

## Study of Pattern of Road Traffic Accidents and Detection of Alcohol in Vitreous Humor as an Evaluation Tool: An Autopsy Based Study

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### Abstract

**Background:** Exponential increase in road traffic accident cases are a major cause of concern all over the world. The fatality of accident cases depends on various factors and alcohol consumption can also be associated to increase in incidence of road traffic accidents. **Materials and Methods:** An autopsy based study on victims of road traffic accidents was carried out in the department of Forensic Medicine, M.K.C.G Medical College, Berhampur, Odisha. The vitreous samples were tested qualitatively for presence of alcohol by potassium dichromate test. The stomach contents and the blood and urine sample sent to RFSL for chemical analysis. **Result:** A total number of 918 autopsies were done during the study period and 250 cases (27.23%) were due to road traffic accidents. 86% were males and belonged to 31-40 years (23.6%). Pedestrians comprised the 51.6% of the victims. 42 % of the victims sustained fatal head injuries (42%) followed by 36.8% of cases sustaining multiple injuries. 20% tested positive for qualitative estimation of vitreous alcohol. Out of 21 victims of drivers of 2/3 wheelers 15 71.43% tested positive for alcohol. Out of 50 vitreous positive cases, alcohol was detected in in blood, urine and stomach samples in 60%, 40% and 20% cases respectively. Vitreous alcohol was positive even after 12 hours. **Conclusion:** A significant number of victims of road traffic accidents showed positive detection of alcohol in their vitreous sample proves alcohol as one of the important factor in incidence of accidents. The vitreous sample was a better sample than blood, urine and viscera in qualitative detection of alcohol.

**Keywords:** Road Traffic Accidents; Vitreous Humor; Alcohol.

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### Introduction

A Road Traffic Accident (RTA) is when a vehicle collides with another vehicle, pedestrian, animal or geographical or architectural obstacle [1]. From the first motor vehicle accident in 1771 in Paris by Cugnot's steam tractor to the present, the road traffic accidents are increasing day by day due to rapid industrialization and urbanization. Accidents are considered a veritable epidemic disease which can be prevented if appropriate measures are taken to check the causative factors. Injuries cause the death

of over five million people around the world each year despite no longer being perceived as unavoidable but largely preventable events [2]. In depth studies of fatal vehicular accidents provide valuable data for implementing effective emergency services to reduce the trauma related mortality and strengthening legal measures in peak hours of fatal accidents [3].

Various studies in our state were done on injury patterns but very few studies have been done to relate vitreous alcohol with road traffic accidents. Although done in recent past, this study was done with an objective to study the pattern of road traffic accidents with emphasis on qualitative detection of alcohol in vitreous humor as an evaluation tool and corroborate with findings of chemical analysis of other body fluids and viscera.

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### Material and Methods

The autopsy based study was carried out in the department of Forensic Medicine, M.K.C.G Medical

College, Berhampur with a cross sectional design. All victims with definite history of road traffic accidents brought for autopsy during the period 1st January 1998 to 31<sup>st</sup> December'1999 were included in this study. The doubtful cases were excluded from the study. The detailed analysis of 250 cases was based on the inquest report, available medical records, autopsy findings and chemical analysis report. Other epidemiological parameters were obtained from the history taken by police and his/her relatives present. A clear transparent sample of vitreous humor was aspirated with a 5ml hypodermic needle, 5 cm away from outer canthus of eye and tested qualitatively for presence of alcohol by potassium dichromate method. The color change in solution from orange to green was taken as positive and no color change was indicative for negative test. The stomach contents, blood and urine sample were sent to RFSL for chemical detection of alcohol. The data thus obtained was entered on excel spread sheet and analyzed statistically for calculating different percentages.

## Results

Out of 918 autopsies conducted during the study of one and half year, 250 cases (27.2%) were due to road traffic accidents. Majority of the victims were males (86%) (Table-1). Most of the victims belonged to 31-40 years (23.6%) followed by 41-50 years (23.2%)( Table 1). Pedestrians comprised the maximum number of the victims (51.6%) and the least number of victims were pillion drivers (2.8%) (Table-2). It has been observed that all the victims sustained fatal head injuries (42%) followed by 36.8% of cases sustaining multiple injuries. 50 victims (20%) tested positive for qualitative estimation of vitreous alcohol out of which 13 victims (26%) were pedestrians. Out of 21 victims of drivers of two wheelers, 15 (71.4%) tested positive for alcohol (Table 3).

Our study revealed that in male population, 40.43% of 21-30 years had vitreous positive for alcohol followed by 35.09% of cases who belonged age group of 31-40 years (Table 4).

**Table 1:** Age and sex preponderance of road traffic victims

Age Group	Male (%)	Female (%)	Total (%)
0-10	6(2.8)	5(14.2)	11(4.4)
11-20	21(9.8)	1(2.9)	22(8.8)
21-30	47(21.8)	8(22.9)	55(22)
31-40	57(26.5)	2(5.7)	59(23.6)
41-50	48(22.3)	10(2.9)	58(23.2)
51-60	23(10.7)	7(20)	30(12)
61-70	11(5.1)	2(5.7)	13(5.2)
>70	2(0.9)	0(0)	2(0.8)
Total	215	35	250(100)

**Table 2:** Fatal injury pattern and types of victims of RTA

Type of victims	Chest (%)	Abdomen (%)	Head and Neck (%)	Limbs (%)	Multiple injuries (%)	Total
Pedestrians	10(7.8)	5(3.8)	59(45.7)	7(5.4)	48(37.2)	129(100)
Cyclists	2(9.6)	0(0)	10(47.6)	1(4.8)	8(38)	21(100)
2 /3wheelers drivers	0(0)	0(0)	10(47.6)	4(19)	7(33.3)	21(100)
Pillion riders	0(0)	0(0)	5(71.4)	1(14.3)	1(14.3)	7(100)
4 wheeler drivers	2(14.3)	3(21.4)	3(21.4)	1(7.1)	5(35.7)	14(100)
Occupants of 4 wheelers	6(10.3)	7(12.1)	18(31)	4(6.9)	23(39.7)	58(100)
Total	20(8)	15(6)	105(42)	18(7.2)	92(36.8)	250(100)

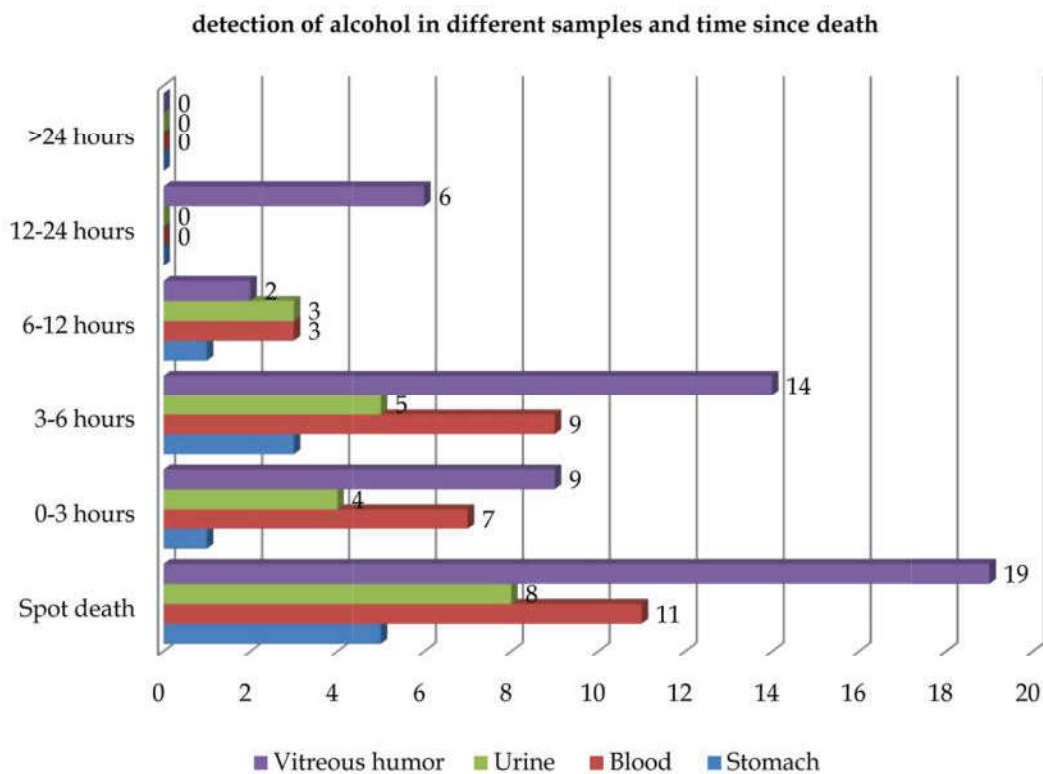
**Table 3:** Distribution of RTA victims tested positive for alcohol and age

Age(years)	Pedestrian (%)	Cyclist (%)	Two wheeler driver (%)	Pillion driver (%)	Four wheeler driver (%)	Occupants (%)	Total (%)
0-10	0	0	0	0	0	0	0(0)
11-20	0	0	0	0	0	1(100)	1(100)
21-30	5(26.2)	1(5.3)	6(31.6)	0(0)	1(5.3)	6(31.6)	19(100)
31-40	7(35)	1(5)	5(25)	0(0)	1(5)	6(30)	20(100)
41-50	1(16.7)	0(0)	2(33.3)	0(0)	0(0)	3(50)	6(100)
51-60	0(0)	0(0)	1(33.3)	1(33.3)	0(0)	1(33.3)	3(100)

61-70	0(0)	0(0)	1(100)	0(0)	0(0)	0(0)	1(100)
>70	0	0	0	0	0	0	0
Total (%)	13(26)	2(4)	15(30)	1(2)	2(4)	17(34)	50(100)

**Table 4:** Sex and age wise distribution of victims of RTA tested positive for alcohol in vitreous humor

Age group in Years	Sex	total number of victims	No. of vitreous alcohol positive cases	Percentage vitreous alcohol positive cases
0-10	Male	6	0	0.00
	Female	5	0	0.00
11-20	Male	21	1	4.76
	Female	01	0	0.00
21-30	Male	47	19	40.43
	Female	8	0	0.00
31-40	Male	57	20	35.09
	Female	02	0	0.00
41-50	Male	48	4	8.33
	Female	10	2	20.33
51-60	Male	23	2	8.70
	Female	07	1	14.29
61-70	Male	11	1	9.90
	Female	02	0	0.00
>71	Male	02	0	0.00
	Female	0	0	0.00
Total		250	50	20.00



**Fig. 1:** Time since death and number of cases showing positive for alcohol in different samples

Amongst 50 vitreous positive cases, alcohol was detected in blood, urine and stomach samples in 30(60%), 20(40%) and 10(20%) cases respectively (Figure 1) Vitreous alcohol was positive even after 12

hours but within 24 hours of time since death. There was not a single case where vitreous in negative for alcohol and alcohol detected in other samples (Figure 1).

## Discussion

The main aim of the study was to study the pattern of road traffic accidents with relation to variables like age, sex, type of victims and type of injury sustained. Study objective also was to qualitatively detect alcohol in vitreous humor and corroborate with chemical analysis report of other body fluids and viscera.

About 27% of our total autopsy cases were due to road traffic accidents showed that people in this rural part of Southern Odisha lack awareness of traffic safety rules and poor conditions of road lead to increased fatalities. Our study revealed, 86% of males with 23.6% in 31-40 years quite similar to the study done at Maharashtra where the highest numbers of deaths (39.79%) were recorded in the 20-39 years age group with male to female ratio of 3.08:1 [4]. The middle aged men were more vulnerable to accidents because they engage in more outdoor activities and were earning members in their family. In our study, pedestrians comprised of 51.6% of victims owing to fact that the proximity of villages to national highway increased their chances of meeting with a fatal accidents. Our findings showed that fatal head injuries in 42% of cases slightly higher to study at Maharashtra where 32.44% of injuries were found on the head, neck and face [4].

Our study revealed that 20% tested positive for alcohol comparable to the study done in Norway where it was found out that in drivers, alcohol was the most common substance abuse followed by amphetamine. In 21.9% of the injured drivers, most commonly alcohol (11.5%) and stimulants eg. cocaine or amphetamines (9.4%) were found [5].

In a study done at Japan of determining the ethanol levels after consumption preceding death revealed the ethanol level in cardiac blood was more than vitreous humor and urine at 10 min (early absorption stage), the vitreous humor alcohol level was more than cardiac blood and urine from 20 to 50min (late absorption stage), vitreous humor alcohol level more than urine and cardiac blood from 60 to 120 min (distribution phase) and urine more than vitreous humor at 180 min (excretion phase) [6]. Out of 50 victims showing presence of alcohol in vitreous humor, 13 were pedestrians and among drivers of 2/3 wheelers 71.43% showed positive test for alcohol owing to the fact that driving under the influence of alcohol leads to overconfidence and impaired coordination as proved in many studies.

In our study amongst 50 (100%) vitreous positive cases, alcohol was detected in in blood, urine and

stomach samples in 60%, 40% and 20% cases respectively owing to the fact that the vitreous humor being a better sample for detection of alcohol. Vitreous alcohol was positive even after 12 hours of death in 6 cases (12%) proved the advantage of vitreous sample over other samples. Of all these body fluids vitreous humor is the only fluid which is unique and preferred because it is anatomically separated, resistant to putrefaction for a long time and most sterile [7].

## Conclusion

The accidents can be prevented by increasing the awareness of the population and stringent traffic regulations, increasing condition of the roads and avoiding use of alcohol. Regular checks for alcohol at roads could significantly reduce the mortality and morbidity due to road traffic accidents. The limited study period, minimum lab facility and qualitative determination of alcohol were the limitations of the study. Quantitative tests are more reliable in establishing the effect of alcohol on accidents.

*Ethical Clearance:* yes

*Conflict of Interest:* None

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