Death rates from alcohol-associated road traffic crashes among vulnerable road users in 5 Brazilian capital cities

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Abstract

Background
In Brazil, vulnerable road users (VRUs) including motorcyclists, pedestrians, and bicyclists, comprised more than half of all fatal road traffic injuries (RTIs) in 2010. Alcohol is a major risk factor for RTI, which is being targeted by the Global Road Safety Initiative (RS10) in five capitals. Few published studies on alcohol-associated RTI exist at the national level.

Aims
To analyze the prevalence of blood alcohol content among motorcyclists and pedestrians involved in fatal traffic crashes in five intervention Brazilian cities from 2000-2010: Palmas (North); Teresina (Northeast); Campo Grande (Midwest); Belo Horizonte (Southeast); and Curitiba (South).

Methods
Mortality rates were calculated based on Brazilian Ministry of Health data using ICD-10 codes, and disaggregated by sex, age, and city. The prevalence of alcohol associated RTI mortality was estimated after applying the proportion of deaths found to be positive for alcohol in another Brazilian capital.

Results
The prevalence of blood alcohol content among VRUs was highest in Palmas and lowest in Belo Horizonte; compare 10.07/100,000 inhabitants and 5.95/100,000 inhabitants respectively. The rates observed in Palmas and Teresina (9.91) are well above the national rate of 6.9/100,000 inhabitants. The blood alcohol content among VRUS in Curitiba and Campo Grande (both 6.61) are slightly below the five Brazilian capital cities rate.

Discussion and conclusions
Blood alcohol content in fatal traffic crashes among VRUs indicates the need for policy reform and renewed enforcement, including increased breath testing. Further analyses can help target interventions toward at-risk groups.

Introduction
Alcohol is a major factor in traffic crashes worldwide and the consequences are more likely to result in injuries and deaths than crashes when alcohol is not a factor. The National Highway Traffic Safety Administration (NHTSA) informed 41% of people fatally injured in traffic were in alcohol-related crashes (Hingson, 2003).
In Brazil the Road Traffic Accidents (RTA) has remained stable since the Brazilian Vehicle Code (BVC) in 1998 (around 20 deaths per 100,000 inhabitants). In Japan, Sweden and Canada the rates are around five to eight deaths per 100,000 (WHO, 2009).

Studies demonstrate the occurrence of collisions and pedestrian accidents are reflections of cities that have grown in a disorganized way, with no enough urban planning and education to the changes in attitudes and behaviors needed (HSE, 2005). Among the RTI victims, the more vulnerable are motorcyclists, cyclists and pedestrians.

That phenomenon is noticeably more intense in urban areas with higher population density (Minayo, 2003) which accumulate about 75% of total deaths caused by accidents and violence, which were the main causes responsible for Potential Years Loss of Life (PYLL).

When studying the health indicator PYLL, the concentration of deaths in early ages and young adults, and the high values that they have, makes these causes the most important groups within the external causes (Mello and Latorre, 1994). Thus, large losses are resulting from traffic accidents among young people in large urban centers of our country.

According to Rio de Janeiro Traffic Department 92% of deaths occur by human failings, of which 35% occur for alcohol abuse (DETRAN, 2004).

The Blood Alcohol Concentration (BAC) >0.6 grams of alcohol per liter of blood is considered a criminal offense in Brazil, since 2008 with the Zero Tolerance law. After that, few studies suggested the new law was effective in the months immediately after the law came into force, but it was true just for a limited period (Mello, 2009; Moura, 2009).

In Brazil, road traffic accidents will be the fourth leading cause of mortality according to the projected scenario for 2030 based on the Global Burden of Disease study prepared for the 1990 to 2020 period. These projections show perspectives on future trends based on the past, taking into account trends such as the ageing of the population, the epidemiological transition in the countries, economic and social development (Matters, 2005).

With the objective to better understand the present scenery, this study aimed to analyze the estimated prevalence of blood alcohol content among VRUs involved in fatal traffic crashes in five RS-10 Brazilian cities.

**Methods**

Mortality rates were calculated based on Brazilian Ministry of Health (MoH) public data using the WHO 10th Revision of the International Classification of Diseases and Related Health Problems (ICD-10) codes V01 to V89, and disaggregated by sex, age, and city.

Data on mortality represent all deaths occurred among the years 2000 to 2010, available from the Mortality Information System of MoH on the Informatics Department of Unified Health System (DATASUS) web site. The files from the period were
downloaded and the registers related to the five cities were extracted using Brazilian public software from DATASUS.

The prevalence of alcohol associated RTI mortality was estimated by applying the prevalence of alcohol level based on data published of another Brazilian capital (Abreu et al, 2010). The proportion of 23.8 deaths with BAC above 0.1g/L was applied on the generated data, based on the specific study which results were obtained from the registers of blood alcohol rates of Legal Medicine Institute analyzes.

Results

The estimated BAC prevalence among RS-10 Brazilian cities traffic accidents death rate was the highest in Palmas (10.07/100,000 inhabitants) and the lowest in Belo Horizonte (5.95/100,000 inhabitants). The observed rates from Palmas and Teresina (9.91) are well above the national rate of 6.9/100,000 inhabitants. The blood alcohol content among Curitiba and Campo Grande (both 6.61) are slightly below the five Brazilian capital cities rate (see tab. 1). The Brazilian Capitals BAC average death rate is 21.0/100,000 inhabitants.

<table>
<thead>
<tr>
<th>Capital</th>
<th>Deaths</th>
<th>Population</th>
<th>Death Rates*</th>
<th>Alcohol deaths (estimated)</th>
<th>BAC death rates (estimated)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palmas</td>
<td>80</td>
<td>188,026</td>
<td>42.3</td>
<td>19</td>
<td>10.1</td>
</tr>
<tr>
<td>Teresina</td>
<td>323</td>
<td>774,874</td>
<td>41.6</td>
<td>77</td>
<td>9.9</td>
</tr>
<tr>
<td>Belo Horizonte</td>
<td>588</td>
<td>2,352,424</td>
<td>25.0</td>
<td>140</td>
<td>6.0</td>
</tr>
<tr>
<td>Curitiba</td>
<td>480</td>
<td>1,728,878</td>
<td>27.8</td>
<td>114</td>
<td>6.6</td>
</tr>
<tr>
<td>Campo Grande</td>
<td>203</td>
<td>731,408</td>
<td>27.7</td>
<td>48</td>
<td>6.6</td>
</tr>
<tr>
<td>Total RS-10</td>
<td>1,674</td>
<td>5,775,610</td>
<td>29.0</td>
<td>398</td>
<td>6.9</td>
</tr>
</tbody>
</table>

*per 100,000 inhabitants

Among the estimated BAC death rates from the five cities, when comparing the pedestrians and motorcyclists’ rates we found different indexes from general BAC death estimated rates.

Belo Horizonte presented the highest pedestrian BAC death estimated rate (2.3/100,000 inhabitants) but the lowest one for motorcyclists (0.9/100,000 inhabitants). Palmas and Teresina had the higher indexes for BAC deaths, 3.3 and 3.1/100,000 inhabitants respectively, related to motorcyclists, the only two very above the RS-10 average 1.4/100,000 inhabitants (see tab. 2). These results could be explained for the cities have the two largest motorcyclist fleets but as well they had the higher death proportions related to the fleet – Palmas 8.82 and Teresina 10.98. The average proportion among the Brazilian RS-10 cities is 6.98.
Table 2. VRU's Traffic Accidents Brazilian Average Rates, Road Safety 10 Cities, 2000-2010

<table>
<thead>
<tr>
<th>Capital</th>
<th>Pedestrians</th>
<th></th>
<th></th>
<th>Motorcyclists</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Deaths* rate</td>
<td>Alcohol deaths (%)</td>
<td>BAC deaths rate*</td>
<td>Deaths* rate</td>
<td>Alcohol deaths (%)</td>
<td>BAC deaths rate*</td>
</tr>
<tr>
<td>Palmas</td>
<td>7.2</td>
<td>3</td>
<td>1.7</td>
<td>13.9</td>
<td>6</td>
<td>3.3</td>
</tr>
<tr>
<td>Teresina</td>
<td>8.7</td>
<td>16</td>
<td>2.3</td>
<td>3.7</td>
<td>24</td>
<td>3.1</td>
</tr>
<tr>
<td>Belo Horizonte</td>
<td>9.7</td>
<td>54</td>
<td>2.1</td>
<td>7.3</td>
<td>21</td>
<td>1.2</td>
</tr>
<tr>
<td>Curitiba</td>
<td>9.0</td>
<td>37</td>
<td>2.1</td>
<td>4.9</td>
<td>20</td>
<td>1.2</td>
</tr>
<tr>
<td>Campo Grande</td>
<td>5.2</td>
<td>9</td>
<td>1.2</td>
<td>6.0</td>
<td>10</td>
<td>1.4</td>
</tr>
<tr>
<td>Total RS-10</td>
<td>8.7</td>
<td>119</td>
<td>2.1</td>
<td>6.0</td>
<td>82</td>
<td>1.4</td>
</tr>
</tbody>
</table>

*per 100,000 inhabitants

Considering the age risk factor, male pedestrians (30 to 49 years) are likely to death in traffic accidents than female (50 to 79 years) among all RS-10 Brazilian cities. The motorcyclists’ fatal injuries traffic-related presented the same age group from 20 to 29 years for male and female groups in all analyzed cities.

Capitals from Southeast and South have the higher annual per capita gross national product (GNP) in 2010: Belo Horizonte (US$ 9,091) and Curitiba (US$ 12,360). In Belo Horizonte we observed the highest BAC deaths estimate rate for pedestrians and the lowest for motorcyclists. Curitiba presents the RS-10 Brazilian cities traffic accidents average rates for pedestrians and lowers BAC than the total RS-10 for motorcyclists. Campo Grande presents the same average for both estimative rates for pedestrians and motorcyclists. Palmas and Teresina are the highest BAC deaths estimated rate for motorcyclists, with the greater proportion of motorcycles related to the vehicles fleet.

**Discussions and Conclusion**

The blood alcohol testing was not actually done on traffic fatal victims in this study. Were used the results observed in another Brazilian capital study- Rio de Janeiro. But it is possible to estimate the presence of alcohol use by extrapolating data. The estimated results presented large rates of deaths by traffic accidents alcohol related mainly on North and Northeast Regions.

The results of the study demonstrate that a big sample was among the most vulnerable road user motorcyclists, and this may be explained by the higher proportions of motorcycles related to the vehicles fleet. Similar studies from WHO indicate in low-and middle-income countries in Africa, Asia and Latin America, the traffic accidents victims are mainly pedestrian, cyclists and other two-wheel vehicles. Among them, the low-income are the majority (Nantulya, 2002). Pedestrians are still at higher risk of death with increasing tendency (MoH, 2010).

Pedestrians impaired by alcohol influence the risk of a road traffic crash and also the severity and outcome of injuries that result from it, as fatal injuries. Many risk factors as lack of pedestrian facilities in roadway design and land-use planning, inadequate visibility, conflict at crossing points and many others (WHO, 2013) can be controlled by implementing pedestrian safety policies.
It is not possible to neglect the responsibility to implement actions to reduce alcohol-related accidents and then, save lives.

Although there is not a national study that provides BAC prevalence to all Brazilian Cities, the Road Safety 10 Cities Project is developing some interventions to obtain these indices. Then, it will be possible to identify if there is differences among cities and road users.

Anyway, we need to change the present scenario with so high traffic accidents death rates by improving the road conditions, educating people, enforce BAC limits and law enforcement. Besides that it is necessary to integrate the information systems among traffic agencies, health, security and forensics for achieving a quality database. This would allow the definition for effective public policies and the evidence-based decision making to target interventions toward at-risk groups.

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