

SURVEILLANCE

The responsibility of alcohol-impaired road users in fatal road traffic accidents

Kuruc R, Sidlo J, Valent D, Mlynar J, Murarikova B

Institute of Forensic Medicine, Faculty of Medicine, Comenius University and Health Care Surveillance Authority, Bratislava, Slovakia. sidlo45@gmail.com

Abstract: The purpose of this paper was to identify the impact of intoxicated road users upon the degree of responsibility for fatal road traffic accidents.

Results: A total of 373 traffic fatalities was recorded. These cases represented 13.5 % of all autopsied cases. Alcohol intoxication was determined in 35.9 % of persons involved in road traffic accidents. The degree of responsibility of intoxicated persons was 87.3 % of all cases, of non-intoxicated persons 56.7 % of all cases. The average determined blood alcohol concentration was 1.91 g/kg.

Conclusion: The degree of responsibility for fatal road traffic accidents was 1.5 times higher among intoxicated road users than among non-intoxicated road users. Alcohol is still the most abused psychoactive substance in Slovakia. The causes of its excessive consumption are the objectives of many larger studies. It is assumed that excessive alcohol consumption can be considerably attributed to its easy availability and lack of awareness and personal responsibility of road users (*Tab. 4, Ref. 35*). Full Text (Free, PDF) www.bmj.sk.

Key words: alcohol, fatal injuries, infliction, responsibility, road traffic accidents.

Road traffic accidents constitute very important economic, social and health problems (1). Injuries in traffic accidents represent important causes of mortality mainly in industrialized countries (2, 3). It has been estimated that more than 2 million people are killed each year in road traffic accidents worldwide (4). Within the European Union (EU), 1.3 million of road traffic accidents result in 40,000 fatalities and 1.7 million injuries yearly (5). In addition, traffic accidents occur as the major cause of death of individuals of 15 to 24 years of age. One third of EU inhabitants are hospitalized during their life due to traffic accident, while the incurred medical costs exceed an amount of 160 billion euros (2–3 % of the Gross Domestic Product) (6).

Reckless driving behavior (70 %) associated with alcohol use is the leading factor among human-related causes of accidents. In 1907, a *Lancet* editorial published their viewpoint that the relationship between alcohol consumption and traffic accidents was clear (7). Compared to sober drivers, those under the influence of alcohol are seven times more likely to have fatal accidents (8). Drinking is a risk not only among users of motor vehicles, but also among pedestrians and cyclists (9).

Alcohol is consumed everyday worldwide. It is the most common substance used for recreational and relaxation purposes due to its euphoric effects. Statistics in the USA rank alcohol con-

sumption as the fourth leading cause of death after heart disease, cancer and stroke (10–12). In the year 2002, more than 17,000 people in the United States were killed in alcohol-related crashes. The latter fact represents one death every 30 minutes (13). Similarly to a number of other countries, consumption of alcoholic beverages in Slovakia is very frequent and sometimes beyond the “normal” or socially “accepted” limits. Such type of consumption represents the major cause of road traffic accidents in Europe as well (4, 14, 15).

Despite intensive campaigns in media, repeated on-road controls and other edification proceedings, the elimination of traffic participants affected by alcohol up to various levels is not successful. Neither the possible sanctions nor deterring cases of fatal traffic accidents have so far been able to persuade the motorists that alcohol simply is incompatible with driving. Recently, the problem of consuming alcoholic beverages by road traffic participants has gradually become extremely urgent.

Alcohol significantly participates in a great number of traffic accidents due to its pharmacological action on the central nervous system, manifested by increased reaction time, decreased ability to estimate correctly the space and distances as well as by increasing the feeling of self-confidence. These effects result in a significant decrease in the ability to drive safely (16). A broad range of epidemiological and pharmacological studies show a significantly positive correlation between blood alcohol concentration (BAC) in drivers, cyclists and pedestrians and the possibilities of their involvement in traffic accidents (17–19).

The evaluation of alcohol concentration in blood and its effect on an individual represent a contact point for forensic medicine and psychiatry. The effect of alcohol on an individual is

Institute of Forensic Medicine, Faculty of Medicine, Comenius University and Health Care Surveillance Authority, Bratislava, Slovakia

Address for correspondence: J. Sidlo, MD, PhD, Inst of Forensic Medicine, Faculty of Medicine, Comenius University and Health Care Surveillance Authority, Antolska 11, SK-857 01 Bratislava, Slovakia. Phone: +421.2.59357264, Fax: +421.2.63531990

fairly subjective, whereby it depends on several factors (sex, age, term and form of alcoholic beverages consumption, regularity of drinking, actual status of organisms).

Forensic medical assessment of alcohol impact on road traffic is based on the knowledge about relations between alcohol concentration in blood and disorders in sensorial, psychic and motive spheres of the particular road traffic participant. The effect of alcohol on road traffic is commonly evaluated as a general distribution of the levels of alcoholic effects (ebriety). It is modified with an accent on road traffic evaluation related to the state and the action of its individual participants.

The concentration of alcohol in blood is determined mostly by the method of gas chromatography and expressed in grams per kilogram (g/kg), which is the current SI unit that substitutes the obsolete term of per mille (%).

Concentration of alcohol in blood up to 0.20 g/kg determined by the method of gas chromatography represents a physiological concentration of alcohol (0.01–0.10 g/kg), potential laboratory error and so-called safety factor (maximum up to 0.10 g/kg); therefore it is considered to prove a nil consumption of alcoholic beverages by road traffic participant. However, it cannot be evaluated as a “negative result” or a “negative concentration”.

The concentration of alcohol in blood of 0.21–0.50 g/kg corresponds to the state after application of alcoholic beverages. It is practically not manifested by any defects in functions; neither of medical examinations can verily prove that a person has consumed alcoholic beverage and recently been affected by alcohol. However, it can be proved by examination of the exhaled air, namely by so-called “breath test”, and by laboratory test of blood referred to as “blood test”. Important is that the concentration of 0.31 g/kg of alcohol in blood determined by the method of gas chromatography is of significant importance from the legal point of view because it represents the lower limit of alcohol concentration allowing to draw consequences in sense of driver’s liability for violating the regulations.

The concentration of alcohol in blood of 0.51–1.00 g/kg corresponds, according to the general distribution of effects of alcohol levels, to relaxation. In this state, a driver’s ability to drive safely decreases. According to legislations of several countries, the individuals with BAC higher than 0.80 g/kg are considered drunk and totally incapable of driving a vehicle. This concentration is the legal limit for driving. For BAC between 0.5 and 0.8 g/kg, the individuals are considered “under the influence” of alcohol and the risk of being involved in a traffic accident is more than doubled (14).

The concentration of alcohol in blood of 1.01–1.50 g/kg corresponds to a light level of ebriety. In each participant of the road traffic, it brings about a subjective feeling of being in a good mood and comfortable. At this stage however, the driver overestimates his or her personal capabilities. From the legal viewpoint, it is important that in Slovakia, the concentration of alcohol in blood of 1.01 g/kg and higher represents the basis for initiating the criminal prosecution.

The concentration of alcohol in blood of 1.51–2.00 g/kg corresponds to the middle level of ebriety. The latter concentration

brings about serious defects in vision (worsened vision sharpness, narrowed field of vision, namely so-called “tunnel vision”, defects in colour perception, especially the differentiation of green and red), concentration, orientation and movements coordination. All these effects disallow safe driving. The driving behaviour becomes significantly dangerous. The driver becomes impulsive, aggressive and even violent. At BAC of 1.60 g/kg (double of 0.80 g/kg) the risk of being involved in an accident increases more than 10-fold.

The concentration of alcohol in blood of 2.01–3.00 g/kg corresponds to a heavy level of ebriety characterised by total psychical and physical lethargy, heavily defective movement coordination, comatose perception, time and space disorientation, memory failure, inability to keep own body in balance (also in position of sitting at the steering wheel), fuzziness and heavy defects in behavior. These effects make safe driving impossible, similarly other road traffic participants (pedestrians, bicyclists) are not able to participate safely in traffic. Often it is frequent that inexplicable traffic accidents of drivers at night on a straight section of road can be explained by tiredness and microsleep episodes caused by alcohol (20–22).

The presented investigation was aimed at analysing the fatal cases of traffic accidents archived at our Institute. The purpose was to recognize the rate of alcohol-related traffic accidents.

Methods

The study included all victims who died in road traffic accidents in Bratislava districts III, IV, and V, Malacky, Skalica, Senica, Pezinok and Senec during a five-year period within the years 2003–2007. All the cases were autopsied at the contemporaneous Institute of Forensic Medicine of Health Care Surveillance Authority in Bratislava. At the time of the study, the attraction zone of the Institute covered about 564,000 inhabitants, who represented 10.5 % of the total population in Slovakia. According to the national decree – Act No. 581, § 48, all traffic fatalities should be subdued to a complete medicolegal autopsy performed by medical examiner. Whole-blood samples from v. cava inferior were analysed for alcohol by gas chromatography, each sample in parallel mode, and the mean value was reported. All available police records, hospital records, and necropsy protocols including histopathological and toxicological analyses were retrospectively scrutinized. The data were analyzed according to sex and type of traffic participant – motor vehicle occupants (drivers and passengers), pedestrians and cyclists. The rate of alcohol-impaired road users was recorded and the level of alcohol intoxication was analyzed. The responsibility analysis was conducted in particular groups of persons involved in traffic road accidents. From the evaluation of rate of infliction were excluded the passengers who played only a passive role in road traffic.

Results

A total of 373 traffic fatalities were recorded within the five-year period in the years 2003–2007. The cases represented 13.5 %

Tab. 1. Distribution and number of cases related to categories of road traffic participants and alcohol intoxication.

Traffic accident	Occurrence		Intoxication	
	No	(%)	No	(%)
Drivers	137	36.7	45	32.8
Pedestrians	112	30.0	45	40.2
Cyclists	39	10.5	20	51.3
Passengers	85	22.8	24	28.2
Together (%)	373	100.0	134	av. 35.9

Tab. 2. Distribution and number of cases related to sex and alcohol intoxication.

Sex	Occurrence		Intoxication	
	No	(%)	No	(%)
Men	303	81.2	124	40.9
Women	70	18.8	10	14.3
Together (%)	373	100.0	134	av. 35.9

Tab. 3. The average and the highest concentrations of alcohol in blood related to categories of road traffic participants.

Traffic accident	Mean BAC (g/kg)	Highest BAC (g/kg)
Drivers	1.66	3.55
Pedestrians	2.07	4.46
Cyclists	2.00	3.78
	av. 1.91	

BAC – Blood Alcohol Concentration

of the latter autopsied within the monitored period. Drivers of personal and cargo motor vehicles and motorcycles represented the most frequent group of participants in fatal traffic accidents – 36.7 %. The second position is taken by pedestrians – 30.0 % who are then followed by passengers – 22.8 % and finally by cyclists – 10.5 %. Out of the ascertained cases, 303 (81.2 %) were males and 70 (18.8 %) were females. Alcohol was found in 35.9 % (n=134) of the cases. After eliminating the group of passive passengers, alcohol was found in 38.2 % (n=110) of so-called active road traffic participants. The intoxicated cyclists (51.3 %) were followed by pedestrians (40.2 %), drivers (32.8 %) and passengers (28.2 %) (Tab. 1). The percentage of cases influenced by alcohol was greater in men (40.9 %, n=124) than in women (14.3 %, n=10) (Tab. 2). The values of alcohol concentration in blood fitted in the range of 0.31–4.46 g/kg. Taking in account all the captured cases, the average concentration of alcohol in blood was 1.91 g/kg (Tab. 3). The alcohol-impaired participants were responsible for causing fatal traffic accidents in an average of 87.3 % of all cases (82.2–91.1 % according to specific categories of the road traffic participants). Rate of in-

Tab. 4. Responsibility for the traffic accident infliction related to alcohol intoxication with respect to categories of the road traffic participants.

Traffic accident infliction	Intoxication		Non-intoxication	
	No	(%)	No	(%)
Drivers	41	91.1	61	66.3
Pedestrians	37	82.2	34	50.7
Cyclists	18	90.0	6	31.6
Together/av. (%)	96	av. 87.3	101	av. 56.7

volvement in other cases fluctuated in specific categories within the range of 31.6–66.3 %, with the average value of 56.7 % (Tab. 4).

Discussion

Traffic accidents in relation to alcohol consumption by their participants represent an object of analysis in a number of studies. Some of them are focused only on motor vehicles drivers, other also on other participants of road traffic. The studies dealing with traffic accidents with fatal consequences are less frequent, prevailing are the studies monitoring all participants injured in traffic accidents. Due to the variety of other evaluated factors and various interpretations of results, the data are very often not comparable, sometime even disarranged.

The presented study has shown that participants of a high percentage of fatal traffic accidents were affected by alcohol (35.9 %, or 38.2 % after eliminating the group of passengers). The highest rate of alcohol-impairment belongs to cyclists (51.3 %) followed by pedestrians (40.2 %) and by drivers (32.8 %). In order to provide integrated data, the passengers were affected by alcohol in 28.2 % of cases. Contrary to legislation of some other countries that allow driving a motor vehicle with BAC up to 0.50–0.80 g/kg, in Slovakia and similarly in all of the Central and Eastern European countries, driving a car after consumption of alcohol is forbidden. The latter fact results in the conclusion that all proved cases of driving after consumption of alcohol are considered illegal.

The studies comparable with the presented one were performed in neighbouring countries, namely in Czech Republic and Hungary. In Czech Republic, alcohol was found present in 34.7 % of active road traffic users participating in fatal traffic accidents (23). Investigations concluded in the Csongrad County (South-East Hungary) pointed out that 56 % of drivers, 32 % of passengers, 78 % of pedestrians and 60 % of cyclists, who suffered fatal road traffic accidents, were under influence of alcohol (24). While the frequency of intoxication of drivers in this region has somewhat diminished it remained unchanged for pedestrians and cyclists (25). In other study performed in Budapest, the rates of alcohol-impairment were found to be as follows: pedestrians and cyclists 48 %, passengers in motor vehicles 33 %

(26). In a similar study performed in Greece, the impairment by alcohol was found only in 19 % of pedestrians (14). In another study performed in the region of middle Slovakia, alcohol intoxication was found in 54 % of fatal cases of cyclists (27).

The studies dealing with monitoring of drivers report various percentages of alcohol intoxication, namely 50.5 % (4) and 43.8 % (28) in Spain, 48 % (29) in Canada, 41 % (14) in Greece, 36 % (30) and 31 % (31) in Australia. Lower values are reported in northern countries, i.e. 27 % (32) and 22.2 % (33) in Sweden. The average BAC in these investigations was similar to our values, namely 1.8 g/kg and 2 g/kg, respectively. Similarly, lower percentage is reported in Norway, namely 28.3 % (34). Such a significant reduction in alcohol impairment of drivers results probably from the fact that these countries have established a very strict policy in regard to drinking and driving. In recent years, the legal limit of BAC has been lowered and specific sanctions have been instituted for chronic alcoholics causing traffic crimes (35).

The aim of the presented work was to determine the rate of responsibility for inflicting fatal traffic accidents in relation to alcohol impairment. It was found that alcohol-impaired participants of road traffic caused traffic accidents in as many as 87.3 % of the cases in average, whereby most often they were drivers (91.1 %), then cyclists (90.0 %) and pedestrians (82.2 %). Traffic participants that were not impaired by alcohol caused traffic accidents in 56.7 % of cases in average, whereby most often they were again drivers (66.3 %), then pedestrians (50.7 %) and cyclists (31.6 %). Based on the obtained results it can be concluded that alcohol-impaired participants of road traffic caused traffic accidents 1.5-fold more often than those not impaired by alcohol.

Conclusion

The results of our study prove indeed that alcohol is an agent most frequently found in fatal road traffic accidents and still remains one of the main factors of traffic accidents in our country. The study shows how widespread the consumption of alcohol is, as well as reveals the occurrence of this substance in high concentrations in blood of road users fatally injured in traffic accidents. Drink-driving has to be tackled in an integrated and multidisciplinary way, at least by stricter law enforcement, severe punishment, rehabilitation schemes, and continuous public education and publicity. In our country, alcohol drinking is a regular part of many peoples daily and social lives. Great tolerance and permissiveness exist with regard to alcohol, thereby making the intervention in this area rather difficult. Continuous and systematic studies will help to monitor the problem and to estimate its range better. This will assist the responsible authorities in planning and evaluating the preventive measures and methods of intervention to decrease the number of traffic accidents caused due to driving under influence of alcohol in Slovakia. The community should be enlightened with the fact that from the view point of traffic accidents, drinking represents a big risk not only for the users of motor vehicles, but also for pedestrians and cyclists. The high rate of their mortality emphasizes the ne-

cessity of prevention strategies including proper supervision in reducing the undesirable risk of alcohol-related road traffic accidents.

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