggering violent behaviors is difficult to assess. This is because these two events may happen at times when it is hard to measure [1]. When drinking by the victim and perpetrator were considered together, the odds of intentional injuries increased greatly in both countries especially when the victims were severely intoxicated. Of particular concern is that compared with moderately intoxicated victims, the odds of intentional injuries by intoxicated patients was relatively higher in mildly intoxicated patients in China (OR = 8.39, 95% CI = 5.71–12.34) and Korea (OR = 16.69, 95% CI = 9.85–28.27).

Studies are conclusive that alcohol is a major risk factor for injuries resulting from violent events and unintentional causes such as accidental falls [22–24]. Compared with other unintentional injuries, the odds of suffering a fall among intoxicated patients in Korea was more than twice (OR = 2.53, 95% CI = 1.57–4.07) that of the Chinese (OR = 1.76, 95% CI = 1.21–2.27). The odds of injury in intoxicated Korean patients during sports and leisure activities increased by tenfold. It should be noted that these findings are based on injuries for which injured persons sought treatment in the ED. Previous research has found that intoxicated patients who reported an injury treated in the ED were more likely to be younger and heavier drinkers [15,25]. These analyses are therefore not representative of all injuries, nor are they necessarily representative of those treated at other ED facilities in both countries [26]. Additionally, these analyses only address acute use of alcohol 6 hours prior to the injury. Elsewhere, usual drinking patterns of patients as a predictor of injury have also been found in other ED samples [15,27].

To the best of our knowledge, this article is the first to compare alcohol-related injuries among intoxicated patients reporting at EDs in just these two Western

Pacific countries. An important source of uncertainty, however, is that the victim’s perception of others’ drinking may not be valid or, if valid, may have little to do with causality. A known example is that persons injured in drinking bars and pubs are more likely to assume that the perpetrators were intoxicated, thereby attributing a causal association [13].

This study is limited by its cross-sectional nature. Another limitation is related to the fact that the sample of patients from the participating EDs is not necessarily representative of other ED facilities or people with injuries who fail to seek medical attention. Despite these limitations, the use of the WHO collaborative study on alcohol and injuries protocol allows a unified comparison between the two countries by using the same set of variables. Findings from this study will contribute to our knowledge regarding the magnitude of the additional burden that drinking by someone other than the victim of violence places on the ED.

Conflicts of interest

The authors declare no conflicts of interest.

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