A Study of Blood Alcohol Level in Victims of Fatal Road Traffic Accidents in Manipur, India

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Abstract

Background: Alcohol is well-established risk factors for road traffic deaths around the world. Method: This is a cross-sectional study to assess the prevalence of alcohol consumption among the victims of fatal road traffic accidents in Imphal, Manipur. A detailed post-mortem examination was carried out among 160 victims and blood alcohol concentration was assessed by Cavett test and then quantified by gas liquid chromatography. Result: A total of 40 (25%) cases were found to be positive for alcohol in the blood. Most of the cases 11(27.5%) occurred in age group of 21-30 years and 41- 50 years, respectively. Maximum number of cases 13(32.5%) showed blood alcohol concentration of 90-120 mg% while 7(17.5%) cases showed readings above 180 mg%. Conclusion: This study found that driving under the influence of alcohol, exponentially increases the risk of having an accident which could be fatal in its outcome.

Key words: *Road traffic accident, alcohol, post-mortem examination, drunk driving*

Introduction

Drunk driving is a well-established risk factor for road traffic accident. It is a grave public health concern because it endangers the life of not only the driver, but also passengers and the pedestrians.[1] India is facing a major demographic and economic shift coupled with increasing motorization and urban development.[2] India has the second largest road network in the world and road traffic accidents (RTAs) is a major cause of concern killing 1.2 million people and injuring 50 million each year. [3, 4] Driving under the influence of alcohol is a major contributor to 70% of road fatalities in India. [5, 6] Increasing blood alcohol levels, cause progressive loss of driving capability by impaired concentration, false confidence, increase in reaction time, and decreased visual and auditory perception. Various countries have set down the legal blood alcohol concentration limit. This differs from country to country. Since legislation against drunk driving relies on data on alcohol related crashes, this study is of vital importance.[7] The main aim of study is to know the demography of road traffic accidents, the incidence of alcohol consumption by the victims and to the estimate concentration of alcohol in the blood.

Methodology

This is a cross-sectional, case-based study, carried out among the victims of fatal road traffic accident. The study was carried out among the victims brought for medico- legal post-mortem examination at the mortuary of Regional Institute of Medical Sciences, Imphal, Manipur, during the period of August 2008 to July 2010. Based on the fatal road traffic accidents of 13.2% (~13.0%) in a previously published article [8] the sample size for the present study was calculated to be 174.

Sample size (N) calculation –

$N = z^2 \times p\,(1\text{-}p)/\,(e)^2$

N = sample size, Z = 95% confidence interval (1.96), p = prevalence of fatal RTA, e = standard error (5%).

During the study period, a total of 160 cases were selected for assessment which was 92% of the sample size (174) calculated. A detailed post-mortem examination was carried out including blood alcohol concentration. All cases of fatal road traffic accident were examined for presence of alcohol in the blood. Putrefied bodies were not included in the study sample and the next victim was chosen if such a situation arose. Various demographic data like age, sex, religion, occupation as well as data like date and time of crash, type of vehicle, history of alcohol consumption, type of road user etc. was taken from both relative of the deceased and the investigation officer before conducting the autopsy. Blood samples were taken from the femoral vein for assessing the blood alcohol level. Using a sterile syringe 10 ml of blood was collected in test tubes containing sodium fluoride as preservative. The samples were frozen at –20°C till the time that they were analysed. The screening of alcohol in the blood samples was done by Cavett test (potassium dichromate method). Positive samples were quantified by gas liquid chromatography.

Inclusion criteria: All the cases of fatal road traffic accident were examined for the presence of alcohol in the blood. Exclusion criteria:

Results

As seen in **Table-1**, majority of the victims were males 140(86.4%) and most of the cases 47(29.37%) were in the age group of 21- 30 years. Seasonal distribution showed that 48 (30%) cases occurred in the winter season followed by 44(27.5%) in autumn. It was observed that maximum number of vehicular accidents 72 (45%) were reported between 12 noon to 6 pm. Truck was the frequent offending vehicles accounting for 61(38.13%) cases followed by 45 (28.12%) accidents by two-wheeler. It has been observed that most of the accidents [90 (56.25%)] occurred on the National Highway.

Table-1 Demographic characteristics (n=160)

S. No.	Characteristic		Number (%)
1.	Gender	male	140 (87.5%)
		female	20 (12.5%)
2.	Season	Winter	48 (30%)
		Autumn	44 (27.5%)
		Spring	42 (26.3%)
		Summer	26 (16.2%)
3.	Time of Incidence	12 am – 6 am	07 (4.4%)
		6 am – 12 pm	34 (21.2%)
		12 pm – 6 pm	72 (45%)
		6 pm – 12 am	47 (29.4%)
4	Types of vehicles	Trucks	61 (38.1%)
		Buses	19 (11.9%)
		Tractors	00 (0%)
		LMVs	26 (16.2%)
		Three-wheelers	09 (5.7%)
		Two-wheelers	45 (28.1%)
5.	Types of roads	National highways	90(56.2%)
		State highways	56 (35%)
		Village Link roads	14(8.8%)

Table-2 shows the qualitative analysis of alcohol in blood of fatal RTA victims. Out of the 160 cases studied, 40 (25%) were found to be positive and 120 (75%) negative, for alcohol in blood. It showed that most of cases [11 (27.5%)] occurred in age group 21-30 years and 41- 50 years, respectively. As shown in **Table-3** among the victims 10 (25%) cases were of pillion riders followed by pedestrians 8 (20%) cases and occupants of four-wheeler 7(17.5%) cases. The **Table-4** of the study showed that only two victims had blood alcohol concentration below 30mg%. Maximum number of cases 13 (32.5%) were having blood alcohol concentration of 90-120 mg% followed by 7 (17.5%) cases were having blood alcohol concentration above 180mg%.

Table 2: Age wise distribution of blood alcohol positive cases

S. No	Age	No of cases	Percentage
1	10-20	08	20%
2	21-30	11	27.5%
3	31-40	04	10%
4	41-50	11	27.5%
5	51-60	06	15%
6	60 and Above	00	00%
Total		40	100%

Table 3: Categorical distribution of blood alcohol positive victims

S. No	Type of victims	Total no. of cases	Alcohol positive cases	Percentage
1	Pedestrians	44	08	20%
2	Pillion riders	35	10	25%
3	Occupants	30	07	17.5%
4	Cyclists	12	04	10%
5	Two-wheelers	22	06	15%
6	Three-wheelers	02	01	2.5%
7	Four-wheeler drivers	15	04	10%
Total		160	40	100

Table 4: Blood alcohol concentration (BAC) level wise distribution

S. No	BAC (mg %)	No of cases	Percentage
1	0 - 30	02	5.0%
2	31 - 60	05	12.5%
3	61 - 90	01	2.5%
4	91 - 120	13	32.5%
5	121 - 150	07	17.5%
6	151 - 180	05	12.5%
7	180 and above	07	17.5%
Total		40	100

Discussion

Road traffic accidents are leading causes of mortality and morbidity worldwide. Careless and reckless driving behaviour associated with alcohol consumption is an important factor leading to such accidents. [9-10]

In this study majority of the victims were males 140(86.4%) cases and most of the cases 47(29.37%) were in the age group of 21- 30 years. It was observed in the study that the least affected group (2.5%) were those above 70 years of age. This is in agreement with the finding of Millo T et al,[7] Arreola Rissa et al,[11] Behera et al,[12] Gupta S et al.[13] The reason for male involvement in accidents is because males are usually the bread winners of the family and remain outdoor during most of the time. On Contrary, females are confined to house hold work. Person in extremes of the age usually remain indoor.

There were 40 cases which were positive of alcohol in blood and were all male victims. Maximum number of cases was in the age group 21- 30 years and 41-50 years. This is so because the age groups 20- 50 years is the most active period of life, socially and physically. They therefore account for maximum number of accidents by consumption of alcohol. Similar finding was seen in study conducted by Fabbri et al[14] and Millo T[7] in which blood alcohol were positive in 18.1% and 34% respectively and most of them were male participants who belonged to the age group of 20-30 years. In contrast a study conducted by Galbraith S. et al[15] in Glasgow showed 27 % of fatal road traffic accident cases were females.

In present study, Maximum number of alcohol positive cases was pillion rider followed by pedestrians. This is like the finding of Gupta S et al.[13] In contrast the study conducted by Foster et al observed that pedestrians were commonest victims. Another study conducted by Jha N et al[16] and Mohan D[17] showed that occupants of various vehicles constituted the large groups of victims. Batra and Bedi[18] observed that maximum number of alcohol positive cases were among truck drivers.

In this study only two victims had blood alcohol concentration below 30 mg% which is the permitted limit given by the Motor vehicle Act. In our study the maximum number of cases was 13 (32.5%) who were having BAC of 91-120 mg%. The study carried out by kulleab S. et al[19] showed 68.4% cases were found to be actually drunk while 38.7% had blood alcohol level higher than 50mg%. Crompton MR[20] showed that the main victims were young, male motorcycle riders with Blood Alcohol Concentration (BAC) 100 mg% and slightly older male car drivers 30 years of age with higher BAC of about 150 mg%. Ordero W[21] found out that

23.4% were BAC positive and 12.2% were intoxicated. According to him, BAC levels of 5 mg% and greater were taken as positive test, patient registering BAC level equal to a greater than 50mg% were considered as being intoxicated. Heatley and Crane[22] in their studies found the mean blood alcohol concentration (BAC) in 175 fatal cases of acute alcohol intoxication was found to be 355 mg/100 ml. According to Millo T et al[7] a total of 170 cases (34%) of fatal road traffic accident cases were positive for alcohol and mean BAC was 196.9 mg%. Galbraith S. et al[15] in their study found that 62% of male and 27% of female had detected alcohol in the blood in which the mean level of BAC was 193 mg% in male and 165% in female.

Conclusion

This study affirms a long-held belief that a firm legislation is needed with strict implementation to prevent drunk driving.[23-24] Behavioural studies on the need to drive after the consumption of alcohol has been done before but there could be demographic variation which needs to be explored. Law enforcing agencies should be strict to with those driving under influence and this could be another area of study showing the socio-demographic characteristics of persons of interest.[25] This could also lead to a reduction in the mortality associated with driving under influence. Health care workers should be trained to counsel the patients which could reduce any untoward incidents in the near future. Lastly, commercial outlets like bars and alcohol outlets should have warning messages about the hazards of drinking and driving.

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Conflicts of Interest: - None

Ethical Clearance: - Taken from the Institutional Ethical Committee

References

1. Hallvard Gjerde, Asbjørg S. Christophersen, Per T. Normann, Jørg Mørland, Toxicological investigations of drivers killed in road traffic accidents in Norway during 2006–2008, Forensic Science International, Volume 212, Issues 1–3, 2011, Pages 102-109, ISSN 0379-0738, https://doi.org/10.1016/j.forsciint.2011.05.021.
2. Kochar SR and Rastogi P. Front wheel disc brake-A killer design for motor cyclist death. J Indian Acad Forensic Med. 2009: 31 (2): 107-11
3. Ministry of Road Transport and Highways. Road Accidents in India-2017. New Delhi: Government of India; 2018.
4. World Health Organization. Road Traffic Injuries. Geneva: World Health Organization; 2018.
5. Nguyen NP, Passmore J, Tran LT, Luong AM. Role of alcohol in hospitalized road trauma in Vietnam. Traffic Inj Prev. 2013; 14:329–34.
6. Baruah AM, Chaliha R. A study of incidence of alcohol use in fatal road traffic accidents. J Indian Acad Forensic Med. 2015; 37:12–5.
7. Millo T, Sharma RK, Murty OP, Bhardwaj DN, Murmu LR. Study of incidence of alcohol use in road traffic accidents in South Delhi in fatal cases. Indian Journal of Forensic Medicine & Toxicology. 2008:2(1);29-32.
8. Farooqui JM, Chavan KD, Bangal RS, Syed MMA, Thacker PJ, Alam S, Sahu S, Farooqui AAJ, Kalakoti P. Pattern of injury in fatal road traffic accidents in a rural area of western Maharashtra, India. AMJ 2013, 6, 9, 476-482. http//dx.doi.org/10.4066/AMJ.2013.1839
9. Dandona R, Mishra A. Deaths due to road traffic crashes in Hyderabad city in India: need for strengthening surveillance. NATIONAL MEDICAL JOURNAL OF INDIA. 2004 Mar 1;17:74-9.
10. Kuruc R , Sidlo J, Valent D, Mlynar J. The responsibility of alcohol-impaired road users in fatal road traffic accidents. Bratisl Lek Listy:2009;110(12):802-6.
11. Arreola-Rissa C, Santos- Guzman J, Esquivel-Guzman A, Mock CN. Traffic related death in Nuevo Leon, Mexico, causes and associated factors. Salud Publica Mex; 2008:50:48-54-1.
12. Behera C, Rautji R, Lalwani S, Dogra TD. A comprehensive study of motorcycle fatalities in South Delhi. JIAFM; 2009:31(1):06-10.
13. Gupta S, Bhardwaj DN, Dogra TD. Alcohol and road accidents –A Review. JIAFM; 1999:21(1):971-973.
14. Fabbri A, Marchessini G, Labate AMM, Rossi F, Cicongnani A, Dente M, Lerveses T. Positive blood

alcohol concentration and road accident. Emerge Med Journal; 2002:19:210-214.

15. Galbraith S, Marray WR, Patil AR, Jone RK. The relationship between alcohol and head injury and its effects on the conscious level. BJS: 2001:63(2):128-130.
16. Jha N. Srinivasa DK, Roy G, Jagdish S. Epidemiological study of road traffic accident cases: A study from south India J of Community Medicine: Jan- March 2004:299:1.
17. Mohan D, Bawa PS. An analysis of road traffic fatalties in Delhi, India. Acci Anal Prev 1985:17:33-45.
18. Batra P, Bedi M. Effect of drunken on Traffic Safety. Acci Anal Prev; 2001:26:377-384.
19. Kulleab S, Sriwiwant S, Thanomsab A, Srikhunsaen C, Strategies for reducing traffic accident related to alcohol consumption in khon kaen Municipality. Regional Health Forum: South East Asia Region: 2009:8:1.
20. Crompton MR. Alcohol and Fatal road traffic accidents. Med Sci Law; 1982:22(3):189-194.
21. Ordero W. Alcohol related road traffic injuries in Eldoret, Kenya. East African Medical Journal: 1998:75(12):708-711
22. Heatley MK, Crane J. The blood Alcohol concentration at post- mortem in 176 fatal cases of alcohol intoxication. Med Sci Law 1990:30:101(5):102-123.
23. Davey JD, Freeman JE. Improving road safety through deterrence-based initiatives: a review of research. Sultan Qaboos Univ Med J. 2011;11:29-37
24. World Health Organization. Strengthening road safety legislation: a practice and resource manual for countries. World Health Organization; 2013.
25. Halder D, Shetty A. Regulating road traffic violation by youth in India: A Therapeutic Jurisprudential approach. Available at SSRN 3230604. 2018 Aug 14.