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# Blood alcohol concentration in fatal traffic accidents in the Federal District, Brazil

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## ABSTRACT

The objective of the study was to assess the association between high blood alcohol levels and fatal victims of traffic accidents in the Brazilian Federal District, in 2005. A total of 442 casualties (163 pedestrians, 84 victims of overturns, and 195 of collisions) were studied. Blood alcohol concentration was analyzed in 238 cases (53.7%). Most victims were young males, aged between 18 and 35 years. Blood alcohol levels higher than 0.6 g/L were detected in 44.2% of collision victims; 57.7% of victims of overturns and 32.5% of pedestrians. The difference in proportions between overturn victims with blood alcohol concentration higher than 0.6 g/L and those victims of other traffic accidents was statistically significant.

**DESCRIPTORS:** Alcohol Drinking. Accidents, Traffic, mortality. Risk Factors. External Causes.

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## INTRODUCTION

Since the early 1980s, external causes have ranked third as cause of deaths in Brazil and traffic accidents are the second most common cause of death in this group. In 2000, traffic accidents accounted for 29,640 fatal victims (25% of all external causes).<sup>3</sup> Mortality rates due to traffic accidents in Brazil ranged between 16.1 per 100,000 inhabitants in 1994 and 18.9 per 100,000 in 2004. In the Brazilian Federal District, this rate was 19.5 per 100,000 in 2005.

Reckless driving behavior (70%) associated to alcohol use is a leading factor among human-related causes of accidents. Compared to sober drivers, those under the influence of alcohol are seven times more likely to have fatal accidents. A Lancet<sup>1</sup> editorial published in 1907 already pointed out to the clear relationship between alcohol consumption and traffic accidents.

The objective of the present study was to assess blood alcohol concentration (BAC) in fatal victims of traffic accidents.

## METHODS

Observational case series study conducted in 2005.

A total of 442 fatal victims of traffic accidents aged 16 years or more who were admitted to the Brazilian Federal District Institute of Forensic Medicine (IML-DF) were included in the study. Of these, 238 had their BAC measured. The remaining cases (204) were excluded based on the following these criteria: time elapsed between injury and death greater than six hours; history of previous hospital admission; time elapsed between death and autopsy greater than 24 hours; major mutilations or left diaphragm rupture.

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High BAC was defined as measures higher than 0.6 g/L, the allowed cutoff level for drivers by the Brazilian Traffic Code.

A blood sample (50 mL) was drawn from the victim's heart chambers making sure there was no contamination with the pericardium and pleural cavity. Blood samples were stored in the refrigerator and analyzed using gas chromatography. Statistical analysis was conducted using EpiInfo version 3.3.2.

## RESULTS

Of 442 fatal victims, 368 (83.1%) were males, mostly mulatto (72.9%), aged between 16 and 62 years, and 63.9% were single. Collisions between motor vehicles accounted for 195 (44%) deaths, followed by runovers (163 deaths; 36.8 %) and overturns (84 deaths; 19 %).

The Table shows the distribution of deaths by BAC and type of accident.

Deaths occurred on average 1.3 hours after injury, mean time between death and autopsy was 18.9 hours, median 12 hours and mode 14 hours. Overall mean BAC was 1.92 g/L  $\pm$  0.83. Most accidents were at night and over weekends. High BAC was found in 42.8% of fatal victims.

Of 80/163 runover victims who had their BAC checked, high levels were seen in 26/80 (32.5%), ranging between 1.1 g/L and 4.4 g/L (mean 2.46 g/L  $\pm$  0.88).

In regard to overturns, 45/84 cases were studied and 26/45 (57.8%) showed high BAC, ranging between 0.7 and 3 g/L (mean 1.7 g/L  $\pm$  0.88).

Of those victims who had high BAC (22/26), 84.6% were driving the vehicle.

Of 113/195 collision victims studied, 50/113 (44.2%) had high BAC, ranging between 0.7 and 3.9 g/L (mean 1.81 g/L  $\pm$  0.74 and median 1.7 g/L).

A greater proportion of victims with high BAC was seen among overturns than both runovers (OR=2.84, 95% CI: 1.25;6.50,  $p=0.01$ ) and runovers plus collisions (OR=2.11, 95% CI: 1.04; 4.29,  $p=0.03$ ). On the other hand, the comparison between victims with high BAC

in overturns plus collisions and collisions plus runovers did not show any statistically significant difference.

## DISCUSSION

The study results confirmed the early assumption that a significantly high proportion of fatal victims of traffic accidents in the Brazilian Federal District (42.8%) had BAC above that allowed by law. Based on the concentrations found – despite measured in dead bodies –, it can be inferred that alcohol has likely contributed, at varying degrees, to the death event. The study data also show greater involvement of young males in traffic accidents.

A greater proportion of high BAC was seen among victims of overturns (57.7%), with a statistically significant difference when compared to collisions plus runovers. On the other hand, higher mean alcohol levels were found among victims of runovers (mean 2.4 g/L), followed by collisions (1.8 g/L) and overturns (1.6 g/L).

Alcohol concentration in the blood or breath, when adequately measured and interpreted, is the most objective indicator of the level of driving impairment associated to alcohol consumption.<sup>2</sup>

Blood alcohol concentration is often used as evidence in civil and criminal lawsuits. In all cases studied, autopsy was performed in the first 24 hours preventing the effects of putrefaction. Mean survival time of victims was 1.3 hours, which also prevented the effect of other potential interfering factors such as liver metabolism. There is no significant change in alcohol concentration from death to onset of putrefaction.<sup>5</sup>

Hingson & Winter<sup>4</sup> (2003) reported that, in the United States, traffic accidents are the leading cause of death among people aged two to 33 years, and 41% of these deaths were directly or indirectly related to alcohol abuse. There are increasing risks as a result of the association between alcohol and traffic accidents making alcohol consumption and driving a major public health concern worldwide. The new Brazilian Traffic Code establishes that driving under the influence of alcohol is a traffic offense and offenders are not only subject to fines but also to vehicle seizure, suspension of driving rights and disfranchisement of driver's license. It also established a one- to six-year detention.

Raising awareness on the major effects of alcohol on driving is paramount so that public health authorities can take stricter actions for alcohol control and selling and inspection of alcohol consumption.

In conclusion, in the present study, the finding of high BAC in fatal victims of traffic accidents corroborates other previous studies. The profile of victims, with young male adults being mostly affected, was also corroborated.

**Table.** Blood alcohol concentration measurements in fatal victims of traffic accidents by type of accident. Brazilian Federal District, Brazil, 2005.

Blood alcohol concentration	Type of accident			
	Overturn	Runover	Collision	Collision + runover
> 0.6 g/L	26	26	50	76
≤ 0.6 g/L	19	54	63	117
Total	45	80	113	193

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