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Short communication

Alcohol involvement in fatal traffic accidents

Marija Bujaroska[1*], Liljana Anastasova[2], Zoran Zhivikj[2], Zorica Bozhinoska[1], Goran Pavlovski[1], Natasa Bitoljanu[1], Viktorija Belakaposka Srpanova[1], Lidija Petrushevska-Tozi[2]

[1]*Institute of Forensic Medicine, Criminology and Medical Deontology, Medical Faculty, Ss. Cyril and Methodius University in Skopje, Mother Theresa 19, 1000 Skopje, Republic of North Macedonia*
[2]*Faculty of Pharmacy, Ss. Cyril and Methodius University in Skopje, Mother Theresa 47, 1000 Skopje, Republic of North Macedonia*

Introduction

Impairment caused by the use of alcohol is one of the most common contributing factors in road traffic accidents (Pasnin et al., 2021; WHO 2018) and therefore most countries have implemented legal blood alcohol concentration (BAC) limits for drivers. These limits have been established through long-lasting studies in the past, based on the assessment of the influence of alcohol on driving ability and/or the risk of violating the traffic safety (Drummer et al., 2004).

Republic of North Macedonia implemented a legal BAC limit of 0.5 g/L although in different countries these values vary between 0.2-0.8 g/L (Kugelberg and Jones, 2007; Official Gazette of Republic of Macedonia, 2015). In the last decade, scientific and law authorities have focused on ramification of blood concentration of drugs that influence driving ability as well as traffic safety (Pasnin et al., 2021). The approach that assesses the concentration limits of various drugs is based on the comparison of intensity of driving ability impairment equal or similar with that caused by 0.5 g/L alcohol (Menzin et al., 2001). An establishment of legal limits for certain drugs is considered as an emerging issue;however alcohol consumption is still the most important reason for traffic accidents. Therefore, the aim of our study was to assess alcohol-related relative risk of involvement in fatal traffic accidents as function of BAC legal limits. Also, we assessed the relative risk for fatal traffic accidents using different BAC levels. These data may be helpfulin revising the current legislation in order to improve traffic safety. In addition, these data would contribute for determination of the relative risk for other substances of interest.

Materials and methods

All the data included in the study (age, gender and BAC levels) were obtained from victims of traffic accidents (motor vehicle drivers, co-drivers as well as pedestrians and bicyclists) autopsied at the Institute of Forensic Medicine, Criminology and Medical Deontology, Medical Faculty, Skopje in the period of 2007-2020. BAC levels were determined using head space gas chromatography with flame ionization detector (HS-GC/FID) in concentration range 0.1-4 g/L. Samples were classified into four groups depending of BAC levels (level I – 0.1-0.5; level II – 0.5-0.8; level III 0.8-1.2; level IV - ≥1.2 g/L). Statistical evaluation of the data was performed using descriptive statistics (average, median, SD, max, min). Correlation between age and BAC was evaluated usingPearson correlation coefficient.Odds ratio (OR) and relative risk/risk ratio (RR) were calculated where RR > 1 was considered as statistically significant. BAC values of cases with natural cause of deathwere used as a control group.

Results and discussion

Within the period of 13 years, 427 cases of traffic accident victims were autopsied, of which 360 males and 59 females. Positive findings for alcohol were detected in 171 (60.8%) of the traffic accidents victims. Compared with neighbor countries with similar drinking habits, there

*marija.bujaroska@medf.ukim.edu.mk

was higher number of traffic accidents victims' positive for alcohol (Papalimperi et al., 2019, Zivković et al., 2013). According to *post-mortem* data, notably, most of the victims positive for alcoholwere males (45.8%)whereas 11.94% were females. Victim's age was in a range of 15-83 years, with average age of 40.91 ±16.36 and median of 38 years. A weak positive correlation between age and BAC was found (R = 0.124, R^2 = 0.0154), but it was not statistically significant (p > 0.05). The lowest percentage of alcohol positive traffic accident victims (19.44%) was observed in 2016, while the highest (63.64%) in 2008. During the 13 year survey, average BAC was 1.47±0.87 g/L, with the highest measured BAC of 4.1 g/L. In the BAC level I 18.13% of the victims were classified, while in the level II and IIIanequal distribution was observed(9.36%).BAC above 1.2 g/Lwas detected in 63.16% of traffic accident victims positive for alcohol. As expected, the risk of fatal outcome as a result of traffic accidents is elevated with increase of the BAC, in a concentration dependent manner (Blomberg et al., 2005;Kuypers et al., 2012). However, it was found that in traffic accidents alcohol use increases the risk of fatal outcome at all concentration levels. The results have shown that BAC level I had RR = 1.24, followed by RR: 1.39, 1.68 and 2.4 for BAC levels II, III and IV, respectively. Considering the calculated RR values, BAC up to 0.5 g/L is associated with significant risk of fatal traffic accidents even though this concentration is within legally acceptable ranges. In line with the literature data, RR for BAC level II (concentration closest to legal limit) should be the one considered as a reference value for estimation of the risk related to other substance use, taking into account that this value refers to a risk for traffic accidents with fatal outcome i.e. not the traffic accident as an incident by itself (Kuypers et al., 2012).

Conclusion

Altogether, the negative influence of alcohol use on traffic has been confirmed in aspect of violation of the road safety, not only for the drivers, yet for the all traffic participants. Since the study was based on *post-mortem* data, established risks should be considered seriously in further regulation's evaluation. Alcohol use, especially in men, contributes to high number of deaths that may be prevented. The obtained data in this study can be used as a reference to revise the current legislation as well as to estimate the concentration for other substances considered to impair driving ability. The last may be significant support in defining legal limits for specific drugs in order to improve the road safety.

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