Belgian Toxicology and Trauma Study (BTTS): alcohol in road traffic accident victim drivers related to day/night, week/weekend, type of accident and victim age.

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ABSTRACT

A total of 2053 cases have been included, of which 74 % were male. More than one third (male 34.7 %, female 33.8 %) was less than 25 years old. After correction for time length (weekend 60 h, week 108 h), the number of cases during the weekend was not significantly different from that during the week (ratio weekend/week: 1.063). However 59 % of weekend accidents occurred during nighttime (20 - 8 h), as opposed to only 31 % during the week.

In weektime accidents, 22 % of the victims had blood alcohol concentration (BAC) exceeding 0.5 g/L and 14 % exceeded 1.5 g/L. In weekend accidents these figures rose to 39 % and 24 % respectively. The highest BAC were seen in nighttime accidents (48.7 % BAC > 0.5 g/L and 30.7 % BAC > 1.5 g/L), especially during the weekend (54.3 % BAC > 0.5 g/L and 32.7 % BAC > 1.5 g/L).

Alcohol abuse was significantly more present in single vehicle accidents (42 % BAC > 0.5 g/L), compared to inter-road-user accidents (16 % BAC > 0.5 g/L).

Notwithstanding the fact that nearly 50 % of all included accident victims were 14 - 30 years of age, the percentage of drunk drivers in this group seems not to be higher than in the older ones, except on the night from Friday to Saturday.

Keywords: Ethanol Traffic accidents, trauma
INTRODUCTION

It is estimated that 3 - 4% of journeys by car involve drivers with a blood alcohol of 0.5 g/L or more, but these drivers cause 15 to 40% of the traffic accidents with severe injury (Alvarez et al. 1996, Direction Générale des Transports de la Communauté Européenne 1995). Different studies have shown that the alcohol-related accident risk is equal to that for sober drivers up to 0.4 g/L. For drivers at BACs around 1.5 g/L, the accident risk is about 25 times as high as it is for sober drivers (Krüger et al. 1995). The percentage of drivers who have alcohol above the legal limit varies greatly between studies. The Belgian Toxicology and Trauma Study was set up to determine the prevalence of positive alcohol and drug findings in injured drivers, the nature and the severity of the injuries and the relation between these findings.

METHODS

The methods of the study have been presented in detail in another presentation (BTTS study research group 1997). Briefly, we studied 2053 injured vehicle (motorized vehicle or bicycle) drivers, older than 14 years, who were admitted for at least a day in five hospitals in Belgium. A detailed history, a blood and a urine sample were taken. Ethanol was analyzed within 7 days on fluoride oxalate blood by Radiative Energy Attenuation (REA) on an ADx analyzer. All positive samples (ethanol > 0.1 g/L) were confirmed by GC-FID in a central laboratory.

Figure 1: Distribution of the ethanol concentrations in the 1871 BTTS injured vehicle drivers.
RESULTS

Blood could not be obtained in 182 patients (8.9 %), so that the results will be given on a total of 1871 cases. The distribution of the levels is shown in figure 1. One thousand three hundred and forty two patients (72 %) had a blood alcohol concentration (BAC) at the time of sampling (i.e. without correction for the metabolism between the accident and the sampling time) lower than 0.5 g/L. Out of the remaining 529 (28 %), approximately two thirds (65.6 %) had a BAC above 1.5 g/L, and more than one third (37.6 %) had a BAC higher than 2.0 g/L.

These results were correlated with the declarations of the patients on their recent ethanol use. Out of the 521 patients who declared not to have drunk alcohol in the week prior to the accident, 3.3 % had BAC > 0.5 g/L. In the patients who admitted alcohol consumption, 37 % were positive (> 0.5 g/L). In ‘regular’ alcohol consumers (more than 30 standard glasses in the week prior to the accident), 70 % were positive.

The prevalence of positive alcohol (> 0.5 g/L) showed a progressive increase with age until the 35 - 39 age group. A secondary peak was observed in the 50 - 54 year age group. (figure 2).

Figure 2: Percentage of ethanol positives in function of age
The percentage of drivers who had a BAC higher than 0.5 and 1.5 g/L at different times is given in table 1. The highest percentages of positives are seen in the weekend, at night (20 h - 8 h) and on Saturday night.

In all age groups, one observes that drivers, victim of an accident at night have a higher percentage of positive ethanol findings. All age groups show a high percentage of positives on Saturday night, but there are some age-dependent pictures: the high percentage of positive forty-year-olds on Sunday (50 %) and on Tuesday night (54 %), fifty-year-olds on Monday night (60 %), thirty-year-olds on Sunday night (61 %). This suggests a diversity of going-out subcultures, on a background of a higher percentage of ethanol intoxication at night-time.

The distribution of positives according to the vehicle shows the highest proportion of positives amongst the car drivers (33.9 %) followed by drivers of motorcycles (23.9 %) and bicycle riders (13.6 %).

Table 1: Percentage of the included patients who had a BAC above 0.5 and 1.5 g/L at different times.

<table>
<thead>
<tr>
<th>Time period</th>
<th>Percentage with ethanol</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&gt; 0.5 g/L</td>
</tr>
<tr>
<td>Week</td>
<td>22</td>
</tr>
<tr>
<td>Weekend</td>
<td>39</td>
</tr>
<tr>
<td>Day</td>
<td>14</td>
</tr>
<tr>
<td>Night</td>
<td>49</td>
</tr>
<tr>
<td>Weekend nights</td>
<td>54</td>
</tr>
<tr>
<td>Saturday night</td>
<td>61</td>
</tr>
</tbody>
</table>

Ethanol intoxication occurred significantly more frequently in drivers involved in accidents without a primary collision (42 % > 0.5 g/L, 30 % > 1.5 g/L) en in collisions with an obstacle (42 % and 26 %), than in collisions between road users (16 % and 9 %).

The global mortality in patients with an alcohol concentration above 0.5 g/L was higher than in other victims (4.9 vs. 3.7 %) and increased with the ethanol level. The risk of severe cranial and thoracic lesions is also higher in the ethanol-intoxicated group. The theoretical
survival chances (ASCOT Ps), derived from the severity of the lesions, were significantly lower in the alcohol-positives and the survival chances decreased with increasing BAC. In patients with a BAC above 1.5 g/L, four times more patients had an ASCOT based probability of survival < 50 % compared to those with a BAC < 0.5 g/L.

Table 2: Relative risk (with 95 % confidence interval) of an Injury Severity Score (ISS) higher than 16, a theoretical survival chance (ASCOT Ps) of less than 50 % and death when different levels of ethanol in blood are exceeded. The values in bold are statistically significant.

<table>
<thead>
<tr>
<th>BAC &gt;</th>
<th>Relative risk (compared to alcohol &lt; 0.5 g/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ISS &gt; 16</td>
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<tr>
<td>0.5 g/L</td>
<td>1.45 (1.14 - 2.06)</td>
</tr>
<tr>
<td>0.8 g/L</td>
<td>1.43 (1.11 - 2.05)</td>
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<tr>
<td>1.00 g/L</td>
<td>1.43 (1.10 - 2.07)</td>
</tr>
<tr>
<td>1.5 g/L</td>
<td>1.44 (1.08 - 2.17)</td>
</tr>
</tbody>
</table>

DISCUSSION

We found that 28 % of the injured drivers had a BAC above the legal limit. This percentage increased to 49 % for night-time accidents, with a maximum of 61 % on Saturday night. These results are comparable to those of others who studied injured drivers in emergency departments: 19.2 % (Wu et al. 1991), 21 % (Wyss et al. 1990), 29 % (Robertson et al. 1994), 30 % (Holubowycz et al. 1994), 32 % (Orsay et al. 1994), 35.5 % (Stoduto et al. 1993) and 43 % (Soderstrom et al. 1996). The percentages for dead drivers are mostly much higher, e.g. 53 % (Deveaux et al. 1990). The higher prevalence of ethanol above the legal limit at nighttime and towards the end of the week was also found by Wyss et al. (1990) and Wu et al. (1991).

The higher prevalence of alcohol-positive drivers in single-vehicle accidents was also observed by Robertson et al. (1994).
CONCLUSION

Our findings are quite comparable to studies in other countries. More detailed analysis should allow the definition of high-risk groups, who can be targeted for preventive actions.

RÉFÉRENCES


BTTS research group. Belgian Toxicology and Trauma Study (BTTS): research methodology. Presented at the 14th International conference on alcohol, drugs and traffic safety, Annecy, September 21 - 26, 1997.


Holubowycz OT, Kloeden CN, McLean AJ. Age, sex, and blood alcohol concentration of killed and injured drivers, riders, and passengers. Accid Anal Prev 26, 483 - 492 (1994)


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