

# Alcohol and Drug Use in Injured Drivers – An Emergency Room Study in a Regional Tertiary Care Centre of North West India

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## ABSTRACT

**Background:** Statistics show an increasing proportion of alcohol and drug use in drivers in more recent times throughout the world. It has been found that among the various human factors, alcohol consumption, using drugs and subsequent driving on the roads are major risk factors. Traffic regulations in India penalises drivers who drive beyond permissible alcohol limit of 30 mg%. Consumption of psychoactive drugs such as opioid, cannabis and benzodiazepines has been reported mainly among youngsters. Hardly any data is available in Indian context particularly from North-West Zone of India.

**Study objective:** To study the pattern of alcohol, opioid, cannabis and benzodiazepines use in injured drivers presenting to a designated trauma centre in Chandigarh zone of North-West India.

**Materials and Methods:** Consenting injured drivers who presented to the trauma centre in Chandigarh from September 2013 to January 2014 were included. Urine samples collected from the subjects were screened for abusive drug exposure (opioid, cannabis and benzodiazepines) and alcohol using commercial bedside urine immunoassay kits. In urine alcohol positive

cases blood samples were collected and analysed for alcohol concentration using standard gas chromatography. Retrograde extrapolation method was used to assess BAC at the time of accident.

**Results:** A total of 200 injured drivers were included in this study. We found substance consumption in 54.5% of drivers and alcohol (40.5%) was the most prevalent substance consumed followed by opiates (13%), cannabis (7%) and benzodiazepines (7%). More than one substance was shown in urine of 11.5% of drivers. Among 81 alcohol positive screening cases, the quantitative analysis was successfully done for 76 cases. Except one, all cases showed BAC value more than 30 mg% which is the legal limit for driving any vehicle in India. The values of alcohol concentration in blood at the time of accident were in the range of 20 to 391 mg%.

**Conclusion:** This study has shown that drivers are consuming not only alcohol but other psychoactive drugs also. Indian traffic regulatory authorities are penalising drunk drivers by doing road side breath alcohol testing with no protocols for drug screening. Appropriate measures should be adopted to screen traffic offenders for psychoactive drugs also.

**Keywords:** Blood alcohol concentration, Psychoactive drugs, Road traffic accident

## INTRODUCTION

Alcohol and drug use have been identified as important risk factors of road accidents worldwide. The prevalence of drugs and alcohol and its role in road accidents have been the objects of research in western countries like Europe, Australia, Canada, and the United States for many years [1-7]. These studies showed that alcohol and drugs particularly cannabis, opiates and benzodiazepines were frequently detected in injured drivers than in the general population. A study from South European countries between 1991 and 2000 found 50% of drivers killed in road accidents showed some type of psychoactive substance in their body. Among them alcohol was more frequently detected substance (43.8%) followed by cocaine (5.2%), opioids (3.2%) and cannabis (2.2%) [8]. Another study from Australia found 29% of all drivers were positive for alcohol with BAC  $\geq 0.05$  gm/dL, 23.5% for psychotropic drugs particularly cannabis (13.5%), opioid (4.9%) and benzodiazepines (4.1%) [9]. A study at a regional trauma centre in USA showed more prevalence for drug use (33.5%) than alcohol use (15.8%) [10].

To the best of Author's knowledge no Indian study has been published yet reporting the prevalence of alcohol and drug use among injured drivers. Despite the well-known fact that alcohol and drugs increase the risk of road accidents, there is very less knowledge about the prevalence, pattern and the type of drug used among drivers in India. In the present study we investigated the use of alcohol and commonly abused psychoactive drugs (opiates,

cannabis and benzodiazepines) in injured drivers brought to the trauma centre, Chandigarh, India.

## MATERIALS AND METHODS

### Study population

This study was conducted after due ethical approval in a regional trauma centre located in Chandigarh, India. The consenting injured drivers who presented to the trauma centre after road accidents over a period of 5 months from September, 2013 to January 2014 were included in this study. A total of 200 subjects were selected after careful exclusion of cases according to the study protocol. Inclusion criteria was drivers of more than 18 years of age who were brought to the emergency department within 6 hours of the accident and willing to give written informed consent (consents were taken from the legal guardians of unconscious/unstable patients). Patients who were treated with opiates and benzodiazepine group of drugs, unstable to provide sample and with hepato-renal impairment were excluded from the study.

### Sample collection and screening

Patients/Guardians were approached immediately after arriving in the emergency room and were explained about the study and were asked for consent to participate. Urine sample was screened for alcohol, benzodiazepines, cannabis, and opiates by using rapid

detection kits based on qualitative immunoassay. The Instant-view urine cassette tests were purchased from Alfa Scientific designs Inc, USA. [Table/Fig-1] summarizes the drugs, metabolites and its cut-off values above which the cassette gives positive reaction.

In urine alcohol positive cases, 5 ml of blood was collected from arm vein after sterilising the area with non-alcoholic antiseptic solution (Povidone iodine), for quantitative analysis of alcohol. All blood samples were collected and preserved in clean, sterile glass collection tube containing sodium fluoride and potassium oxalate. The tubes were labelled properly and stored under refrigeration (-20°C) until the time of analysis.

### Ethanol analysis

Ethanol was analysed by gas chromatography method. 1 µl of n-propanol, as internal standard was added to 2ml of blood sample to give a concentration of 0.05% v/v. After a few minutes, precipitating agent was added with sample and centrifuged. 2µl of supernatant was injected into the packed column of gas chromatography. Chromatogram record was taken and the same was compared with peak area of standard and ethanol concentration was derived. Retrograde extrapolation was done to find blood alcohol concentration (BAC) at the time of accident.

BAC at the time of accident was calculated by the following formula [11].

$$\text{BAC} = \text{Measured AC} + \{(\text{Time of test} - \text{Time of driving}) \times 0.15\}$$

Here the average elimination rate of alcohol was taken as .015 g/Dl/h [11,12].

Due to limitation of resources and the nature of study, confirmation for the presence of drugs by gas chromatography-mass spectrometry (GC-MS) was not attempted. All urine positive screening cases were considered as true positive for drugs.

Drugs & Metabolites		Cut-off concentration (ng/ml)
<b>Cannabis</b>		
1.	11-nor- 9-THC-9-carboxylic acid	50
2.	11-nor- 8-THC-9-carboxylic acid	50
3.	11-hydroxy- 9-THC	100
<b>Opiates</b>		
1.	Morphine	300
2.	Codeine	300
3.	Ethyl Morphine	300
4.	Hydromorphone	400
5.	Morphine-glucuronide	500
6.	Oxycodone	1000
<b>Benzodiazepines</b>		
1.	Oxazepam	300
2.	Alprazolam	300
3.	Bromazepam	500
4.	Clobazem	1500
5.	Chlonazepam	500
6.	Diazepam	200
7.	Desmethyldiazepam	300
8.	Flurazepam	300
9.	Lorazepam	450
10.	Lormetazepam	300
11.	Medazepam	300
12.	Nitrazepam	250
13.	Nordiazepam	400
14.	Prazepam	250
15.	Triazolam	300

[Table/Fig-1]: List of drugs and its metabolites with cut-off values, screened in urine

## RESULTS

### Crash characteristics

200 drivers involved in road accidents presented to trauma emergency formed the study group. Majority of injured drivers were males and motorcyclist. More than half of injured drivers had not worn helmet/seat belt. Maximum number of accidents (48.5%) were observed between 18.01 and 24.00 hours. 141 (70.5%) accidents were observed on weekdays whereas 59 (29.5%) accidents were on weekends [Table/Fig-2].

### Toxicology

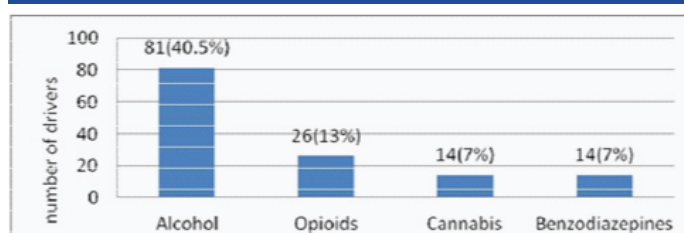
Over all 54.5% of injured drivers were positive for alcohol and/or drug use. Most commonly abused substance among the drivers involved in road traffic accident was alcohol (40.5%). Opiate was the second most commonly abused drug (13%) and the prevalence of cannabis and benzodiazepine group of drugs were 7% each. About 11.5% of drivers showed more than one substance in their urine [Table/Fig-3].

The majority of positive cases belonged to the age group of 25-34 years (61.5%), followed by 18-24 years (57.4%). 60% of subjects in the age group of 18-34 years were found to be positive for psychoactive substances in their urine. The majority of cases of alcohol and opiates (48.2% and 14.3%) belonged to 18-34 age groups, whereas for THC and benzodiazepines the majority of drivers belonged to >55 years of age. 57% male drivers were found positive for alcohol and/or drugs whereas only 9% of female drivers were found positive.

	Number(N)	Percentage (%)
<b>Gender</b>		
Male	189	94.5
Female	11	5.5
<b>Age (years)</b>		
18-24	47	23.5
25-34	65	32.5
35-44	40	20
45-54	24	12
≥55	24	12
<b>Time of accident (hours)</b>		
00.01-08.00	20	10
08.01- 18.00	83	41.5
18.01- 24.00	97	48.5
<b>Type of vehicle</b>		
Bicycle	19	9.5
Motorised two wheelers	152	76
Car	20	10
Others	9	4.5
<b>Seatbelt/Helmet use(173)*</b>		
Yes	59	34.1
No	108	62.4
Not known	6	3.5

[Table/Fig-2]: Characteristics of sampled drivers

\* Applicable for only 173 cases where the type of vehicle supported the use of helmet/seatbelt



[Table/Fig-3]: Pattern of substance abuse in injured drivers

Study (2014)	Alcohol (%)	Opioid (%)	THC (%)	Benzodiazepines (%)
Present study	40.5	13	7	7
Belgium [13]	(≥0.1 g/L) 42.5	Illicit opiates 0.6	7.6	7.3
	(≥0.5 g/L) 38.2	Medicinal opioids 3.3		
The Netherlands [13]	(≥0.1 g/L) 29.6	Illicit opiates 0.0	0.5	0
	(≥0.5 g/L) 28.0	Medicinal opioids 3.5		
Italy [14]	-	3.5	3.5	7.5
Dutch study [14]	-	4.0	17	10
France [14]	-	10.5	13.9	-
Australia [15]	(≥0.01 g/100ml) 29.0	9.4	9.8	8.9

**[Table/Fig-4]:** Comparison between the present study and the studies from Western countries

With respect to the type of vehicle used, substance abuse was highly prevalent among cyclists (73.7%) followed by motorcyclist (69.7%) and car drivers (40%). Among 81 alcohol positive screening cases, the quantitative analysis was successfully done for 76 cases. Except one, all cases showed BAC value more than 30 mg% which is the legal limit for driving any vehicle in India. Retrograde extrapolation was done to assess the blood alcohol concentration (BAC) at the time of accident. The BAC was found in the range from 20 mg% to 391 mg% with the average of 94.5 mg%. The mean BAC was higher in victims driving car (109.8mg%) followed by motorcyclist (92.8mg%) and cyclist (84.6mg%)

## DISCUSSION

Among 200 injured drivers screened, 109 (54.5%) subjects were found positive for alcohol and/or drug use. Most commonly abused substance was alcohol (n=81; 40.5%) followed by Opiate (n=26; 13%), cannabis (n=14; 7%) and benzodiazepines (n=14; 7%). About 11.5% of drivers showed more than one substance in their urine. The present study showed more prevalence for substance abuse (54.5%) than Belgium (52.6%) and the Netherlands (33.9%) [13]. Alcohol (>0.1 g/l) was the most prevalent substance among the injured drivers in Belgium (42.5%), the Netherlands (29.6%) and Australia [13,15]. The present study also reflected the same pattern where alcohol was the more commonly used (40.5%) substance. The prevalence of cannabis (7%) and benzodiazepines (7%) in this region is similar to the Belgium study (7.6%, 7.3%) and higher than the injured drivers in the Netherlands (0.5%, 0%). We observed more drivers were found to be positive for opioids (13%) when comparing with other western countries [13-15]. [Table/Fig-4] compares the present study with the recent studies from European countries and Australia. It shows the high prevalence of drink/drug driving in North West India just like other developed countries.

Among all injured drivers, 44% (n=88) of drivers in the age group <45 years were positive for substance, whereas for >45 years age group it was 10.5% (n=21). Alcohol and opioid were more prevalent in the age group of <45 years (46%; 14.5%) whereas for cannabis and benzodiazepines more prevalence was noted in >45 years of age group (8.3%; 14.6%). A study from Australia also showed the use of benzodiazepines increases with age [1].

With respect to the vehicle type, substance abuse was seen highly prevalent among cyclist (73.7%), followed by motorcyclist (69.7%) and car drivers (40%). This result shows that cyclist and motorized two-wheeler riders are more frequently driving the vehicle under the influence of alcohol and drugs which adds to the risk of sustaining fatal injuries in road accidents in this group as there is little protective measures when compared to car drivers.

Among 81 alcohol positive screening cases, the quantitative analysis was successfully done for 76 cases. Except one, all cases showed

BAC value more than 30 mg% which is the legal limit for driving any vehicle in India [16]. The mean BAC was higher in victims driving car (109.8mg%) followed by motorcyclist (92.8 mg%) and cyclist (84.6 mg%).

Binary logistic regression analysis was applied to find any association between positive urine screening and characteristics of driver (Gender, age, occupation, day & time accident and type of vehicle). It showed significantly higher substance abuse among male drivers when compared to female drivers (odds ratio = 12.7; P value = 0.018, 95% confidence interval). Except gender difference, other characteristics were not significantly associated with positive urine screening.

## LIMITATIONS

The screening for alcohol and drugs was conducted only in injured driver without a control group. Hence it is difficult to comment about the higher prevalence of alcohol and drugs among injured drivers compared with that of the general population. The present study had sampled only the drivers ≥18 years of age and due to medical condition all the adult injured drivers attended emergency department could not be included. Because of this selection bias there is a possibility of over or under estimation of the prevalence. Due to the limitation of resources, confirmatory tests for drugs were not attempted. Cross reactivity resulting in false positive tests is an issue when testing with immunoassays. However results from previous studies showed high correlation between screening results and subsequent confirmatory test results [17]. For the same reason all screening positive cases were taken as true positive.

## CONCLUSION

Globalization is fast changing the cultural values all over the world and India is not an exception. The prevalence and pattern of alcohol and drug use among injured drivers in North-West India reflects almost the same pattern as in European countries. Though Motor Vehicle Act, 1988, India prohibits alcohol/drug use during driving, the drug testing is hardly done in routine circumstances. Indian traffic regulatory authorities are penalizing drunk drivers by the way of road side breath alcohol testing with no protocols for drug screening. Extensive further studies are needed to find the intensity of this problem in India and strict traffic regulations should be initiated to reduce the incidence of accidents related to drug and drunk driving.

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