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Original Research Article

Head injuries in Drunken Driving: Does liquor ban in highways reduce mortality?

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Abstract: The fatalities in road traffic brain injuries in India have increased in recent times. Alcohol abuse and dependency are the leading risk factors in drunken drivin, with young male drivers at highest risk. The recent ban of selling liquor in and around 300m radius of highways may reduce mortality in drunken driving. But it may not show any impact in reducing the incidence of drunken driving in rural areas. As long as the facilities in primary care and transportation of injured patients to the tertiary hospital from the site of injury in rural areas are not improved, the mortality will keep on increasing. The objective of this study is to analyse the influence of alcohol on the incidence of drunken driving and severity of injuries, and the present scenario of primary care and transportation of the injured to the tertiary hospital and the time interval in transportation.
Keywords: Alcohol abuse, primary care, transportation

INTRODUCTION

Alcohol abuse and dependency are leading risk factors for head injuries in Drunken Drive [1]. WHO noted road traffic accidents (RTAs) as the 6th leading cause of death in india, with higher incidence of death, disability and socioeconomic loss in young and middle aged population [2]. In the United States, more than 28,000 accidental deaths per year are attributed to alcohol intake [3] and 1.4 million emergency casualties are related to alcohol intake [4] . Drunk driving was noticed to contribute about 19% and 6% of two and four wheeler accidents respectively. Acute alcohol intoxication often interferes and leads to overestimation of the severity of traumatic brain injury and delays the urgently needed diagnostic imaging. Intensive measures like serial CT or intracranial pressure monitoring may be unnecessarily performed [5]. In trauma patients with alcohol intoxication, the level of consciousness may be altered by factors like intracranial injuries, shock, hypoxemia, hypotension, or concomitant use of Central Nervous system depressants, in the form of medication or illicit drugs [6]. So, majority of the researchers proposed, a prompt neurological evaluation in all intoxicated head injury patients without much delay [6]. The primary resuscitative measures and transportation of injured to tertiary hospital are very poor in rural areas in developing countries like India. Our primary aim is to evaluate the profile of patients with head injuries, demographics, alcohol consumption, mode of injury and severity, time orinterval for reaching definitive care and outcome.

MATERIALS AND METHODS

This prospective study was conducted in the Department of Neurosurgery, Gandhi Hospital, from January 2017 to July 2017. We analysed 150 patients, admitted in our emergency Department with history of head injuries. The severity of injury was assessed by using Glasgow Coma Scale (GCS), Injury Severity Score (ISS) and Abbreviated Injury Scale (AIS) of each

body region. Injury Severity Score (ISS) correlates with morbidity, mortality, and length of hospitalisation in trauma patients. If ISS score is greater than 15, it is defined as major trauma [7]. Abbreviated Injury Score (AIS) is scored on a scale of zero to six, 0 was assigned to no injury to head and neck region, one being minor and six being major injury [8]. The GCS score was recorded first in the emergency department and reassessed frequently as and when necessary [9]. Other parameters like age, gender, mode of injury, alcohol intake, Marshall CT scoring of injuries [10] associated injuries, time interval between incident and primary care and between primary care and definitive care at tertiary hospital, disability, length of hospital stay (LOS), in-hospital mortality and cost burden were also analysed. Glasgow Outcome Scale (GOS) Of injured patients was analysed after 3 months of follow up [11,12].

Inclusion Criteria

Patients with traumatic brain injury, who were admitted under neurosurgical care were included in this study.

Exclusion criteria:

Mild head injury patients manageable at outpatient department, those who have died or lost for follow up in one month were excluded.

RESULTS

We analysed 150 patients admitted in our Department with history of head injury. Among these, males were 128 and females were 22 (Table 1 & Figure 1). 81 Patients were under the influence of alcohol at the time of injury and 69 patients were not drunk (Table 1 & Figure 2). Among 150 patients 123 were involved in RTAs, 23 patients fell from a height and 4 patients were fell from train (Table 2). 76 patients were two wheeler riders, 14 were pillion riders,11 were co-passengers and 22 were pedestrians (Table 2).

Total 81 injured patients had consumed alcohol at the time of injury, 79 were males and 2 were females. The maximum incidence of head injuries and drunken driving was observed in 20-29, 30-39 and 40-49 age groups (Table 1 & Figure 1&2). The maximum alcohol consumption was noticed at weekends.

Table-1: Comparative analysis of head injured patients among different age groups and incidence of alcohol intoxication

Age Group(years)	M, n(%)		F, n(%)		Alcohol intoxication	
					Male	Female
0-9	2	(1.3%)	3	(2%)	0	0
10-19	9	(6%)	1	(0.66%)	3	0
20-29	37	(24.6%)	4	(2.6%)	24	1
30-39	36	(24%)	3	(2%)	27	0
40-49	24	(16%)	4	(2.6%)	17	0
50-59	12	(8%)	5	(3.3%)	5	0
60 and above	8	(5.3%)	2	(1.3%)	3	1
Total	128		22		79	2

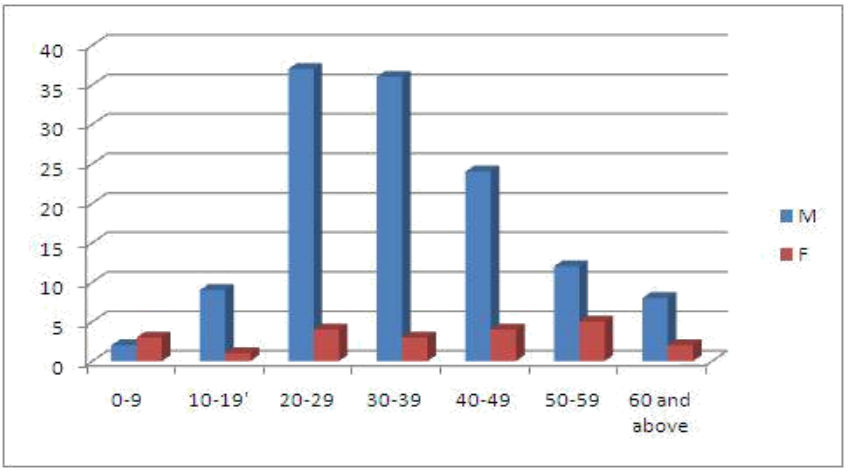

Fig-1: Incidence of head injuries in different age Groups

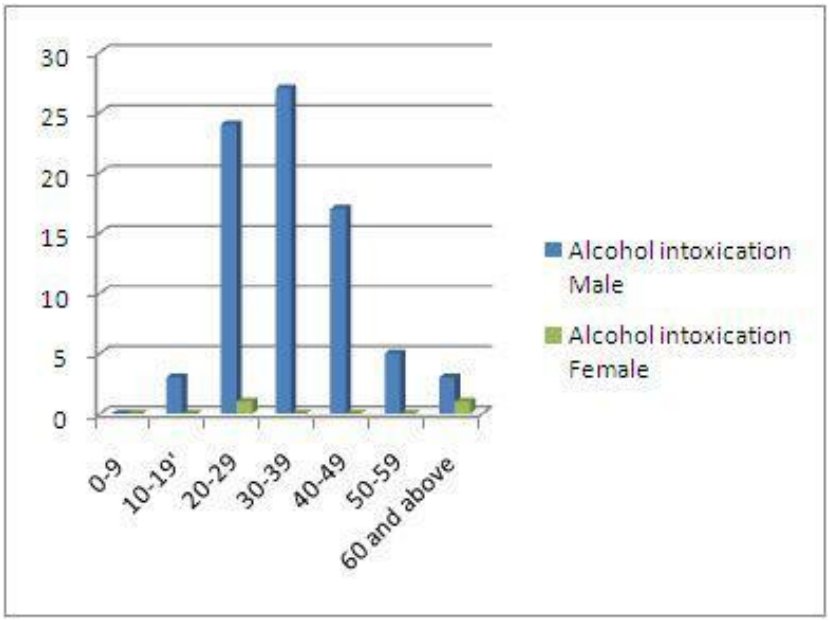

Fig-2: Incidence of drunken driving in different age groups

Table-2: Mode of injury in different age groups

Age group (years)	Bike riders		Pillion riders		Fall from height		Fall from Train		Co passengers		Pedestrian	
	M	F	M	F	M	F	M	F	M	F	M	F
0-9	0	0	0	0	1	1	0	0	1	0	0	2
10-19	3	0	0	0	3	0	2	0	0	0	1	1
20-29	26	1	3	2	3	1	1	0	2	0	2	0
30-39	23	1	0	0	6	0	1	0	5	0	1	2
40-49	12	0	3	3	4	0	0	0	2	1	3	0
50-59	7	0	0	3*	1	1	0	0	0	0	4	1
60 and above	3	0	0	0	1	1	0	0	0	0	4	1
Total	74	2	6	8	19	4	4	0	10	1	15	7

*2 riders took alcohol, the reason why pillion riders were injured.

Among total injured, 35 suffered severe and 23 patients suffered critical head injuries. The incidence of severe head injury is 25.9% and critical head injury is 18.5% in alcohol intoxicated patients, whereas in non drunk patients, the incidence of severe head injury is 20.2%, and critical head injury is 11.6%. We observed no significant difference in the incidence of mild and moderate head injuries in alcohol intoxicated and non alcoholic patients. There is no difference in Abbreviated injury scale (AIS) and Injury severity scale (ISS) and mortality in relation with alcohol (Table 3).

Table-3: GCS Grades and injury related characteristics in head injury patients - comparison between drunken driving and non-drunken driving

Variable	Alcohol Intoxicated	Non alcoholic
GCS, n (%)		
Mild (14-15)	20	23
Moderate (9-13)	25	24
Severe (5-8)	21	14
Critical (3-4)	15	8
AIS, n (%)		
Head/neck	3	2
Face	23	24
Thorax	2	5
Abdomen	0	2
Extremity	9	11
ISS	18.5	16.4
Mortality, n (%)	13	15
Spine injury	0	1

CT scan brain was performed in all patients, out of 150 patients 145 showed positive findings in CT brain irrespective of injury severity. The percentage of difference in CT based diagnosis is less in both groups (Table 4 & Figure 3&4)

Table-4: Positive findings in CT brain

Diagnosis	Alcohol Intoxicated	Non alcoholic
Subarachnoid Hemorrhage	4	5
Subdural Hemorrhage	15	12
Extradural Hemorrhage	15	9
Intracerebral Hemorrhage	23	22
Depressed fracture	18	15
Diffuse Axonal Injury	3	4
Normal	3	2
Total	81	69

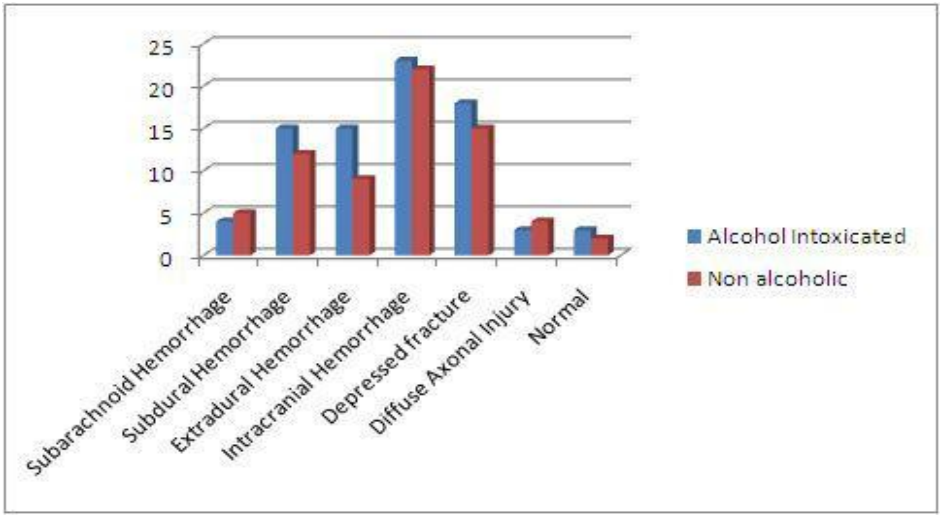

Fig-3: Positive findings in CT brain in alcoholics and nonalcoholics

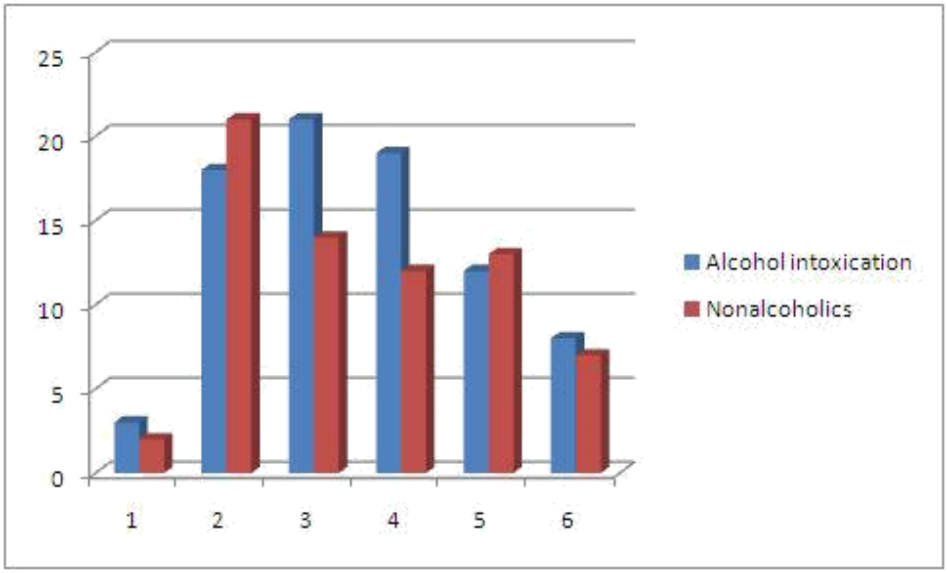

Fig-4: Comparison of Marshall CT scoring in alcohol intoxicated and non-alcoholic patients

Among 150 patients, 36 underwent Craniotomy, and 114 were treated conservatively, out of which 28 patients died in the hospital. The incidence of surgical intervention is 25.9% in alcohol intoxicated patients and 21.7% in nonalcoholic patients (Table 5 & Figure 5).

Table-5: Incidence of surgical intervention and conservative management in alcoholics and nonalcoholics

	Alcohol intoxication, n(%)		Non alcohol, (n%)	
Conservative management	60	(74%)	54	(78.2%)
Surgical intervention	21	(25.9%)	15	(21.7%)
Mortality	13	(16%)	15	(21.7%)

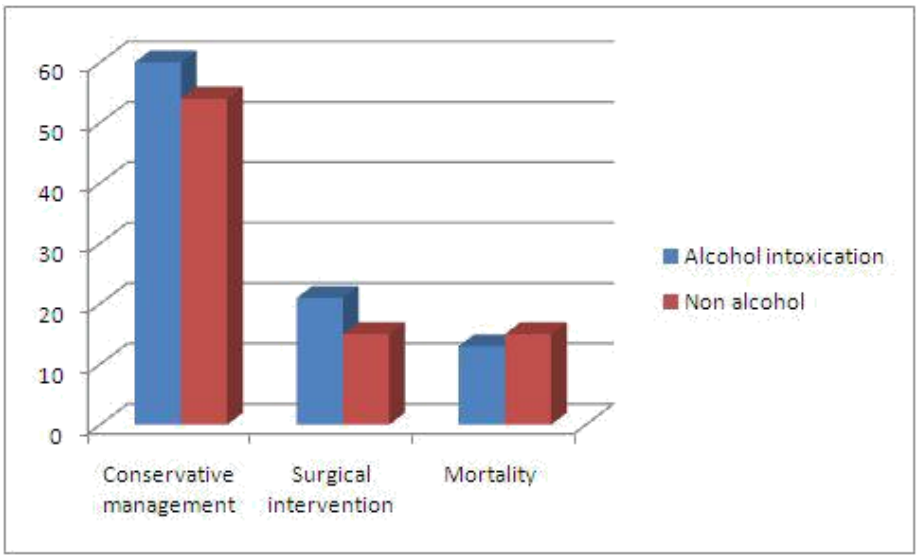

Fig-5: Incidence of conservative and surgical management, and mortality in alcohol and non alcohol intoxicated patients

At the follow up we observed a linear relationship between GCS at admission and GOS at 3 months. Patients who presented with better GCS, improved well on follow up, and those with very poor GCS showed either deterioration or remained same on follow up (Table 6). In alcohol intoxicated patients who survived 12 patients had significant neurological deficits. The average days of hospitalization were 8.6 days and the average days of loss of work was 18.3 days.

Table-6: Comparison of GOS at 3 months of follow up in alcohol intoxicated and nonalcoholic patients

GOS	Alcohol intoxicated, n(%)	Nonalcoholic, n(%)
1	13 (16.0%)	15 (21.7%)
2	07 (8.6%)	05 (7.2%)
3	12 (14.8%)	09 (13.0%)
4	23 (28.3%)	16 (23.2%)
5	26 (32.1%)	24 (34.8%)

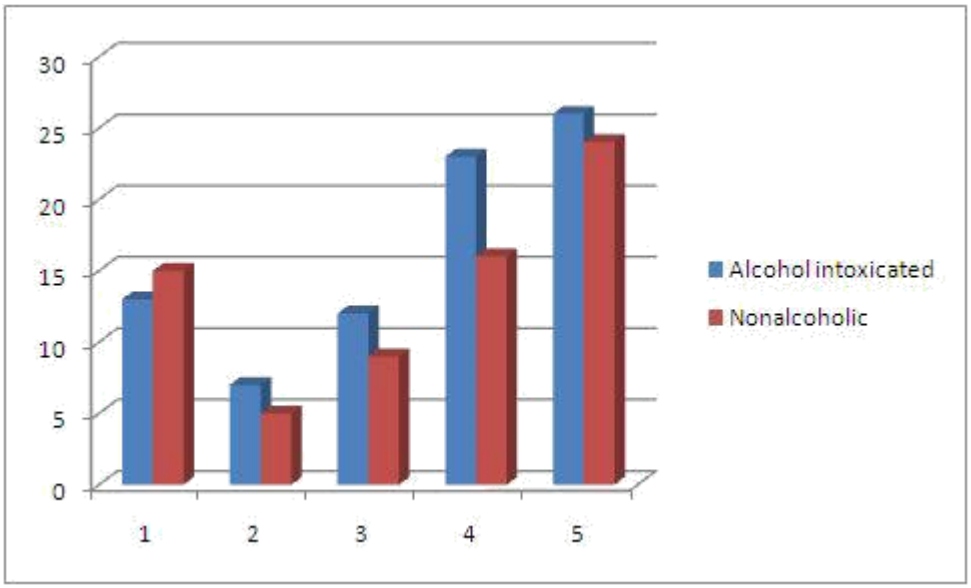

Fig-6: Comparison of GOS at 3 months of follow up in alcohol intoxicated and nonalcoholic patients.

Table-7: Correlation of GOS in relation with the time interval in reaching the tertiary hospital.

GOS	< 4 hrs, n(%)	4-8 hrs, n(%)	> 8hrs, n(%)
1	04 (2.6%)	11 (7.3%)	13 (8.6%)
2	03 (2%)	04 (2.6%)	07 (4.6%)
3	08 (5.3%)	06 (4%)	08 (5.3%)
4	11 (7.3%)	11 (7.3%)	17 (11.3%)
5	12 (8%)	16 (10.6%)	19 (12.6%)

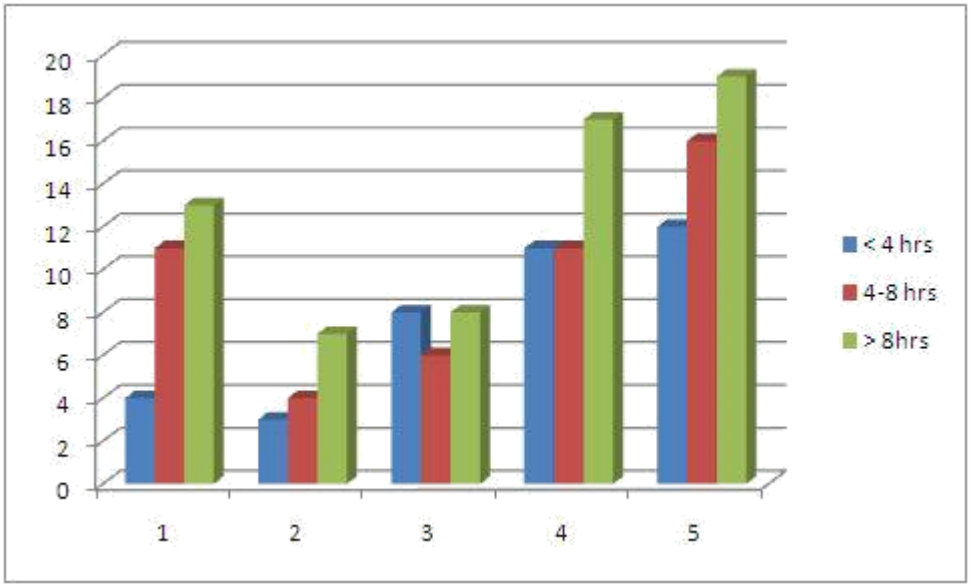

Fig-7: Correlation of GOS in relation with the time interval in reaching the tertiary hospital.

The total number of patients from Urban area is 43, semi urban is 29 and from rural area is 78 (43 alcoholics and 35 non alcoholics). The majority of patients who got admitted in our hospital belong to low socioeconomic status and their average monthly income is Rs 3100/-. 77 were illiterates, 52 patients were high school dropouts, 21 patients were graduates. The average time interval between the time of injury and primary care was 1 hour 10 minutes. And we observed that, majority of the patients who got injured in rural areas didn't receive sufficient primary care. In our study only 2 patient's airway was secured at initial resuscitation. The average time interval between injury and received of definitive care was 8 hours 40 minutes. In our study 38 patients reached tertiary hospital in less than 4 hrs, 48 patients reached in between 4-8 hrs duration, and 64 patients reached after 8 hrs of injury. We observed that, the mortality and outcome is inversely proportionate to the time interval in reaching the tertiary hospital(Table 7 & Figure 7).

DISCUSSION

With India reporting as many as 1.34 lakh fatalities in road traffic accidents every year, a vast 70% of them are due to drunken driving. Despite prosecution of drunken driving having increased by about 7 times in Delhi and 16 times in Mumbai since 2001, there has been no corresponding decrease in accidents and fatalities. Each day, nearly 3,500 people die on the roads worldwide, of these Indians account for 10%. About 56 accidents and nearly 14 deaths per hour occur on Indian roads. It is important to note that the number of persons killed per lakh of population has risen to about 11 and simultaneously India also records the highest per capita consumption of alcohol in South East Asia. The 24 hour availability of alcohol along National and State highways results in impulsive buying of alcohol and contributes to 72 per cent of road accidents on National Highways.

The GCS, the most commonly used tool to quantify the level of consciousness in traumatic brain injury, may be misinterpreted in acute alcohol intoxicated patients. We observed that, in the initial evaluation of patients with mild to moderate GCS, the Marshall CT score is 1-3 in both alcohol and non-alcohol intoxicated patients. In few patients we observed a discrepancy between GCS and Marshall CT score.in the may be due to alcohol. We also observed a linear relationship between higher Marshall CT score, and severe and critical GCS in both groups. In our study we observed a higher incidence of severe and critical head injuries in alcohol intoxicated patients. In trauma patients with alcohol intoxication, the level of consciousness also depends on other factors like intracranial injuries, shock, hypoxemia, hypotension, or concomitant use of medication or illicit drugs [6]. National Trauma Data Bank of American College of Surgeons which studied 108929 patients between 1994 and 2003, analysed that alcohol consumption does not influence the GCS score irrespective of the severity of traumatic brain injury [6]. But alcohol consumption impairs motor skills and judgement resulting in decreased ability in driving. So, many researchers

proposed neuro evaluation in all intoxicated head injury patients without much delay [6].

Recently the Supreme Court of India banned selling or serving of alcohol within 220m radius of national and state highways. In our study 53% (43 in 81) of alcohol intoxicated patients were from rural area. Majority of them fell from 2 wheeler in their villages. A large number of road users in India are pedestrians, bicyclists, and two wheeler riders. Unlike occupants in four wheelers, these road users were directly exposed to road traffic and most were unprotected. Exceeding lawful speed and Drunken driving were accounted for rise in casualties. The permitted limit of "Blood Alcohol Concentration" (BAC) for drivers in India is 0.03% or 35 ml of alcohol in 100ml of blood.

Hyder *et al* summarized characteristics of epidemiology of traumatic brain injury worldwide and reported, that 62% of TBIs are due to road traffic accidents, 8% are due to falls, violence contributes 24%, and 4% are work and sports related injuries [13]. However, motor vehicle injuries are the leading cause of TBI related mortality. In our study TBI due to motor vehicle accidents are 82% (123 of 150), and falls are 18%(27 of 150). (Table 2). We also observed that majority of TBI patients have not used helmets while driving.

The critically affected age group was 15 to 29 years. The risk is maximum in young commuters, attributable to high incidence of alcohol and drug consumption, peer pressure, driving inexperience and risk taking behaviour of young adults. In our study the incidence of TBI and drunken driving is more in 20-29 and 30-39 age groups (Table 1& Figure 1&2).

In our study the percentage of positive CT findings does not show any difference in both alcohol intoxicated and nonalcoholic patients (Table 4 & Figure 3). We found that ISS score is more in alcohol intoxicated patients than nonalcoholic with no significant difference in the AIS score (Table 3).

The incidence of surgical intervention is more in alcohol intoxicated patients, but mortality is more in nonalcoholic patients (Table 5& Figure 5). Our observation is similar to that of National Trauma Data Bank of American College of Surgeons study [6]. However, we observed severe and critical injuries are more in alcohol intoxicated patients, with the GOS at 3 months almost similar in both groups (Table 6&7, Figure 6&7).

Due to inadequacy of trauma care centers and lack of adequately trained paramedical staff along with fully equipped ambulances in the semi urban and rural areas, majority of the injured are not receiving prompt trauma care. Most of the times the victims were transported to the hospital by relatives, bystanders or police in commercial vehicles rather than trained paramedical staff in equipped ambulances. Often the average time interval between incident and reaching hospital or definitive care was increasing. In our study 53% of alcohol related injured patients were from rural area, and by the time they reach to the tertiary care hospitals, the critical window period is being missed.

CONCLUSION

Deaths and injuries due to road mishaps are a national problem that must be addressed immediately, as the damage caused by them is enormous in terms of lives and injuries as also the national cost involved in treating over 5 lakh people who get injured every year. In addition to the ban on sale of liquor in highways, the more stringent enactments and punishments in drunken driving are required to reduce the incidence of RTAs and mortality. The improvement in primary care, transportation facility of the critically injured patients and reducing the time interval in reaching the tertiary hospital reduces the mortality in TBI.

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