



ROAD TRAFFIC ACCIDENTS: ALCOHOL AND SELECTED DETERMINANTS INFLUENCING FATAL OUTCOMES

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Abstract

Road traffic accidents constitute a major public health challenge in India, with alcohol consumption playing a significant role in fatal outcomes. This study assessed the prevalence and characteristics of alcohol use among victims of fatal road traffic accidents undergoing medico-legal autopsy at a tertiary care centre over a one-year period. Alcohol was detected in nearly one-fifth of the total road traffic fatalities examined. The majority of victims were male, with young adults in the 20–29-year age group being most commonly affected. Most individuals belonged to lower educational strata and were pedestrians or users of two-wheelers at the time of the incident. Blood alcohol analysis demonstrated a mean concentration of 167.28 mg/dl, with almost all cases exceeding the legally permissible limit. These findings highlight the substantial contribution of alcohol to fatal road traffic accidents and reinforce the need for stringent enforcement of drunk-driving laws, improved surveillance, and focused public awareness initiatives to reduce alcohol-related road mortality.

Keywords: Alcohol use; Fatal road traffic accidents; Blood alcohol concentration

Introduction

India is experiencing rapid socioeconomic change marked by expanding urbanization, industrial growth, and increasing motorization. While these developments reflect modernization, they have also resulted in a sharp rise in road traffic accidents, making accidental deaths an unavoidable consequence of progress. Alcohol consumption has long been recognized as a major contributory factor influencing both the occurrence and severity of road traffic injuries and fatalities.

Globally, road traffic accidents account for approximately 1.2 million deaths annually and result in nearly 50 million injuries each year [1]. In India, road traffic fatalities have exceeded 135,000 annually, according to reports published by the National Crime Records Bureau [2]. These reports further identify drunken driving as a significant determinant of road traffic crashes, with nearly 25% of fatal accidents attributed to alcohol use.

The increasing burden of alcohol-related harm in India is influenced by changing social norms, rapid urbanization, greater availability of alcoholic beverages, aggressive marketing strategies, and

inadequate public awareness regarding alcohol-related risks. Alcohol consumption in India has shown a steady upward trend, with sales growing at an annual rate of approximately 6% and projected to increase further [3]. A substantial proportion of consumption involves distilled spirits, which contain high concentrations of alcohol and pose a greater risk when combined with road use.

Alcohol impairs psychomotor performance by increasing reaction time, inducing false confidence, reducing concentration, and diminishing visual and auditory perception. Although the legally permissible blood alcohol concentration in India is limited to 30 mg%, alcohol-impaired road use places not only the individual but also co-passengers and other road users at significant risk. Blood alcohol concentration shows a strong correlation with alcohol levels in other body fluids and is widely accepted as objective evidence of alcohol intake in forensic and legal medicine [4].

A systematic analysis of alcohol-related road traffic fatalities—considering demographic characteristics, temporal distribution, circumstances of occurrence, cause of death, and blood alcohol concentration—provides valuable insight into the magnitude and dynamics of this preventable problem. Such evaluations are essential for developing effective preventive, legal, and public health strategies aimed at reducing alcohol-associated road traffic mortality. The study is done with the following objectives:-

1. To evaluate the causes and other contributing factors leading to death in Road traffic incidents with alcohol consumption.
2. To study the level of alcohol present in body by analysis of blood

Materials and Methods:-

A cross sectional study was done on the victims of RTA brought for medicolegal autopsy in a tertiary centre over a period of one year. A specially created proforma was used to record a variety of information, including age, sex, occupation, religion, date and time of the collision, kind of vehicle, type of road user, and history of alcohol consumption.

The femoral vein was used to get blood samples. [4] A sterile syringe was used to draw about 10 milliliters of blood into glass-capped vials with sodium fluoride added as a preservative. Gas liquid chromatography was used to quantify the blood samples and results were obtained from Regional Forensic Laboratory. RTA victims who spent more than 48 hours in the hospital were not included in the study.

Results

Out of **952** cases of alleged vehicular accidents, a total of **188** cases showed evidence of alcohol consumption at the time of accident, i.e. **19.75%** of total number of RTAs.

The age group between **20 to 29** years of age contained the highest number of cases, **72 (38.30%)** closely followed by the age group between **30 to 39** years of age with **60 cases(31.91%)**.

Age distribution	Number of cases	Percentage
0-9	0	0
10-19	13	6.91
20-29	72	38.30
30-39	60	31.91
40-49	36	19.15
50-59	5	2.66
above 60	2	1.06

Table 1 showing age distribution of case

Occupation	Number of cases	Percentage
Student	23	12.23
Business	58	30.85

Service	13	6.91
Unemployed	9	4.79
Private	37	19.68
Cultivator	42	22.34
Unknown	2	1.06
Retired	1	0.53
Daily Wage Laborer	2	1.06
Others	1	0.53
Total	188	100

Table 2 showing occupation distribution of cases

The majority of the victims had low levels of education, with those under matriculated (35.64%), primary educated (13.30%), and illiterate (5.85%) accounting for the largest percentage of instances. Graduates or above made up only 10.1% of the cases. Two instances were recorded as unidentifiable; therefore it was unable to ascertain their educational status at the time of the autopsy. Most of the incidents occurred in the evenings 6pm-12 midnight (45.21%) and afternoons (41.49%).

Victim type	Number of cases	Percentage
Pedestrian	60	31.91
Driver	20	10.64
Passenger	17	9.04
Motor cyclist	51	27.13
Pillion rider	21	11.17
Bicyclist	19	10.11
Others	0	0.00
Total	188	100

Table 3 showing. Type of victim involved in incident

In our study, 68 cases (36.17%) had blood alcohol concentrations above 201 mg/dl, while 38 cases (20.21%) and 36 cases (19.15%) had concentrations between 51 and 100 mg/dl and 151 and 200 mg/dl, respectively. The range of 0–50 mg/dl is where the fewest cases are found. The average blood alcohol content is determined to be 167.28 mg/dl. 185 of the patients had blood alcohol content (BAC) levels over the 30 mg/dl threshold. The BAC was below the permitted limits in just three occasions.

Discussion

The present study demonstrated that alcohol consumption was detected in nearly one-fifth of fatal road traffic accident victims, a finding that aligns closely with previously published Indian studies reporting alcohol involvement in approximately 20–25% of fatal cases [5,7]. In contrast, data from high-income countries have reported a higher proportion of alcohol-related fatalities, with studies from the United States indicating alcohol involvement in nearly 40% of fatal crashes [8]. These differences may reflect variations in reporting systems, enforcement practices, and sociocultural patterns of alcohol use.

A marked predominance of male victims was observed, a trend consistently documented in earlier studies [5,9,10]. This gender disparity is likely attributable to greater exposure of males to outdoor activities, occupational travel, and higher rates of alcohol consumption. The highest involvement was noted among young adults aged 20–29 years, followed closely by those aged 30–39 years, findings that are in agreement with several Indian and international studies [9,11–13]. However, some authors have reported a higher prevalence among older age groups [7,14], possibly reflecting regional differences in drinking behavior and occupational patterns.

The greater involvement of younger individuals may be explained by increased mobility, occupational demands, and recreational alcohol use in this age group. In contrast, lower involvement at the extremes of age may be due to reduced outdoor activity and lower alcohol consumption. Occupational analysis revealed higher involvement among businessmen, cultivators, private employees, and students, similar to observations made in earlier studies [6,10,12]. These groups are more likely to be mobile and have easier access to alcohol, thereby increasing exposure to road traffic risk.

Most victims belonged to lower educational strata, a finding supported by previous literature [9,12]. Lower educational status may be associated with reduced awareness of road safety measures, greater engagement in risk-taking behavior, and occupational circumstances that necessitate frequent travel. Temporal analysis showed a higher incidence of accidents during evening and late-night hours, consistent with other studies [7,9], and likely reflects post-work travel combined with alcohol consumption and fatigue.

Pedestrians constituted the largest group of victims, followed by two-wheeler riders, a pattern also reported by multiple authors [6,10,12,15]. Alcohol-induced impairment of judgment, coordination, and situational awareness increases vulnerability among pedestrians, particularly in the absence of adequate footpaths and designated crossing areas. Drivers under the influence of alcohol exhibit delayed reaction times and impaired motor control, leading to increased crash risk.

Blood alcohol concentration levels observed in this study were comparable to those reported in earlier investigations [9,10,12]. High BAC levels are associated with impaired judgment and increased risk-taking behavior, contributing significantly to fatal outcomes. The findings reinforce the critical role of alcohol intoxication in road traffic fatalities and underscore the need for sustained preventive efforts.

Conclusion

Alcohol consumption continues to play a significant role in fatal road traffic accidents, particularly among young male road users. The findings of this study highlight the widespread violation of permissible blood alcohol limits and the heightened vulnerability of pedestrians and two-wheeler users. These observations underscore the urgent need for a multipronged approach involving strict enforcement of drunk-driving laws, routine screening for alcohol use in road traffic injuries, and sustained public awareness initiatives. Strengthening surveillance systems and improving institutional capacity for timely blood alcohol estimation may further support effective legal and preventive measures. Focused and consistent interventions are essential to reduce alcohol-related road traffic mortality and its associated social and economic burden.

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