



## Relation between alcohol consumption and traffic violations and accidents in the region of Ribeirão Preto, São Paulo State

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### ABSTRACT

In recent years, alcohol consumption has been considered an important public health problem. Ethanol, the alcohol used in beverages, is a drug that affects the central nervous system (CNS) and impairs driving skills and co-ordination, increasing risk of deaths and injuries derived from crashes and road accidents. Consumption of alcoholic beverages is implicated with premature deaths, injuries and damages caused by motor vehicle crashes, which result in high costs to government and society. Considering that alcohol consumption is the main responsible factor for deaths and disabilities in young people, the aim of this work was to evaluate the prevalence of blood alcohol in offenders and/or fatal and non-fatal victims of traffic occurrences in the region of Ribeirão Preto, São Paulo State, from 2005 to 2007. The results revealed that in 2134 cases investigated, blood alcohol positivity was generally found in young adults, 25–45 years old and male. The study showed the high risk of drinking and driving and the importance in establishing actions of prevention and intervention to promote the reduction in the number of traffic occurrences related to consumption of alcoholic beverages.

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### 1. Introduction

Alcohol is one of the most consumed drugs in the world, because it is a legal substance, highly acceptable and easy to purchase [1]. It is considered a psychotropic drug, as it acts on the central nervous system (CNS). Alcohol gives drivers of motor vehicles a false sense of confidence, impairing their ability and motor coordination [2]. Several researchers have demonstrated that the fact of driving under the influence of alcohol is a bit worrying, because it increases the risk of involvement in violations and traffic accidents, resulting in often fatal victims and damages to the community [1,3,4]. Besides that, the risk of involvement in traffic accidents increases with the extent to which there is an increase in the concentration of alcohol in the driver [1,2,5–7].

Data provided by the World Health Organization (WHO) indicated that approximately two billion people worldwide consume alcohol and this consumption may have caused 1.8

million deaths during the 2004 year, of which 1/3 are represented by trauma. Injuries from traffic accidents account for 2.1% of total fatalities and 23% of deaths from external causes reported annually worldwide [8].

The Brazilian government estimates that over 350 thousand accidents with casualties are reported in Brazil every year. Thirty five thousand were fatal victims and 315 thousand were injured [9]. Another report performed during 2007 showed that the southeast region shows the largest proportion of deaths by traffic accidents compared to other Brazilian regions, representing 41% of all the cases in the country, and that cities with more than 500,000 inhabitants have the largest number of deaths (32%). Thus, in addition to the impact on public health, contributing to reducing the quality and life expectancy, traffic accidents also generate high social costs in health care, welfare, absenteeism at work and school [9]. The prevention of intoxication by alcohol is a powerful strategy to reduce the damage caused by alcohol, and must be one of the objectives of public policies [4]. On the complexity of the problem, the available literature in Brazil is still very poor, since systematic studies evaluating the risk of drinking and driving are very well covered and reported. Based on this information, the purpose of

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**Table 1**  
Statistical results of BAC (g/L) of offenders and victims from traffic violence.

	<i>n</i>	Mean	Median	Standard deviation	Minimum	Maximum
Total	2134	2.09	2.07	1.53	0.00	8.81
Positive	1654	2.68	2.52	1.21	0.61	8.81
Negative	480	0.05	0.00	0.13	0.00	0.60

this study was to evaluate the alcohol presence in the blood of offenders and/or victims of traffic accidents, occurring in the region of Ribeirão Preto, between the years 2005 and 2007, and delineate the general profile of these individuals, as well as to provide subsidies to support the implementation and development of public policies.

## 2. Materials and methods

### 2.1. Study delineation

During the present study we investigated the prevalence of alcohol consumption by offenders and/or victims involved in fatal and non-fatal traffic accidents, occurring in the region of Ribeirão Preto city, São Paulo State, Brazil, between the years 2005 and 2007. The study was performed in the Forensic Toxicology Laboratory, Center of Legal Medicine (CEMEL), Faculdade de Medicina de Ribeirão Preto, Universidade de São Paulo and in the Centro de Exames, Análises e Pesquisas, Polícia Técnico-Científica, Núcleo de Perícias Médico Legais de Ribeirão Preto. We also characterized the general profile of the individuals involved in the traffic accidents in the region of the study.

The region of Ribeirão Preto was separated in 5 sub-regions: Barretos, Franca, Ituverava, São Joaquim da Barra, and Ribeirão Preto, which together provide assistance for more than 60 cities.

### 2.2. Inclusion and exclusion criteria

The study involved individuals living and dead, over 18 years old, who had been involved in violations and traffic accidents as driver, passenger, pedestrian or cyclist.

### 2.3. Toxicological analysis

Blood samples from offenders and victims of non-fatal traffic accidents were collected by puncture in the anterior cubital vein of the arm by nurses in the Basic Health Units and Hospitals. In cases of fatalities, samplings were made by puncture in larger vessels such as subclavian or femoral artery by the auxiliary staff of the autopsies room. Samples were placed in 4 mL plastic tubes containing sodium fluoride and EDTA, properly identified and stored immediately after their arrival at the laboratory in a refrigerator at 4 °C until the analysis. The method used for alcohol analysis was gas chromatography with a flame ionization detector using the headspace technique [10].

### 2.4. Data analysis

The BAC results were digitized and stored in a database program supplied by Microsoft Access 2000 version, using information collected from police requisitions. To determine the prevalence of alcohol in the biological specimen, values of BAC higher than 0.6 g/L indicate positivity, that is the maximum permitted limit by the National Council of Transit (CONTRAN) during the studied period. It is important to point out that as soon as the study was finished Brazilian government established a limit of BAC equal to 0.2 g/L for driving. Because of that, we re-analyzed all the data of this study using a cut-off equal 0.2 g/L, but the obtained results were not significantly different when compared with that using a cut-off equal 0.6 g/L.

We performed a descriptive analysis to characterize the samples. Contingency tables (cross-tables), presenting the variables involved in the study with respect to the response variable (alcohol) was obtained, as well as descriptive measures for continuous variables (age and concentration). We used the distribution of Chi-square for the verification of differences between the proportions of positive results of alcohol in the different categories of variables: gender, age, marital status, ethnicity (skin color), sub-regions, year of occurrence and different categories of traffic accidents, considering the statistical significance of 0.05. The logistic regression model was then established to evaluate the association of independent variables gender, age, marital status, ethnicity (skin color), sub-regions, year of occurrence, and the different categories of traffic accidents with the probability of the outcome of the presence of alcohol being positive (dependent variable). For the independent variables, we calculated the gross odds ratio (OR) and adjusted by gender and age, with confidence intervals of 95%. Thus, with OR adjusted, we obtained measurements of associations between each independent variable and dependent variable without the influence of the confounding variables of gender and age, knowingly associated with blood alcohol positivity.

### 2.5. Ethical aspects

This research was submitted and approved by the Ethics Committee on Human Research in the Faculty of Pharmaceutical Sciences of Ribeirão Preto, University of São Paulo.

## 3. Results

### 3.1. Blood alcohol concentration

During the period of 2005 and 2007, 2134 blood samples were received by the Centro de Exames, Análises e Pesquisas, Polícia Técnico-Científica, Núcleo de Perícias Médico Legais de Ribeirão Preto. Among these 2134 studied cases, 77.5% ( $n = 1654$ ) had a blood alcohol concentration exceeding 0.6 g/L, therefore positive, and 22.5% ( $n = 480$ ) had no blood alcohol concentration or blood alcohol was equal to or less than 0.6 g/L, being classified as negative. The average concentration of alcohol in the blood of all offenders and victims of traffic accidents was 2.09 g/L, which was approximately 3-fold higher than the permitted level of alcohol according to Brazilian law at the beginning of the study (Table 1). When we analyzed only the average concentration of alcohol in the blood of individuals who were positive for alcohol, with values between 0.61 and 8.81, we reached a BAC value of 2.68 g/L. This concentration is around 4-fold higher than the limit permitted by the existing law during this research (Table 1).

This study showed that the number of blood samples received by the CEAP during the years of 2005 and 2006 was 664 and 633, respectively. These samples represent 31.12% and 29.66% from the total of 2134 samples received during all the studied period. In contrast, there was a small increase in the prevalence of positive cases, which was 77.86% in 2005 and 80.73% in 2006.

Comparing 2005 with 2007, we observed an increase from 664 to 837 cases, which represent 31.12% and 39.22%, respectively, from the total of 2134 samples received during all the studied period. On the other hand, we observed a small decrease in the prevalence of positivity, which was 77.86% in 2005, and 74.79% in 2007.

The comparative analysis between 2006 and 2007 also showed an increase in the number of cases, from 29.66% to 39.22% of all received samples, and a reduction from 80.73% to 74.79% in the positivity rates. In general, there was significant variation in the number of positive cases during the studied period ( $p = 0.02$ ) (Fig. 1).

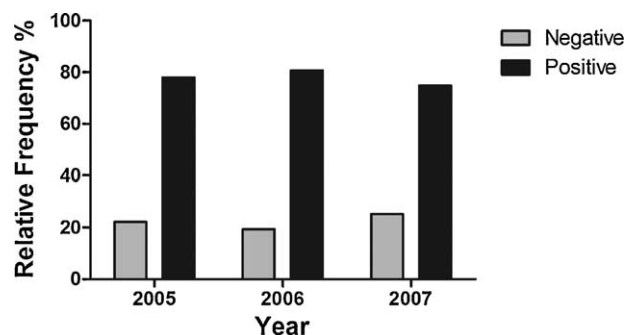


Fig. 1. Frequency of alcohol positive rate and period of study.

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