CLINICAL RESEARCH

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Alcohol Screening in a National Referral Hospital: An Observational Study from Qatar

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	Background:	Alcohol consumption is a high-risk factor for several medical disorders and traffic accidents and poses a bur- den on outpatient clinics and emergency units. We aimed to assess the pattern of alcohol screening among patients in a multicultural setting in a national referral hospital in an Arab Middle-Fastern country.						
	Material/Methods:	A retrospective analysis was conducted for patients who were screened with blood alcohol concentration (BAC) in the Emergency Department (ED) in the period from January 2009 to December 2012. BAC positive and negative patients were compared, and BAC positive patients were classified into mmol/L (Group 1: BAC 0.1–10.8 (less intoxicated); Group 2: BAC 10.9–21.7 (intoxicated), and Group 3: >21.7 mmol/L (intoxicated at CNS depression level).						
	Results:	A total of 9417 patient visits were screened for BAC during the study period (an average of 4.87 per 1000 ED visits); 38% of these tested positive. Most screened persons were males (97%) with a mean age of 37.5 ± 11.6 years. There was a steady increase in BAC screening initially (3.18 per 1000 ED visits in 2009 and 7.47 in 2012). However, the proportion of BAC-positives per total screened decreased steadily over the years, from 50% in 2008 to 33% in 2012. There were more BAC positives (92% vs. 81%, p<0.05) in patients seeking medical vs. non-medical assessment. Among BAC positives, Group 3 patients had higher HLOS (p=0.001), but the ICU-LOS was comparable.						
	Conclusions:	Despite the absence of a clinical protocol for alcohol screening, this study shows that alcohol consumption has a serious impact in ED visits and hospitalizations, even in a country that partially prohibits alcohol drink- ing. Implementing a protocol for the screening of alcohol misuse among select hospitalized patients should be considered in the ED.						
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Background

Excessive or harmful alcohol consumption affects individuals and communities in many ways and has been identified as an important public health concern worldwide. It causes a range of chronic non-communicable conditions as well as acute injuries such as violence, motor vehicle crashes, and acute medical events. Evidence suggests that harmful use of alcohol has a causal relationship with more than 200 diseases and injuries, and accounts for 5.1% of the global disease burden, corresponding to 3.3 million deaths per year [1]. Combined evidence from Emergency Department (ED) and epidemiological studies suggest that 10-18% of injured patients attending EDs are alcohol-related cases and the majority were young males [2]. Alcohol screening tests identify patients with positive blood alcohol concentration (BAC) and these patients are more likely to be heavy alcohol drinkers, with a previous history of alcohol-related illness and injuries, and have sought more treatment for alcohol-related problems than for any other condition [2,3]. Moreover, alcohol-related injury patients are less likely to use healthcare services other than EDs [2]. However, the pattern of alcohol-related ED encounters shows a significant variation by region, as well as within regions of the same country. This can be attributed to several individual and social factors, including aggregate volume of consumption, overall drinking patterns, and legislative policies to tackle alcohol-related harm [2,3]. According to a WHO report in 2014, a guarter of alcohol consumption is unrecorded (e.g., homemade alcohol, illegally produced or sold outside normal government controls) [4]. There are many countries that consider alcohol consumption illegal for religious and health-related reasons. The adverse effects of alcohol and the behavior of individuals under its influence affect a country's decision to pass an alcohol prohibition act [5]. Alcohol consumption in Qatar involves several restrictions and Qatar has a zero-tolerance policy to driving under the influence of alcohol. Recently, Ghandour et al. published a review to assess alcohol consumption in 22 Arab countries through available publications. There were 81 articles in the review, of which 76 were interviews or self-reported surveys. Only 5 were hospital-based and none were based on ED data [6]. The present study describes and analyzes the pattern of alcohol screening among ED treatmentseeking adults in a high-income country in the Arab Middle-East that is very diverse in culture, ethnicity, and economy.

Material and Methods

This study was conducted at Hamad General Hospital (HGH), the national referral healthcare facility that offers a full range of medical and clinical services for the State of Qatar, with a population of 2.3 million people during the study period. Generally, alcohol drinking is prohibited in Qatar. We performed a retrospective analysis of data from all adult patients (age \geq 18 years) who presented to the HGH-ED and were screened for alcohol use through BAC testing from January 2009 to December 2012. Patients who were brought in dead (BID), those without a documented BAC determination, and those below the age of 18 years were excluded. Data collected included patient demographics, BAC result, medical comorbidities, laboratory findings, ICU and hospital duration of stay, and clinical outcome (discharge or death).

The term "alcohol" in the present study denotes "ethyl alcohol or ethanol". The level of alcohol in blood was reported as millimoles of ethanol per liter of blood (mmol/L). A BAC level "0" was as "alcohol negative" and any report above "0" as "alcoholpositive". BAC-positive patients were classified into 3 groups based on the BAC levels in mmol/L (Group 1: BAC 0.1–10.9 (less intoxicated); Group 2: BAC 10.9–21.7 (intoxicated), and Group 3: >21.7 (very intoxicated, at CNS depression level).

These reference ranges were based on the laboratory standards of our institution. The Annual Health Report prepared by the Department of Epidemiology & Medical Statistics of the Hamad Medical Corporation was the reference for annual statistics on ED admissions.

Results

Frequency and pattern of screening tests

A total of 9417 BAC test results from 8556 adult patients (\geq 18 years) were included in the final analysis after removal of incomplete or repeated tests conducted in a single patient within the same admission (Figure 1). Of the total BAC tests, 38% (n=3618 tests) were BAC-positive, i.e., 3115 patients (36%). We found that screening tests were repeated in 407 (4.8%) patients during multiple visits to the hospital.

The number of screening tests performed increased over the study period, from 1609 to 3475, as did their rates, from 3.18 to 7.47 per 1000 ED visits (Figure 2). The rate of BAC-positives per 1000 ED visits also increased steadily in this period, from 1.6 to 2.43 per 1000 ED visits.

As a consequence of the expansion of regional ED services, the overall ED visits decreased by more than 10% after 2010. The number of ED visits reported in 2010 was 519 287 and in 2012 was 465 041. The proportion of BAC-positives among the total screened persons decreased steadily over the years, from 50% in 2009 to 33% in 2012 (Figure 2).

The mean BAC level was 47.3±25.7 mmol/L (median=46mmol/L, range 0.04–328.3). Of the total 3618 BAC-positives, the majority



Figure 1. Flow chart of screening for blood alcohol concentration in emergency department (2009–2012).

(n=3020, 83%) were intoxicated at the level of CNS depression (BAC >21.7). The mean BAC level was significantly higher in medical patients when compared to trauma patients (47.9.0 \pm 25.9. vs. 39.5 \pm 20.8, p=0.001).

Demographic information of the screened cases

The majority of total screened persons were males (97%), with a mean age of 37.5 ± 11.6 years (median 36 years, range 18–95) (Table 1). Nearly 13% were the age 18–24 years and 9% were 55 years and above. The majority of tests were performed in the 25–34 years age group (33%) followed by the 35–44 years (25%) and 45–54 (17%) years groups. Similarly, the 25–34 years age group contributed to most (32%) of the BAC-positive results, followed by the 35–44 years age group (29%) (Table 2).

Trauma patients screened were comparatively younger than medical patients (34.5 ± 11.2 vs. 38.0 ± 11.6 years, p=0.001). However, there was no significant difference in their BAC results. Nearly 67% of those screened were Asians, Europeans, or other non-Arab patients, followed by Qataris (22%) and non-Qatari Arabs (11%).

Comorbidities, hospital course, and outcomes

The majority of cases (85%) were presented to the ED for medical reasons. Hypertension (24%) was the most commonly reported comorbid condition, followed by ischemic heart diseases (20%), diabetes mellitus (9%), and epilepsy (8%). There was a significantly higher proportion of BAC-positive patients



Figure 2. Trends in alcohol screening among Emergency Department patients.

among the medical than the surgical/trauma patients (p=0.001). The BAC-negative group had a higher proportion of patients with comorbidities such as hypertension, epilepsy, and cardiac arrhythmia than in the BAC-positives (p<0.05). When BAC-positive patients were classified into 3 groups according to the BAC levels, the largest proportion of medical patients was in Group 3, with the highest level of intoxication. A significantly higher proportion of Group 1 patients had comorbidities such as diabetes mellitus, epilepsy, and cardiac arrhythmia than in other groups of patients (p<0.05) (Table 3).

There was a significant difference between BAC-positives and BAC-negatives in terms of hospital (HLOS) and ICU (ICU-LOS) length of stay; both were higher among BAC-negatives (p=0.001). A more than 2-fold increase in mortality was also noted for BAC-negative patients.

On comparing the case fatality rates (CFR) by the BAC levels, it has been shown that the lower the BAC levels, the higher the CFR (Table 3).

The mortality trend persisted when stratified by HLOS; it was significantly higher for Group 1 and Group 3 patients with HLOS 3–7 days. However, Group 2 patients had comparable CFR in all groups in terms of HLOS. Overall, the HLOS was significantly higher for Group 3 patients, but the majority of patients had a HLOS <2 days (Table 4).

Discussion

In Qatar, having a positive BAC test is not uncommon (approximately 2 per 1000 visits) for patients presenting to the ED. Almost 4 in 10 patients who met clinical criteria for testing were BAC-positive, with males being the great majority (98%), and most being treated for a medical condition (92%) and age 25–44 years. BAC-positives were less likely to have a medical comorbidity other than diabetes mellitus, and to

 Table 1. Demographic information, initial contacts for care, comorbid conditions and outcomes of patients underwent screening test for blood alcohol concentration (BAC).

Variables	Ove (n=94	rall 417)	BAC Po (n=3618,	sitives , 38.4%)	BAC Ne (n=5799	gatives , 61.6%)	Р
Age (mean± SD)	37.5±	11.6	38.2 ±	10.8	37.1±	12.0	0.001
Males	9078	(96.5)	3544	(98.0)	5534	(95.5)	0.001
Nationality							
Asian, European, others	4386	(67.1)	1664	(68.4)	2722	(66.3)	
Qatari	1431	(21.9)	636	(26.2)	795	(19.4)	0.001
Arab non-Qatari	722	(11.0)	132	(5.4)	590	(14.4)	
Patient initial services							
Medical	8052	(84.5)	3340	(92.3)	4712	(81.3)	0.001
Surgical and trauma	1365	(14.5)	278	(7.7)	1087	(18.7)	0.001
Comorbidities							
Hypertension	2241	(23.8)	838	(29.9)	1403	(27.9)	0.06
Ischemic heart disease	1923	(20.4)	741	(29.4)	1182	(28.1)	0.24
Diabetes mellitus	862	(9.2)	349	(14.8)	513	(12.1)	0.002
Epilepsy	713	(7.6)	190	(8.6)	523	(12.5)	0.001
Cardiac arrhythmia	46	(0.5)	10	(0.6)	36	(1.1)	0.04
Liver disease	13	(0.1)	3	(0.1)	10	(0.2)	0.19
Outcomes							
Sepsis	8	(0.2)	1	(0.1)	7	(0.2)	0.16
Hospital Length of stay (median)	1 ((1–363)	1 ((1–363)	2	(1–300)	0.001
Intensive care unit duration (median)	4	(1–76)	3	(1–76)	4	(1–56)	0.06
Mortality	99	(2.0)	12	(0.7)	87	(2.8)	0.001

* Valid percent used when appropriate.

Table 2. Frequency of screening tests for blood alcohol concentration (BAC) by age group.

Age groups	Overall (n=8850)	BAC Positives	BAC Negatives	Р
18–24	1141 (12.9)	321 (9.6)	820 (14.8)	
25–34	2878 (32.5)	1074 (32.3)	1804 (32.6)	
35–44	2376 (25.2)	950 (28.5)	1426 (25.8)	0.001
45–54	1639 (17.4)	679 (20.4)	960 (17.3)	
55 and above	816 (8.7)	301 (9.1)	515 (9.3)	

have a 2-fold reduced in hospital mortality when compared to BAC-negatives, as most of them were young, healthy, nonnational workers. This is the first study to describe the general practice of alcohol testing and the differential epidemiology of BAC-positive patients presenting to the ED of a national referral hospital in the Arab Middle-Eastern Region. Blood alcohol testing was

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Variables	*Group 1		*G	*Group 2		iroup 3	Р
Age	39.	39.2±11.7		37.4±11.4		.1±10.7	0.15
Males	281	(97.9)	299	(97.1)	2962	(98.1)	0.43
Nationality							
Asian, European, others	123	(61.2)	127	(55.2)	1414	(70.7)	
Qatari	69	(34.3)	83	(36.1)	484	(24.2)	0.001
Arab non-Qatari	9	(4.5)	20	(8.7)	103	(5.1)	
Patient initial contact (services)							
Medical	264	(92.0)	268	(87.0)	2806	(92.3)	0.001
Trauma or surgery	23	(8.0)	40	(13.0)	215	(7.0)	0.001
Comorbidities							
Hypertension	110	(45.3)	96	(37.1)	632	(27.5)	0.001
Ischemic heart disease	86	(43.7)	90	(38.6)	565	(27.1)	0.001
Diabetes mellitus	48	(24.5)	41	(20.1)	260	(13.3)	0.001
Epilepsy	27	(15.1)	14	(7.9)	149	(8.0)	0.006
Cardiac arrhythmia	3	(2.6)	1	(0.7)	6	(0.4)	0.009
Outcomes							
Hospital length of stay	1	(1–210)	1	(1–170)	1	(1–363)	0.001
Intensive Care Unit duration	3	(1–33)	30	(1–33)	3	(1–76)	0.96
Mortality	5	(1.7)	2	(0.6)	5	(0.2)	0.001

Table 3. Characteristics of patients with positive blood alcohol concentration.

* Patient groups by BAC levels in mmol/L; (1) Group 1: 0.1–10.89; (2) Group 2: 10.9–21.7; (3) Group 3: >21.7.

 Table 4. Distribution of patients screened and mortality based on blood alcohol concentration (BAC) and length of stay in hospital (HLOS).

	HLOS	≤2 days	HLOS=	3-7 days	HLOS	>7 days	Total n patie	umber of nts (N)	Р
*Group 1: N (%)	154	(66.7)	36	(15.6)	41	(17.7)	231	(100)	0.048
Mortality n (%)	1	(0.6)	2	(5.6)	2	(4.9)	5	(2.2)	
*Group 2: N (%)	156	(67.2)	35	(15.1)	41	(17.7)	232	(100)	0.31
Mortality	1	(0.6)	1	(2.9)	0	(0)	2	(0.9)	
*Group 3: N (%)	1756	(81.2)	192	(8.9)	214	(9.9)	2162	(100)	0.03
Mortality	2	(0.1)	2	(1.0)	1	(0.5)	5	(0.2)	

* Patient groups by BAC levels in mmol/L; (1) Group 1: 0.1-10.89; (2) Group 2: 10.9-21.7; (3) Group 3: >21.7.

not uncommon in our center during the study period. Over 10 600 tests were performed in the absence of a formal protocol for such testing and, of these, we were able to analyze and report on 89% of the patients who were tested over this 4-year period. The variations in frequency of screening tests during the study also reflect the total ED visits and changes in the population size in the country, which largely depends on the expatriate workforces (94% of the total workforce are foreigners) [7]. The decrease in ED visits in our center during the study time period could be related to establishment of regional ED services across the country after 2010.

The retrospective nature of the data collection for this study cohort limited the ability of the study to more completely describe the population of patients who were screened, regardless of BAC status. Budgetary and temporal constraints did

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not allow for a more thorough data extraction from more than 10 600 hard-copy medical records. It is hoped that future studies will address these issues.

Our study has 2 main findings that need to be analyzed in the context of other work in this field. First, there was an overall 38% positive rate for all BAC tests performed. The high sensitivity of this clinician-directed alcohol screening could be indicative of the selection bias inherent in such a system. In the absence of a comparator for medical patients, we can compare our BAC positive rate of our surgical/trauma patients from this study with that of results from our trauma center's protocol. The second main finding for comparison is the relatively 'low' rate of BAC-positives for every 1000 ED visits, from 1.6 to 2.4, when compared to a similar ED population from the USA, which was 79.8 per 1000 ED visits [8].

The BAC-positive rate from trauma/surgical patients [20%] is higher than the 10% reported by the Alcohol Screening, Brief Intervention and Referral for Treatment [ASBIRT] program of the Hamad Trauma Center [9]. The ASBIRT performs a BAC test on all moderately to severely injured patients, ages 12 and up, and it is less likely to be influenced by clinical hunches and biases. Through its maturation and process evaluation, we have identified key obstacles and challenges that were addressed in order to attain a 95% compliance with the protocol; therefore, it is more representative of a true alcohol-positive rate for all trauma patients [10].

The BAC-positive rate of 38% is rather difficult to interpret given the absence of a standard protocol for testing as well as a reference value from a hospital in a similar cultural, ethnic, and economic setting. This rate could be more indicative of the clinical intuition and/or the high pre-test probability of BAC testing done in a clinician-guided rather than a protocoldriven manner, but this should be interpreted in the context of local restrictions to alcohol access and consumption [11].

McDonald et al. [8] reported an 18% aggregate increase in ED visits attributable to alcohol for a 9-year study period in the USA. The estimated rate of 79.8 ED visits attributable to alcohol per 1000 ED visits in the USA is at least 40-fold higher than the estimates of this study from Qatar. In this study, however, ED visits with 1 of 37 alcohol-related diagnoses were considered using data from the 1992–2000 National Hospital Ambulatory Medical Care Survey (NHAMCS) were combined to generate national estimates of alcohol-related ED visits [8]. Whether this great disparity in rates is due to the unique local social, cultural, and legal environment or due to the wider inclusion criteria in the USA study should be the focus of future work in this field.

Patients with comorbidities were more likely to get BAC testing but to be negative, as evidenced by their significantly higher prevalence of comorbid conditions, mortality rates, and longer ICU and HLOS. These patients were likely to be tested to rule out other reasons for their poor health and possibly identify correctable conditions that may arise from alcohol misuse.

This report will help to estimate the health burden of alcoholrelated diseases in Qatar, where there is acute alcohol involvement in 2 out of every 1000 ED visits. This number must be acknowledged as a likely underestimate of the true picture, as it does not measure the effect of chronic misuse; those who do not meet clinician-directed screening criteria nor overtly exhibit the signs of alcohol intoxication. Considerations for a systems-wide alcohol screening protocol should be in the plans of the national healthcare system because the problem does exist and it has been proven in numerous settings to be costeffective and to optimize patient outcomes [12].

Accepting that alcohol is contributory to the health burden in Qatar should lead to efforts to measure the burden attributable to other substances of abuse. Future analysis should include mandatory BAC tests to detect alcohol misuse (e.g., AUDIT), the adverse effects or complications due to alcohol use, and the effect/s of interventions to prevent and reduce alcohol misuse [13,14].

The retrospective design of our study could be considered a limitation to generalizing the results and to exploring more data. However, this is the first study from an Arab country that shows the pattern and burden of alcohol consumption on admissions to EDs and hospitals over a multi-year period.

Conclusions

Despite the absence of clinical protocol of alcohol screening, this study shows that alcohol consumption has a significant impact in ED visits and hospitalizations, even in a country that partially prohibits alcohol drinking. Implementing a protocol for the screening of alcohol misuse among select hospitalized patients should be considered in EDs.

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Conflict of interest

None.

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