Original Research Paper

Forensic Pathological Study of Drivers Exploring the Role of Alcohol in Road Traffic Accidents

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Abstract

Road traffic accident is one of the leading causes of trauma, disabilities and deaths. Nearly 50 crore people are injured across the world every year of which more than 12 million turned into fatal. Amongst the various causes of road traffic accidents, rash driving is one of the major causes of accident which is substantiated by driving under the influence of alcohol. Alcohol not only inhibits self-control but impairs the judgment and visual acuity, affects safe driving that's why it is restricted all over the world. In this study, the person who were driving and injured in road traffic accidents, were investigated for epidemiological and clinico-pathological characteristics including causes/factors responsible for the accidents. All the victims were male above 15 years of the age and motorcyclists were the most (82.52%) injured. Fault of the driver was the commonest (53.39%) reason behind the accident and large number of them (23.30%) had consumed alcohol before driving. This was also confirmed by estimating concentration of alcohol in blood by Vitros Auto-analyzer.

Key Words: Road traffic accidents, Driver, Blood alcohol concentration, Head injury, Two-wheelers

Introduction:

Road traffic accident is one of the most serious health problems throughout the world by killing and crippling thousands of persons every day. In India, 1, 37, 423 people died in 2013 due to Road traffic accidents, of which 34,187 (24.87%) were from motorcycles. Thus the average death from RTA is 377 per day. [1] For every death, 4 people suffer with severe disabilities, 10 require hospitalization and 30 emergency room treatment.

"Forensic pathological study of drivers exploring the role of alcohol in road traffic accidents" is a project designed to find out causes and factors responsible for high incidence of RTA. Here the persons, who were driving the vehicle at the time of accidents, were studied for epidemiological and Forensic pathological aspects.

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The aim of this study is to explore the nature of injuries and factors responsible in road traffic accidents. Large number of studies on RTA is conducted throughout the world but very few on drivers alone and no one in India so far to the best of my knowledge. That's why this study was taken to look into the causes and factors including the role of alcohol behind the road traffic accidents so that preventive measures can be suggested.

Material and Methods:

The present study was carried out on the people who were driving a two, three, four-wheeler vehicle or a heavy motor vehicle, injured and admitted in Chhattrapati Shivaji Subharti Hospital (CSSH), Meerut for treatment from 1st September 2012 to 31st march 2014.

Persons, other than drivers injured in the accident, are not included in this study. The drivers, if they were brought dead or died in the hospital before registration/admission, are also not included in this study.

All these cases were studied for epidemiological, Clinico-pathological and medico-legal aspects. After consent, the personal information of the victim such as age, sex, education, occupation, socio-economic status, habit, disabilities, diseases such as hypertension, epilepsy, cataract etc. and use of medicines inducing sleep etc. were gathered from the patient and their relatives.

The information regarding the accident particularly how it occurred, was the driver

drunk, number of person injured/died in the accident and duration for which patient was lying unattended were noted from accompanying person and from persons present at the scene of accident. The condition of the patient including level of consciousness, injuries, features of alcoholic intoxication and investigations were noted with the help of residents posted in surgery department and from the hospital records. Blood alcohol level was estimated by Vitros auto-analyzer in cases where suspicion of alcohol consumption was found during clinical examination. All the data thus collected was analyzed and presented in table and bar/pie diagram.

Observation and Results:

One hundred and three drivers, injured in the road accidents and admitted in CSS Hospital Meerut were studied for epidemiological and medico-legal aspects. All the victims in this study were male; none of them was female.

The maximum number of the victims (38.83%) belonged to 21-30 years of age-group followed by 26.21% in 31-40 and 14.56% in between 15-20 years of age. (Table 1) None of the victims was below 15 years.

Amongst the person who were driving the vehicle and injured, the maximum 82.52% were the drivers of two-wheelers (mostly motorcyclists) followed by 8.73% of four-wheelers, 4.85% of three-wheelers and 3.88% of heavy vehicles. (Table 2) Most of these drivers (81.56%) were not driver by occupation. Only 18.44% of the victims were drivers by occupation. 30.09% of the victims were students and 20.38% the businessmen. (Table 3)

On examination of victims, injuries to the head and face alone or with other parts of body were seen in majority (72.82%) of the cases in which fracture of skull bones were seen in 41.75% cases. Limbs alone or with other parts of body were injured in 44.67% cases. (Graph A)

In our study fracture of upper limb bones in 20.39% and lower limb bones in 22.33% of the victims. Ribs were found fractured in 5.83% and pelvis in only 0.97% cases. (Table 4)

Apart from injuries, drivers were brought unconscious in 7.76% orientation was disturbed, in 30.09%, bleeding from mouth/nose or ear in 48.54%, smell of alcohol from breath/body in 23.30% and signs of muscles in-coordination by negative finger-nose test in 33.96%, negative Romberg's test in 17.46% and inability to pick up object in 23.29% cases. (Table 5)

According to the statement of drivers and/or their attendants, 24 (23.30%) of the victims had consumed alcohol half to one hour before started driving. BAC was also analyzed by Vitros auto-analyzer in these cases and found more than 60 mg% in all these cases. BAC was 60-120 mg% in 45.83%, 120-180 mg% in 25% and more than 180 mg% in 29.16% cases at the time of collection and investigation of sample. (Table 6) In majority of the cases road traffic accidents occurred either by collision with other motor vehicles (65.04%) or by slipping of the vehicle (23.31%). Accidents also occurred by striking with animal carts in 1.94%, with divider in 4.85%, with other stationary objects such as tree, railings etc. in 2.91%, and with wandering animals in 1.94% cases. (Table 7)

Among the 67 vehicles, which were collided with other motor vehicles, half (49.25%) of vehicles collided with LMVs, 26.86% with HMVs and 20.89% with two-wheelers (Table 8) and these were hit from back in 41.79%, from sides in 35.82% and from front in 22.38% cases.

The vehicles which were slipped, most of them were motorbikes and slipped due to presence of sand and gravels at the side of road (25%), rain and mud (16.66%), pits on road (12.5%) and flattening of tire (8.33%). (Graph B)

The causes of road traffic accidents were explored and fault of victim or its vehicle was found in 2/3rd (68.93%) of the cases and of the driver or vehicle of opposite side in 1/3rd (31.06%) of the cases. As a total, human error (fault of drivers of either side) was responsible for most (78.64%) of the casualties of which victims were at fault in 50.48% and drivers of opposite side in 28.15% cases. (Table 9)

Here over speeding and driving under the influence of alcohol were the two most important predisposing factors behind the accidents. Over speeding was seen in 36 (34.95%) cases, of which injured drivers were at fault in 16 (15.53%) and drivers of offending vehicles in 20 (19.41%) cases.

Driving under the influence of alcohol was observed in 24.27% cases mostly (23.30%) in the drivers of injured vehicles. cases. Besides this inexperienced driving (5.82%) and driving on wrong side or giving wrong signal (5.82%) were responsible for substantial number of casualties. Amongst other causes, defective road conditions in 8.73%, environmental variation in 6.79% and vehicular causes in 5.82% cases.

Discussion:

In "Forensic-Pathological study of drivers exploring the role of alcohol in RTA", the person who were driving the vehicle, injured and admitted in CSS Hospital, Meerut were examined for epidemiological, Clinico-pathological and medico-legal aspects of road

traffic accidents and these were 103 in number, all were male and above 15 years of age.

This is because most of the vehicles are driven by male after being adult. Laws also do not permit driving below 18 years of age but few boys start driving even before without bonafide driving license and get injured. Females drive less and if drive, they are more careful.

Drivers of two-wheelers were most often (82.52%) injured in RTAs. This is probably due to inherent instability in motorbikes and covered protection in three wheelers, LMV and HMV. This corresponds to the data released by NCRB. [1] Similar results were also observed in Rajasthan. [8] The majority of the people (81.56%) who were driving the vehicle at the time of accident were not driver by profession.

These were students (30.09%), businessmen (20.38%), and employees in different sectors (8.73%) etc. driving vehicle, mostly motorbikes, for their personal use. Majority of the vehicles in RTA were two-wheelers which were driven by common people not by drivers. That's why, majority of the drivers are not driver by profession.

Injuries to the head and face alone or with other parts of body were seen in 72.82% of the cases which corresponds to the studies conducted in different parts of the country as 89.36% in Delhi [2], 84.7% in Haryana. [3] 60.61% in Rajkot [6] and 76% in Ahmadabad. [7]

Fracture of skull bones were seen in 41.73% corresponds with the study done in Aligarh where skull fractures were seen in 40.65% cases. [5]

In this study 23.30% of the drivers consumed alcohol which corresponds to the BAC in the drivers of RTA in South East Asian countries. [4]

Collision with other motor vehicles is the most common cause of accident seen in 65.04% cases. Vehicles usually hit by heavier vehicles as by LMV in 49.25% and HMV in 26.86% of the accidents. Amongst the causes of accidents human error is the most important seen in more than three-fourth (78.64%) of the cases, of which fault of the victim is seen in 52 (50.48%) and fault of the driver of the opposite vehicle in 29 (28.15%) cases.

Amongst the faults of victims, driving under the influence of alcohol is the commonest (23.30%) followed by over speeding of the vehicle in 15.53%. This corresponds to the data mentioned in All India Road Statistics. [9]

Conclusion:

In road traffic accidents large number of casualties occurs every day in which not only the person who is driving the vehicle is injured but other co-passengers, drivers and passengers of other vehicle which collided in the accident and other road users such as pedestrians, cyclists etc. are also involved. Drivers of motor vehicles injured in the RTA were males and above 15 years of age. No-one was female.

Majority (82.52%) of the vehicles injured in road accidents are two-wheelers (especially motorbikes) and driven by the person other than the drivers in most (81.56%) of the cases.

Injuries to head and/or extremities were present in most of the cases of which fracture of skull bones were found in 41.74% and limb bones in 37.86% case. Collision/hit by other vehicle (65.04%) is the commonest cause of accident of which most of them are hit by LMV/ HMV especially from back.

Motorcyclists also slipped in significant number of cases mostly due to defective road conditions as gravel and sand (25%), mud (16.66%) and pits (12.5%) on road.

Human error was the most important cause of accident found three-fourth (78.64 %) of the cases, of which fault of the victim was seen in 52 (50.48%) and fault of the driver of the opposite vehicle in 29 (28.15%) cases.

Amongst the faults of victims, driving under the influence of alcohol was the commonest (23.30%) followed by over speeding of the vehicle in 15.53%. Over-speeding is the main fault of opposite driver seen in 19.41% cases.

Measures to Curb Road Traffic Accidents:

The four basic reasons behind the accident are fault of the road users, defect in the vehicles, poor roads conditions and adverse weathers. It can be minimized by:

- Making people aware of traffic rules, threats of alcohol and rash driving in accidents and advantage of protective gears such as helmets, seat belts etc. during driving through posters and hoardings, television and documentaries. Traffic rules and preventive measures can be added in the school curriculum so that people may aware of traffic rules from childhood.
- Enforcing the traffic rules and not allowing driving without driving license, helmet and seat belt. Drivers should be monitored regularly for alcohol, rash driving and use of protecting gears and also checked for B.P., visual defects, colour blindness, epilepsy etc. once in a year after the age of 40.
- Maintain road by improving road surfaces, removing obstacles, encroachments and

blind turns, constructing guards/rails at turns, widening of bottle necks and proper signs and signals throughout the highways. If feasible, mix traffic should be avoided on main roads and highways.

- Regular inspection and maintenance of vehicles is necessary for safe driving. Now large number of safety devices such as air bags, laminated windshields, improved automatic break system, anti-glare/anti fog lights, sensor device and camera etc. are available. They should be made mandatory in all the vehicles on roads.
- There should be traffic aid posts at suitable distances on the highways to assist injured in accidents and quick transport to trauma centres after giving first-aid/resuscitative measures.

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Table 1: Age and Gender wise Distribution of the Drivers of RTA

Age (yrs)	Male (%)	Female (%)	Total (%)
< 10	-	-	-
11-20	15(14.56)	-	15(14.56)
21-30	40(38.83)	-	40(38.83)
31-40	27(26.21)	-	27(26.21)
41-50	12(11.65)	-	12(11.65)
51-60	06(5.82)	-	06(5.82)
61-70	03(2.9)	-	03(2.9)
Total	103(100)	-	103(100)

Table 2: Type of Vehicles Involved in RTA

Type of Vehicle	Number	%age
Two-wheeler	85	82.52
Three-wheeler	05	04.85
LMV (four-wheeler)	09	08.73
HMV	04	03.88
Total	103	100.00

Table 3: Occupation of the Person who drive the Vehicle

Occupation	Number	%
Driver	19	18.44
Student	31	30.09
Service	09	08.73
Businessman	21	20.38
Others	23	22.33
Total	103	100.00

Table 4: Fracture of Bones in Victims of RTA

Bones fractured	Number	%
Skull	26	25.24
Skull + Upper Limb	11	10.67
Skull + lower limb	05	4.85
Skull +chest+ both extremities	01	0.97
Upper limb only	05	4.85
Chest	03	2.91
Chest + upper limb	02	1.94
Pelvis	01	0.97
Lower limb only	13	12.62
Upper + lower limb	02	1.94
Total	69	66.99

Table 5: Other Clinico-pathological Features in Victims of RTA

Clinical features	Assessment	Number (%)
Mental condition	Unconscious	08(7.76)
	Altered Orientation	31(30.0)
Smell of alcohol	Present	24(23.3)
Speech	Slurred	12(11.65)
Muscle Co-ordination	(-ve) Finger nose test	35(33.96)
	(-ve) Romberg's test	18(17.46)
	Inability to pick up objects	24(23.29)
Bleeding	From mouth/ nostrils/mouth	50(48.54)

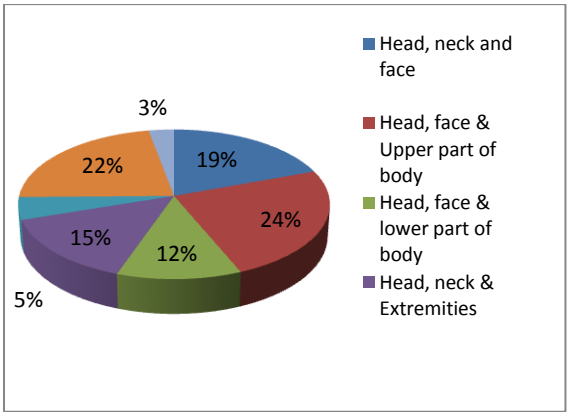
Table 9: Causes of Accidents

Causes of accident	Driver	Opposite party
MANUAL		
Alcoholic Intoxication	24 (23.30%)	01 (0.97%)
Sleep/Exhaustion	-	-
Inexperienced driver	06 (5.82%)	01 (0.97%)
Medical illness	-	-
Over Speeding	16 (15.53%)	20 (19.41%)
On Wrong side	02 (1.94%)	04 (3.88%)
Giving wrong signal	-	02 (1.94%)
While preventing other people	03 (2.91%)	-
Others	01 (0.97%)	01 (0.97%)
VEHICULAR		
Break failure	01 (0.97%)	01 (0.97%)
Head light defective	01 (0.97%)	-
Tail light defective	-	01 (0.97%)
Flattening of tire	02 (1.94%)	-
ENVIRONMENTAL		
Fogging	02 (1.94%)	01 (0.97%)
Heavy raining	04 (3.88%)	-
ROAD CAUSES		
Open manholes	-	-
Speed breakers	-	-
Mud/gravel	06 (5.82%)	-
Pits	03 (2.91%)	-
Total	71 (68.93%)	32 (31.06%)

Table 6: BAC in Drivers Having Suspicion of Alcohol Consumption

S. No.	Range of BAC (mg/dl)	Number	%age
1	61 – 90	05	20.83
2	91 – 120	06	25.00
3	121 – 150	04	16.66
4	151 – 180	02	08.33
5	**> 180**	**07**	29.16
	Total	24	100.00

Graph A: Major Body Areas Involved in Victims of RTA



Graph B: Causes of Slip of Vehicle in RTA

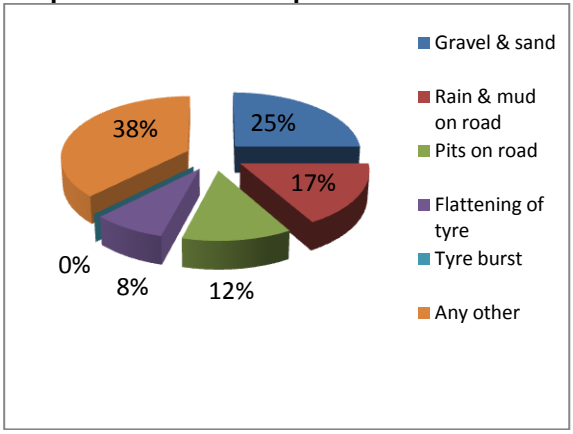


Table 7
Causes of Accidents

Victim's Vehicle	CAUSE OF ACCIDENT							
	Collision with						Slipped (%)	Total (%)
	Motor vehicle (%)	Animal cart (%)	Divider (%)	Stationary object (%)	Animal (%)	Total (%)		
Two-wheelers	54(52.42)	02(1.94)	04(3.88)	01(0.97)	02(1.94)	63(61.16)	22(21.35)	85(82.52)
Three-wheelers	03(2.91)	-	-	-	-	03(2.91)	02(1.94)	05(4.85)
LMV	07(6.79)	-	01(0.97)	01(0.97)	-	09(8.73)	-	09(8.73)
HMV	03(2.91)	-	-	01(0.97)	-	04(3.88)	-	04(3.88)
Total	67(65.04)	02(1.94)	05(4.85)	03(2.91)	02(1.94)	79(76.69)	24(23.30)	**103(100)**

Table 8
Collision with Other Motor Vehicles

Victim's vehicle (67)	Collided with Motor Vehicles				
	Two-wheeler (%)	Three-wheeler (%)	LMV (%)	HMV (%)	Total (%)
Two-wheeler	13(19.41)	02(02.98)	28(41.79)	11(16.41)	54(80.59)
Three-wheeler	01(01.49)	-	01(01.49)	01(01.49)	03(04.47)
LMV	-	-	04(05.97)	03(04.47)	07(10.44)
HMV	-	-	-	03(04.47)	03(04.47)
Total	14(20.89)	02(02.98)	33(49.25)	18(26.86)	67(100.00)