



CAGE Screening at Emergency Department with Trauma Patients

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Authors' contributions

This work was carried out in collaboration between all authors. Authors CBS and GDP designed the study and wrote the protocol. Authors SCS and JMFS managed the field work with the individuals participating in the study. Authors MAO, JSS, JCS and JCSS managed the patients' interview process in the emergency department. Author RMRS managed the analyses of the study results. Author CBS managed the literature searches and wrote the first draft of the manuscript. Authors GDP and CML interpreted data, reviewed the manuscript and edited. All authors contributed to the writing, read and approved the final manuscript.

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ABSTRACT

Due to the great evidence between accidents trauma assisted in the emergency department (ED) and the involvement of patients with alcohol, the goal of this work is characterize violence and trauma patients treated in two regional hospitals in a rural area, using the CAGE questionnaires and other questionings. A cross-sectional cohort study was carried out from August 2014 and December 2015, on weekends. 85 individuals, who showed clinical characteristics of alcohol intoxication, were submitted to a socio-demographic and CAGE questionnaires. The data analysis was carried out using the Statistical Package for the Social Sciences SPSS 20.0. The 73.5% of the individuals were male, 83% non-white, 61.5% with less than 6 years of formal education, and 57% of men and 68% of women were single. The main sectors of occupation were agriculture (25%), trade and services (27%), followed by students (12%) and only 1.2% of them were unemployed. The vast majority of traumas were caused by motorcycles (80%), followed by car accidents (7%). The results obtained with the CAGE questionnaire was surprising since 38.2% of the interviewees scored two or more points, of those, 10.7% answered affirmatively three or more questions, which indicates a severe risk of alcohol consumption. Data obtained in our study suggest a strong association between traumas and alcohol use. The alarming number of males, motorcyclists, with low educational and socioeconomic levels, should be taken into account in order to improve public healthcare policies and trauma assistance practices in the ED.

Keywords: Emergency department; alcohol; illicit drugs; trauma; CAGE questionnaire.

1. INTRODUCTION

Alcohol consumption has become a Public Healthcare problem [1,2]. According to the World Health Organization, alcohol accounts for almost 3.3 million deaths each year, which corresponds to 5.9% of all deaths worldwide, it is a higher death toll than the one from HIV (2.8%), violence (0.9%) or tuberculosis (1.7%) [3]; and to tobacco consumption and high blood pressure [4]. Alcohol abuse takes the third place as a contributor of the Global Burden of Diseases, causing elevated morbidity [5].

Alcohol is a psychoactive substance and it directly affects several organs [6], and it may bring irreparable consequences to the individuals' health. From over 200 diseases associated with alcoholic beverage abuse, the most incident are sexually transmitted diseases, gastrointestinal disorders, cardiovascular diseases, cancer, diabetes mellitus, chronic lung diseases [3], cerebrovascular accident and liver diseases; furthermore it is associated with several adverse social results: alcohol poisoning, unintentional injuries, violence and sexual abuse for instance [7].

People have long been aware that alcohol consumption increases the occurrence of injuries which result in going to an emergency department (ED), because it affects psychomotor abilities leading to injuries or trauma, due to incidents, such as car accidents or falls [8]. In

addition to alcohol, illicit drug abuse is also frequently linked to events which lead to a trauma and may at many times cause significant implications for future medical management of the traumatic injuries [9]. Studies suggest that between 20% and 50% of all traumas is a consequence of illicit substances [10].

In the United States, according to the National Highway Traffic Safety Administration, 33,808 people died from traffic accidents in 2009, of those deaths, 10,839 occurred in accidents involving a high blood alcohol content driver, that is, 40% of fatal accidents involve alcohol consumption [11]. Apart from the accidents, around 8 million ED assistances per year are linked to alcohol consumption [12].

In Europe, traffic accidents are one of the main causes of death of people aged between 15 and 29, and drunk driving appears as a major risk factor in most of these accidents. In Spain, in 2001, alcohol was present in 30 to 50% of fatal accidents and in 15 to 35% of serious injuries caused by accidents [13]. In the United Kingdom, several hospital visits are linked to alcohol and it also is one of the main causes of hospital admissions [7].

In Brazil, alcohol consumption is well regarded by society and alcohol abuse has become common due to its low cost, availability and strong advertising which associates alcohol consumption to the idea of well-being and

happiness. All that contributes to alcohol consumption being closely linked to traffic accidents [14]. Data of 2011 from VIVA (an Organization for the Surveillance of Accidents and Violence), carried out by the Ministry of Health in 71 hospitals which provide emergency assistance in the country's Public Healthcare System (SUS), reveal that accidents and violence represent the third most common cause of deaths among the entire population and the first one for the population aged between 1 and 39 years. It also revealed that 16.7% of all assistances were reportedly of patients with suspected alcohol consumption, among those, 20% were represented by males and 8% of females. Furthermore, 21.7% of victims who had drunk alcoholic beverages and had been in a traffic accident passed away [14].

Consequently, the world tendency is to decrease the blood alcohol content rates for drivers [13]. In Brazil, as a result of a high incidence of traffic accidents linked to alcohol, two laws were passed in order to outlaw the combination of alcohol consumption and driving (Law 11,705 of 2008 and the "Zero Alcohol" Law, 12,760 of 2012) [2]. According to the WHO, this strategy is financially efficient and may reduce the incidence of traffic accidents by around 20% [3].

This study aimed to estimate the incidence of violence cases and traumas assisted by the Regional Hospitals which were associated to the consumption of alcohol and other drugs, characterizing the patients treated.

2. METHODS

This is a descriptive cross-sectional cohort study, carried out at the Regional Hospitals of two rural cities in the state of Sergipe (Lagarto and Itabaiana), in covenant with the Public Healthcare System (SUS) between October 2014 and December 2015, always during the weekends. The patients who sampled the study were trauma victims, aged 12 or older, having searched treatment at the Emergency Departments in this period. Patients underage were only interviewed accompanied by a parent or legal guardian in order to sign the Informed Consent Form. The individuals were subjected to two forms: the first one to collect data to characterize them, such as gender, educational background, occupation, ethnicity, marital status, place of birth, type of accident (car, motorcycle, bicycle, horse riding, and others) and whether or not they had ingested alcohol prior to the event.

The second form was the Brazilian version of the CAGE questionnaire (Cut-down, Annoyed by criticism, Guilty eye-opener) [15], a method widely used to track down alcoholism, in which two affirmative answers indicate that the possibility of alcoholism must be more deeply investigated, with the sensitivity and specificity verified when it is used in the Emergency room environment. The CAGE questionnaire, among other methods, has been extensively validated for use in identifying alcoholism. CAGE is considered a validated screening technique, with one study determining that CAGE test scores ≥ 2 had a specificity of 76% and a sensitivity of 93% for the identification of excessive drinking and a specificity of 77% and a sensitivity of 91% for the identification of alcoholism. Item responses on the CAGE are scored 0 or 1, with a higher score an indication of alcohol problems. A total score of 2 or greater is considered clinically significant, positive screening for alcohol abuse or dependency [15]. All participants or their parents and legal guardians signed the Informed Consent Form and the research has its approval by the University's Research Ethics Committee, protocol number 835,437 of October 10th, 2014. Data is presented as mean, standard deviation and percentage.

2.1 Statistical Analyses

The data analysis was carried out using the Statistical Package for the Social Sciences SPSS 20.0. In order to verify whether or not there was significance ($p \leq 0.05$) between the interest variables within each group it was used Pearson's correlation test.

3. RESULTS AND DISCUSSION

This is cross-sectional cohort study carried out at the Central and South-Central regions of the State of Sergipe, in Brazil's northeast region. Participants were selected at two small Regional Hospitals in the cities of Lagarto and Itabaiana. The hospital staff helped investigating patients' information and all patients in the sample were victims of trauma and had suspected alcohol consuming status. This data was obtained from clinical signs and symptoms evaluated by the healthcare staff at each emergency department. Information such as age, gender, history of illnesses and previous traumas were extracted from medical records.

Socioeconomic status and ethnicity were identified according to the classification of the

Brazilian Institute of Geography and Statistics and Pena et al. 2011 work [16]. The CAGE questionnaire was used in order to detect patients who suffered any kind of alcohol-related disorder, as well as other questionings in regard to alcohol consumption prior to the occurrence of the trauma. From all individuals assisted by the ED presenting mild to moderate traumas and suspected alcohol consumption, and able to be interviewed after the first medical treatment, only 100 patients agreed to participate in the research. From those, 73% were male, 51% admixed, with poor educational formation (43% had less than 6 years of study), 38% single and 27% married, and no age range statistically predominant (Table 1).

Scientific evidences have demonstrated that alcohol consumption is more frequent among men than women in all cultures and societies [17], as well as the number of occurrences of intentional and unintentional injuries [8]. Despite the fact that women are under the same risks, men are significantly more likely to be tested positive to alcohol ingestions in the ED, as reported by Akin and col. in results obtained in a study in Georgia State [18], as well as by other researches which associated alcohol consumption to traumas or interpersonal violence [4,10-12,19-22].

Some previous researches have also reported that individuals who searched assistance in the

ED presenting trauma and possible alcohol consumption are adults age-ranged around 40 years [8-10,17-20]. Other studies, however, demonstrate results from an inferior age range, such as 36 years [21,23], or less [11,22]. Our results didn't demonstrate a predominant age range, still the age range between 12 and 20 years was significantly smaller ($p \leq 0,05$) than the others (Table 1).

Another variable analyzed in our study was the patients' ethnicity, were the vast majority reportedly black or admixed, 62.3% (Table 1). This is mostly a result of a regional factor, because the majority of the population in this region is admixed, which, for Brazil, represents an almost equivalent miscegenation between whites, African-Americans and Natives People [16]. Other studies have demonstrated similar numbers regarding ethnic distribution, in which some studies demonstrate the predominance of an African background for patients suffering from alcohol-influenced trauma, as in Akin's and col. study, 2015, which demonstrated a 55% predominance of African Americans [18], as well as other studies [12,24].

In some studies carried out in the United States, Latin-American patients were also more likely to test positive for alcohol [20]. On the other hand, other studies demonstrated no significant difference among ethnicities [22] and in some cases white patients were more likely to test

Table 1. Socio-demographic variables

		Gender					
		Female		<i>p-value</i>	Male		<i>p-value</i>
		N	N%		N	N%	
Age range	12 --- 20	8	36.4%	.378 ⁽¹⁾	12	20.3%	.866 ⁽¹⁾
	21 --- 29	7	31.8%		15	25.4%	
	30 --- 38	4	18.2%		16	27.1%	
	39 --- 65	3	13.6%		16	27.1%	
Ethnicity	White	5	22.7%	.017 ⁽²⁾	9	14.8%	.000 ⁽²⁾
	Black / Brown	17	77.3%		52	85.2%	
Education	Illiterate	1	4.8%	.085 ⁽¹⁾	2	3.4%	.000 ⁽¹⁾
	Elementary School*	8	38.1%		40	67.8%	
	High School**	8	38.1%		13	22.0%	
	Higher Education***	4	19.0%		4	6.8%	
Marital status	Single / Divorced / Widowed	15	68.2%	.134 ⁽²⁾	35	57.4%	.306 ⁽²⁾
	Common-Law Marriage / Married	7	31.8%		26	42.6%	

(1) Chi-square test (2) Binomial test. Significance for $p\text{-value} < 0.05$; * Elementary School (Complete/Unfinished);

** High School (Complete/Unfinished); *** Higher Education (Complete/Unfinished)

Source: Regional Hospital of Lagarto and Itabaiana, 2015

positive for alcohol than the other ethnicities [21], as well as Suffoletto's and col. study, in which in comparison to white individuals, the African-Americans binge drank less frequently and were more likely to report no binge drinking at all [25].

Education is a poorly explored factor in myriad published studies concerning those patients seeking emergency treatment for alcohol-related traumas. In our study, poor education (less than 6 years) was predominant, 42.5% of patients presenting unfinished elementary school education or being illiterate and only 2.5% had a graduation major. In the work of Bazargan-Hejazi and col., carried out in California with violence victims between partners, reported that 80.6% of patients in the sample completed high school or less [20]. In a study carried out in Atlanta in which participants answered a questionnaire, they were less likely to have a high school diploma [12]; or in Bogenschutz's and col study, in which 32% of patients hadn't graduated high school [21], as well as Suffoletto's and col. study, in which college applicants were less likely to report binge drinking in comparison to those who hadn't been to college [25].

Probably, because this study was carried out in a region of a low Human Development Index (HDI), the amount of poorly educated individuals is expected. In a study comparing violence injuries and non-violence injuries related to alcohol in women from developed and underdeveloped countries, shows that in underdeveloped countries women were more likely to have primary education (45%) or high school (37%), whereas women from developed countries were more likely to have graduated high school (43%) or at least have some academic graduation (37%) [8].

Regarding the patients' occupation, it may be observed a predominance of workers from the agricultural sector (22%), typically for both cities being situated in rural regions. Other working areas include trade and services (19%) and construction worker (16%). Surprising numbers were the amount of students in the sample (11%), which presented a higher number than expected, as well as the amount of unemployed people which was rather small (2%) (Table 2).

Data collected in our study regarding the participants' occupation are rather distinct from other studies, in which the majority of patients seeking emergency treatment for alcohol-related

traumas were unemployed [20,21]. However, Silva and col., also reports different findings, in which 35% of women sampling the study in underdeveloped countries were students and only 19% had an occupation, while in developed countries, 34% were employed and 19% were students [8].

Table 2. Sector of occupation

	N	N%
Agriculture	21	24,7
Trade/Services	23	27,1
Construction worker	8	9,4
Student	10	11,8
Office / Public worker	4	4,7
Household	3	3,5
Retired	3	3,5
Industry	3	3,5
Surveillance	2	2,4
Unemployed	1	1,2
Absent	7	8,2
Total	85	100,0

Source: Regional Hospital of Lagarto and Itabaiana, 2015

The low education levels collected in the sample are a reflection of the low HDI numbers in the region which vary from 0.642 in the Itabaiana city to 0.625 in Lagarto city; reaching even lower rates in neighboring cities, such as Riachão do Dantas with a 0.539 HDI [26], which results in socioeconomic destructuring and risky alcohol and other drugs involvement. Some studies have also suggested that socioeconomic situation may be directly associated with risky alcohol use, as reported in Silva and col. study, though men and women from deprived socioeconomic levels drink less frequently, they tend to consume a larger amount of alcohol [8]. Bogenschutz and col., reports that most individuals involved with alcohol (63%) sampling their research came from low-income families [21]. Regions where social districts are not organized present a high density of retail alcohol outlet [23].

All patients sampling this research were victims of trauma due to accidents or interpersonal violence. The vast majority of patients had excoriations over their bodies and at least a simple bone fracture from the upper or lower limb. Only four individuals had multiple fractures and seven had to undergo emergency surgery (non-presented data). Only one patient from the sample had to be admitted to hospital for more than 24 hours. The largest percentage of

accidents (80%) was from motorcycles, followed by car accidents (7%). The remaining accidents happened from horse riding and/or wain riding, bicycling, falls and a simple case of domestic violence was registered by a woman who was spanked by her partner (Table 3).

The United States estimate that from 1.2 million to 5.1 million hospital assistances per year may be attributable to excessive alcohol consumption and/or illicit drug use, from those, 20% to 30% of patients seeking assistance at the ED report dangerous levels of alcohol and other drugs consumption [18]. In 2011, more than 707 thousand youngsters aged between 10 and 24 years in the United States were treated in the ED with injuries caused by violence followed by alcohol use [24]. In another study reported by Beydoun and col., an association between trauma and alcohol dependency was proven to be positive [11]. In the analysis of the American National Trauma Data Bank, the previous use of ethanol is associated to a higher mortality rate, or to a higher incidence of medical complications [19].

Other studies endorse this dangerous relation between traumas and alcohol use, as observed in Polland, a strong connection between alcohol and traffic accidents, in which 25% of patients admitted to orthopedic wards in Warsaw city were risky alcohol consumers [27]. In Oxford, two thirds of the people who died in traffic accidents were found to have involvement with alcohol [5]. Likewise, in Buenos Aires, alcohol consumption and intoxication when analyzed were suspected for 7% of all injured patients and for 28% of those intentionally injured, 7 times more than of those who didn't report alcohol use [28]. Similarly, a general hospital in the UK observed that 6.2% of all hospital admissions and 12% of accidents admitted to the ED happened on account of problems associated with alcohol [17], it was also reported that exposure to ethanol increases the risk of traumatic brain injury up to more than 40% [19].

At the ED of the hospitals sampling this research, the evaluation of blood alcohol content in the patients isn't routinely performed; therefore, the reports of alcohol consumption prior to the event of the trauma were spontaneously given by patients or were clinically diagnosed by the hospital staff. In some cases, the patient denied having consumed alcohol; however these were included otherwise due to suggestive clinical

characteristics or even the alcohol breath easily perceptible during the anamnesis and the questionnaires distribution. On the other hand, some studies show that injuries are significantly more severe for patients tested negative for alcohol and also show no relation between mortality and ethanol concentration, as observed in a Charleston's study, West Virginia [9], as well as Brennan's and col. analysis in Melbourne, Australia, through a univariate analysis or multivariate regression, exposure to ethanol was found to be associated to a decrease in mortality [19].

It's not possible to assert that the most severe cases which were treated at the ED of the regional hospitals not sampling this study, such as multi-trauma patients or those who were unconscious when taken to the ED, hadn't consumed alcohol prior to the event of the trauma or who tested negative for risky alcohol consumption through the CAGE questionnaire. Similarly, it's not possible to assert that patients who demonstrated no signs or symptoms of intoxication or those who didn't accept partaking the research also wouldn't have had tested positive for alcohol through the CAGE questionnaire. Nevertheless, this will always be a limitation for this kind of research which uses questionnaires on alcohol and other drugs, because a large amount of patients will deny substance use or abuse, as it has been observed in other studies [12,29].

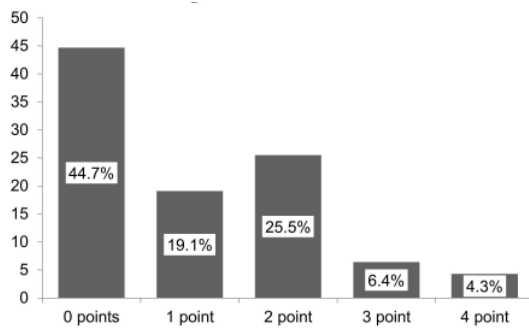
Trauma caused by interpersonal violence under the influence of alcohol is a recurrent fact and it has been reported in several studies [1,8,24]. In our study, only one case was reported as interpersonal violence, despite of the fact that 10 patients didn't reveal what had caused their trauma. Other studies demonstrate this problem of violence against women. The work of Silva and col. shows that women in underdeveloped countries were twice more likely to report injuries regarding interpersonal violence and they were also more likely to test positive for alcohol than those of developed countries [8], similarly, Stoddard's and col. study, found that aggression and victimization between partners were more prevalent in those days in which alcohol had been consumed [24]. The fact that women are more likely to deny having ingested alcohol prior to the trauma should also be taken into account, since there is the stigma of associating alcohol consumption to subsequent injuries [8].

Table 4. Other reported addictions

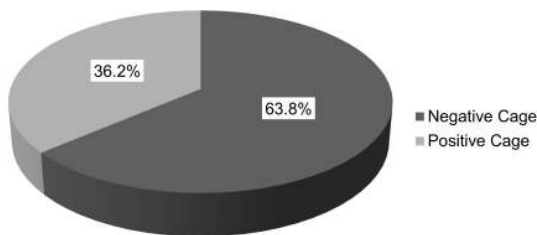
		Gender					
		Female		<i>p-value</i>	Male		<i>p-value</i>
		N	N%		N	N%	
Do you drink?	Yes	6	30.0%	.115 ⁽²⁾	45	71.4%	.001 ⁽²⁾
	No	14	70.0%		18	28.6%	
Do you smoke?	Yes	2	9.5%	.000 ⁽²⁾	16	26.2%	.000 ⁽²⁾
	No	19	90.5%		45	73.8%	
Do you use illicit drugs?	Yes	0	0.0%		4	6.7%	.000 ⁽²⁾
	No	21	100.0%		56	93.3%	

(1) Chi-square test (2) Binomial test. Significance for p-value<0,05.

Source: Regional Hospital of Lagarto and Itabaiana, 2015

**Fig. 1. CAGE score**

Source: Regional Hospital of Lagarto and Itabaiana, 2015

**Fig. 2. Distribution of the positive and negative results in CAGE**

Source: Regional Hospital of Lagarto and Itabaiana, 2015

Other studies which used the CAGE questionnaire bring different results to the ones found in this study, Ferreira and col. for example, reports that after a urban population (out of the hospital environment) took the CAGE questionnaire in another city, also located in the Northeast region of Brazil (Jequié city in the state of Bahia), the prevalence of alcohol dependence found using two affirmative answers as a cut-off point, was of 10.4%, of those, the majority being of male adults and youngsters [35]. Richoux and col. identified alcohol problems in 6.1% of patients treated in the emergency sector in

France, and the auditing scale revealed a prevalence rate for alcohol related disorders of 9.4% when individuals scored 3 or more points in the CAGE questionnaire, and the majority was also consisted of male adults and youngsters [33]. Our results, when patients who scored three or more points are included, also present the prevalence of alcohol dependency in 10.7% of the population in the sample. In the study of Freitas e col., carried out at a hospital in a big city in the Southeast region of Brazil (Uberlândia city in the state of Minas Gerais), 31.8% of patients tested positive for alcohol [1].

Regarding the use of illicit drugs by patients in our sample, a large majority reports never having used them, only 5% of the men interviewed acknowledged frequent use of illicit drugs, mostly cannabis and snorting cocaine. Other studies with ED patients also presented low rates of illicit drugs use, for example in Nkire's and col. study, in Ireland, only 1% of the examined cases had a history of recreational drugs use [4], as well as Richoux's and col. study, 2011 carried out in France which shows that patients tested positive for alcohol were more likely to report smoking more cigarettes and cannabis, in addition to using opiates, cocaine and sedatives [33]. Still, in Bogenschutz's and col. study, carried out in the United States, reports that the mostly used drugs among patients tested positive for alcohol were cannabis and cocaine [21]. Only Suffoletto's and col. study, carried out in Pittsburgh US, reports that 50% of young adults in the studied sample had consumed cannabis in the last three months [25].

Consistent with Healthy People 2020 recommendations, the American College of Surgeons Committee on Trauma requires that all Level I trauma centers have a mechanism to identify and provide intervention for trauma patients with risky alcohol use, such as

Screening, Brief Intervention, and Referral to Treatment (SBIRT). The SBIRT, for example is a valid tracking and intervention program for ED patients in order to evaluate the risk for alcohol and substance abuse, aiming to reduce future traumas [12]. Previous studies demonstrate that the majority of patients who could benefit from a brief intervention for alcohol and illicit drugs abuse are not diagnosed in the ED [18]. Being under the influence of alcohol and other illicit drugs may be worrying for ED patients and significantly impact the patient's health. Previous researches with adults showed that screening and brief intervention in trauma centers may lead to a decrease in long-term health costs [22]. The lack of screening for alcohol and illicit drugs represent a large overload for the ED clinical staffs with expressive costs for society [17], once this patient will at many times respond to standardized treatments unexpectedly due to the association of clinical interventions, the medicines used and the alcohol or other psychoactive drug present in the patients' blood.

4. CONCLUSIONS

Data obtained in our study suggest a strong association between traumas and alcohol use, 55% of patients in the sample scored one or more points in the CAGE questionnaire. The alarming number of males, motorcyclists, from low educational and socioeconomic levels, should be taken into account in order to improve public healthcare policies and practices regarding trauma assistance in the ED. Future longitudinal studies from a popular basis over the use of alcohol and illicit drugs, associated to different types of injuries and traumas must be conducted to broaden the scientific evidences and promote preventive measures on the matter.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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