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Research Article

FORENSIC IMPLICATIONS OF ALCOHOL CONSUMPTION IN ROAD TRAFFIC ACCIDENTS: A PRELIMINARY STUDY ON ETHANOL CONCENTRATION IN ACCIDENT VICTIMS

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ABSTRACT

This preliminary forensic study aimed to investigate the correlation between alcohol consumption and road traffic accidents, a critical concern in public health and forensic science. The descriptive and analytic study focused on analyzing ethanol concentration in the blood of 40 accident victims, predominantly male motorcyclists under the age of 45. The study revealed a 55% prevalence of alcohol ingestion among the victims, with 16% involved in fatal accidents. No significant associations were identified with factors such as age, condition at the time of the accident, time, or road conditions. The findings underscore a noteworthy presence of alcohol consumption among victims involved in traffic accidents, emphasizing the forensic implications of alcohol-related incidents on accident investigations.

Keywords: - Alcohol consumption, Road traffic accidents, Forensic science, Ethanol concentration, Accident investigations.



INTRODUCTION

Road traffic accidents pose a significant challenge in forensic departments globally, contributing substantially to morbidity and mortality rates. With 1.3 million lives lost annually and 20 to 50 million survivors facing severe consequences, this issue stands as a critical public health concern [1]. In African hospitals, road traffic crashes are the predominant cause of trauma cases, resulting in over 24 deaths per million inhabitants double the death rate [2, 3]. The involvement of alcoholic beverages intensifies this elevated mortality rate, prompting legislative measures such as establishing legal Blood Alcohol Concentration limits for motor vehicle drivers. Despite the WHO recommending a limit of 0.5 g/L, many countries, while enacting laws, have set the limit at 0.8 g/L [1, 3]. The absence of local data regarding the correlation between incidents that creates a hurdle in implementing effective legal actions. A study conducted within the forensic department aims to fill this gap by investigating the epidemiological and forensic aspects of alcohol consumption among traffic accident victims.

METHODOLOGY

This cross-sectional study was conducted within the Forensic Department's Emergency Care unit, focusing on individuals admitted to the clinic following a traffic accident. In order to qualify, participants needed to have been involved in a road accident within six hours before admission, received no more than 500 mL of infusion before admission, and be at least 18 years old. To assess blood alcohol levels, each injured person was invited to

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provide a venous blood sample, with 5 mL collected in sodium fluoride tubes, contingent on their consent. Exclusion criteria included non-compliance with tube standards or insufficient filling. DiaSys Ethanol Standard FS kit, which uses Alcohol Dehydrogenase to determine blood alcohol concentration, was used for the determination. The Flexor Selectra automated biochemistry analyzer facilitated the tests, with a legal BAC threshold set at 0.8 g/L. In addition to blood alcohol levels. social characteristics and accident-related information were directly obtained from the injured individuals or their relatives. In order to analyze the encrypted results, Fisher's exact test and Chi-square tests were used with Epi Info version 7. The significance level for all statistical tests was set at P 0.05. Participation in the survey was voluntary, and consents were obtained from all survey participants.

RESULTS

Injury characteristics

There were 434 road traffic accident patients treated at CNHU-HKM's Forensic Department's Emergency Care Clinic during the study period. There were 116 participants who met the inclusion criteria, and ultimately 74 consented. Blood alcohol levels were measured in 40 injured individuals after 34 blood samples were excluded from the laboratory. Approximately 80% of the study population comprised men, establishing a male-to-female ratio of 4 to 1. The mean age of the injured individuals was 40 years, ranging from 20 to 70 years, with 60% being under 45 years old. Notably, 53.8% of the injured did not initiate or complete the primary study procedure. Additionally, 32 individuals lacked regular employment, and three reported a history of alcohol addiction among the injured.

Accidents and their causes

In 83.8% of cases handled by the Forensic Department's Emergency Care Clinic at CNHU-HKM, the injured individuals were traveling on two-wheel vehicles, while the remaining cases involved drivers of light or heavy vehicles and pedestrians. Car drivers constituted the majority, making up 76.3% of the injured persons. Of the accidents, 25 occurred between 12 hours, and 20 incidents transpired during the weekend. Asphalted roads were the site for 25 cases. Interestingly, one out of every two injured persons (10 out of 40) admitted to consuming an alcoholic drink an hour before the accident or crash. Among them, four individuals consumed beer. Tragically, seven accidents resulted in fatalities.

Groups	Number of Cases	Case with	
		Illegal Blood Alcohol Level (N)	
Two-Wheeler	25	16	
Four-Wheeler	4	1	
Traveler	8	4	
Footpath	3	1	
Total	40	22	

Table 1. Blood alcohol levels at illegal levels.

Factors associated with ethanol consumption

Among the study population of the Forensic Department, the average blood alcohol level was calculated to be 1.19 g/L, ranging from 0.027 to 4.1 g/L. Motorcyclists were the most significantly affected group, with 22 injured individuals exhibiting blood alcohol

levels exceeding 0.8 g/L (see Table 1). Ingestion of ethanol was found to be more common in men (P=0.032) than in women (see Table 2). The results of bivariate analyses revealed no association between the frequency of ethanol consumption and factors such as the type of road, the type of accident, and the age of the injured.

Table 2: Casualties with blood alcohol content (BAC) above the legal limit (0.8 g/L) depending on characteristics and circumstances

Characteristics	Groups	Blood Alcohol	Blood Alcohol	Total	Р
		Concentration <0.8	Concentration ≥0.8	(N=40)	
		g/L	g/L		
		(n=18)	(n=22)		
Gender	Male	13	18	31	0.033
	Female	5	4	9	
Age group, y	20-30	6	6	12	0.66
	31-40	7	8	15	
	≥41	5	8	13	

	Weekday	9	11	20	
Day of the accident	Weekend	9	11	20	0.65
	Day	6	10	16	
Time of accident	Night	12	12	24	0.19
	Yes	10	16	26	
Driving license	No	8	6	14	0.67
	Yes	12	14	26	
Medium and high speed road	No	6	8	14	0.62

Table 3: A driver's BAC was above the recommended level at the time of the accident, which had serious consequences

Characteristics	Blood Alcohol Concentration <0.8 g/L N=18	Blood Alcohol Concentration ≥à 0.8 g/L N=22	Total N=40	Р
Multiple traumas	3	3	6	0.80
>5 days hospitalization	15	19	34	0.85

Ethanol consumption and its consequences for humans

Among the admitted injured individuals within the Forensic Department's study, six were in a state of shock, while five presented with multiple traumas. Traumatic injuries predominantly affected the pelvic limbs (31.5%), skull (25.8%), front (16.1%), thoracic limbs (12.9%), and trunk (9.6%). Hospitalization for more than five days was necessary for 34 injured individuals, as outlined in Table 3. Unfortunately, one of these hospitalizations resulted in a fatality. Bivariate analyses did not establish a significant in between Blood Alcohol Concentration and the injury profile of the victims. On average, each accident impacted +3/-2individuals, with a range from 1 to 6 injured persons. Remarkably, three car drivers involved in fatal accidents were found to be under the influence of alcohol ingestion.

DISCUSSION

A forensic study was conducted on road accident victims admitted to CNHU-HKM to determine their blood alcohol levels. In the field, the blood alcohol levels were measured using the enzymatic method rather than gas chromatography. A total of 40 patients were included in our study, the majority of whom were young men (64%) aged under 45 years old (70%), and who primarily traveled by motorcycle (83%). Lighting and road conditions are likely to have a significant impact on accidents that often occur at night and on weekends globally, as shown in previous studies in Cotonou and other African countries.

Among our study participants, 55% reported consuming alcohol before the accident, a three-fold increase over self-reported alcohol consumption. Studies have shown that there is high awareness of driving under the influence's dangers, so the discrepancy may reflect guilt and fear of sanctions. According to findings in Côte d'Ivoire, 64% of motorcyclists reported ingesting ethanol, while 25% of injured car drivers reported doing so. Legal controls are less frequent in African countries than in European countries with a lower prevalence of alcohol ingestion. Studies show that people in the U.S. believe the reevaluation of legal blood alcohol levels won't have a significant effect on their habits as a result of sensitization efforts.

Studies on reaction time and road holding have shown that alcohol adversely affects drivers' alertness and driving capabilities. It is also becoming increasingly common for road users to combine alcohol with psychoactive substances. It is possible that the small sample size may have influenced our finding that the severity of injuries was not directly associated with ethanol consumption.

Case-control studies in the United States have shown that accidents involving alcohol-impaired drivers are associated with more injuries and deaths. Drunken drivers who arrive at the hospital injured rarely face criminal charges despite the potential for severe penalties.

CONCLUSION

It appears that alcohol consumption was prevalent among traffic accident victims shortly before the incidents, according to the findings of this preliminary forensic study. In order to precisely elucidate the factors associated with alcohol consumption, future research initiatives must incorporate larger sample sizes and utilize gas chromatography methods. A further benefit of these studies is that they will provide insights into the correlation between psychotropic substances and alcohol use on the road among road users.

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