

An Epidemiological Study for Evaluation of Seasonal Variation in Road Traffic Accidents in the City of Ghaziabad

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ABSTRACT

Background: Injuries are increasingly recognized as a global public health epidemic. Everyday

around the world almost 16000 die from all types of injuries. According to WHO data, deaths from Road Traffic injuries account for 25% of all deaths from injury. Road traffic accidents represent epidemic of non-communicable disease in the present century.

Objective: To evaluate the influences of seasonal variation in road traffic accident.

Methodology: This study Prospective, descriptive and co-relational study was carried out at the Department of Forensic Medicine and Toxicology at Santosh Medical College and Hospital, Ghaziabad. All victims of road traffic accidents were the study subjects. The road accidents data were sourced from the archives of the Federal Road Safety Commission and Police Force while the climatic data were sourced from the Meteorological Agency.

Result: The possible explanation for the fact that majority of accidents occurred during afternoon i.e. during 12-18 hours may be due to large number of vehicles on the overcrowded roads. In evening between 18-24 hours 32 (32.67%) accidents occurred, this may be due to work stress occurring during the day or intake of alcohol during these evening hours which make them careless, reckless with impaired judgment.

Conclusion: It is possible to prevent traffic accidents or at least make them less harmful only with a life chain formed with the rings added into each other such as education, precaution, correction of technical requirements, consistent and conscious traffic control and wide organization of first aid services. Individuals, community and government should work in cooperation in order to transform that chain from a death chain into a safe transportation chain.

Keywords: Road traffic accident, Seasonal variation, Pedestrians, Thoracic injuries

1. INTRODUCTION

Road accidents are among the major causes of death, injuries and financial problems [1]. Each year, more than 1.2 million people die on the world's roads, and between 20 and 50 million suffer non-fatal injuries [2]. This rise of road accident is still increasing in most regions of the world. According to World Health Statistics [3], road accident injuries will become the 5th leading cause of death by 2030 as against the 9th position 2004. In addition, over 90% of the world's fatalities on the roads occur in low-income and middle-income countries which have only 48% of the world's registered vehicles. For instance, the road accident fatality rates are about 21.5 per 100,000 population and 19.5 per 100,000 populations for low income and middle income countries respectively. This is lower in the high income countries which are about 10.3 per 100,000 populations [2]. Road accidents, unfortunately, are not often due to ignorance, but are associated with numerous factors of human, vehicle and environmental interplays [4]. Accidents, therefore, can be studied in terms of agent, host and environmental factors [5,6] and epidemiologically, it is classified into time, place and person distribution in terms of carelessness, thoughtlessness and over confidence. For instance, vehicles drivers operate under inhospitable conditions which induce high levels of stress and possibility of accidents; poor maintenance of wayside amenities or facilities; coverage of long distances by drivers leading to fatigue; roadside hawkers, dumping of construction material and parking indiscriminately on roads due lack of parking space alongside road networks as well as the use of mobile phones while driving. Weather variables and seasonal variation could impact road accidents significantly [7] and determine the rates at which any of these factors instigate accident occurrences. For instance, [8] associated between 30 and 50% of highway accidents in Quebec with harsh meteorological conditions. These including rain, snow, hail, and icy, and result to poorer safety condition particularly, poor visibility, slippery of road surfaces. In addition [9] considered the amount of rainfall, the number of rainy day, time trend and the monthly effect of seasonality, and number of vehicle as factors associated with road accidents occurrence. For the purpose of the study and better understanding of seasonal variations of road accidents, monthly records of road accidents were examined for in State, Ghaziabad on seasonal basis in relation to weather conditions for the periods of 6 years (2014 -2020).

2. METHODS AND MATERIALS

Based on the aim of the study, a Road Accident was described as accidents , which took place on the road between two or more objects and involves any kind of moving vehicle(s) including Taxi, Private, Buses, Motor cycle, Lorry, Trailer, Pedal cycle, Pick up, Kit car. The study examined road accidents in relation to seasonal climatic variations for the periods of 6 years (2014-2020) using road accident records and climatic data (rainfall and temperature) on monthly basis. The road accidents data were sourced from accident records of Federal Road Safety Commission (FRSC) and Police Force (PF) while climatic data were sourced from Meteorological Agency. In order to generate the total monthly occurrence of road accidents for each of months between 2014 and 2020, the number of accidents occurred in each month for the 6 years (for example January 2014 – January 2020) were summed. The average monthly rainfall and temperature for the 6 years were determined by dividing the total value of rainfall and temperature for each month (for example January 2014 – January 2020) within

the studied years by the total number of years. The months were divided into two seasons based on the length and characteristics. The number of casualties (fatal, serious and minor), persons killed and persons injured were extracted from accident records and correlates with seasons (dry and wet) with respect to rainfall and temperature variability. The information on accident victims, magnitude and locations/points of occurrence were excluded from the study.

3. RESULTS

Table 1 shows that the distribution of the 98 victims of road traffic accidents ranging in an age group of minimum three years to maximum 85 years. Out of 98 cases 74 (75.51%) males and 24 (24.48%) females. The male predominance in this study is obvious. The male to female ratio was found to be 3.08:1. Similarly, the marital status wise distribution of the 98 victims of road traffic accident. Overall 77(78.57%) were married and 19 (19.38%) were unmarried victims. Amongst these married victims majority 60 (61.22%) were married males. In two occasions marital status was not known. The highest number of victims 29 (29.59%) were from the dependent population (unemployed/housewife/retired people/children less than 5 years). Second largest group 19 (19.38%) were labourers and businessmen both being equally affected. Farmer and private employees accounted for 13 (13.26%) and 12 (12.24%) cases. In 2 (2.04%) cases occupation of the victims could not be found. It was observed that majority 24 (24.48%) victims were uneducated followed by 22 (22.44%) were with high school passed, 19 (19.38%) primary, 14 (14.28%) junior college and only 16(16.32%) were with graduate, post graduate or professional education.

Table 2 shows month wise distribution of victims of road traffic accident cases. Maximum occurrence was in the month of November 13 (13.26%) followed by January 11(11.22%), while the least number of accidents in June and February i.e. 3 (3.06%) and 5(5.10%) respectively. Maximum cases were reported in winter season (October-January) i.e. 39 (39.79%), followed by summer season (February – May) i.e. 35(35.71%). Among week days maximum cases are on Friday and Saturday equally i.e. 17 (17.34%), followed by Monday (16.32%) and Wednesday 15 (15.30%).

Table 3 shows type of road network where road traffic injuries have occurred and time of accident. 47(47.97%) cases are observed from the accidents occurring on secondary system i.e. state highways and major district highways, followed by 27(27.55%) on rural and village road and 24(24.48%) on national highway. Maximum number 38 (38.77%) of accidents occurred between 12–18 hours followed by 32 (32.67%) between 18–24 hours. Minimum number 11(11.22%) of cases found between 00 – 06 hours.

4. DISCUSSION

The present study was conducted in Santosh Medical College and Hospital, Ghaziabad at the Department of Forensic Medicine & Toxicology for a period of two years. In this study the age and sex wise distribution of the 98 victims of road traffic accidents ranging in an age group of minimum three years to maximum 85 years. Out of 98 cases 74 (75.51) are males and 24 (24.48%) are females. The highest number of accidents amounting to 26 (26.53%) are

in the age group of 30-39 years, 39 (39.79%) in the 20-29 years age group. The least common 05(5.10%) age group affected was 00-09 years. The average age amongst victims of road traffic accidents is 39.7 years. After applying Chi-square test there is no significant association between age in years and sex of victims under study, i.e. $p > 0.05$. The male predominance in this study is obvious. The male to female ratio is found to be 3.08:1. The average age of male of victims of road traffic accident is 40.58 years 33 (33.06%) of the male victims are in the 20-29 years age group. Amongst female victims the highest number 6 (6.12%) of accidents are observed in age group of above 60 years. The average age of female victims of fatal road traffic accident is 37 years. The maximum number of male victims 39(39.79%), may be due to the fact that this is one of the active periods of life in males who work outdoors and therefore one is most commonly exposed to traffic accidents. According to this study 40.27% fall in the 29-39 years age group. The young and middle age groups largely consist of student; working people in various jobs who usually travel by own vehicles, use the public transportation or walk. The result in the involvement of young adults more commonly in road traffic accidents.[10]The least common 05(5.10%) age group is 0-9 years. This is due to road traffic fact that young children are less exposed to the traffic environment. In our study Maximum occurrence of accidents is in the month of November 13 (13.26%) followed by January 11(11.22%), while the least number of accidents occurred in June and February i.e. 3 (3.06%) and 5 (5.10%) respectively. The present study findings are not comparable with above studies. The number of accidents in a specific month depends on the locality and the activity in that month and therefore there is variation in findings by different authors. Among weekdays maximum cases are reported on Friday and Saturday equally i.e. 17(17.34%), followed by Monday 16(16.32%) and Wednesday 15(15.30%). Maximum number 38(38.77%) of accidents occurred between 12-18 hours followed by 32(32.67%) between 18-24 hours. Minimum number 11(11.22%) of cases found between 00-06 hours. The possible explanation for the fact that majority of accidents occurred during afternoon i.e. during 12-18 hours may be due to large number of vehicles on the overcrowded roads. In evening between 18-24 hours 32(32.67%) accidents occurred, this may be due to work stress occurring during the day or intake of alcohol during these evening hours which make them careless, reckless with impaired judgment. Bansal YS and Dikshit PC [11] found that maximum number of accidents occurred between 9pm-12midnight (22%), followed by 12am-3am (17%). According to Amit K, Sharma GK et al. [12] the vulnerable time for road traffic accidents was between 8pm -12midnight (35%) and 12noon -4pm (18.8%).

5. CONCLUSION

This study concluded that most of the road traffic accidents occurred on state highway i.e. 47(47.97%) and 27(27.55%) on village and other roads. Pedestrians and two-wheelers users 28(28.57%) each are the most vulnerable amongst the victims of road traffic accidents. Light motor vehicles are the commonest 28(28.57%) offending vehicles. All types of skeletal injuries are common in pedestrians. Abrasion was the most common injury i.e. 212 (56.38%) followed by Contusion 84 (22.34%). Majority 122(32.44%) of external injuries are over lower extremity followed by upper extremity 79 (21.01%) and Abdomen and pelvis 74

(19.68%). Thus, this study reveals that vast spectrum of factors involved in road traffic accidents. It also highlights the epidemiological and medico-legal aspects of road traffic accident in this area. The information regarding the causative factors for injuries and the recommendation made in this study help in preventing such accidents.

Acknowledgement:

6. REFERENCES

1. Farajzadeh A. M., M.H. Gholizadeh and A. A. Firozjai (2010): Spatial Analysis of Accidents with Climatic Hazards Approach Case Study: Karaj-Chalous Road, Physical Geography Research Quarterly, No; 73, Autumn 2010.
2. WHO (2009): Global status report on road safety: Time for Action, World Health Organization Department of Violence & Injury Prevention & Disability (VIP).
3. World Health Statistics (2008): World health statistics Geneva, World Health Organization <http://www.who.int/whosis/whostat/2008/en/index.htm>.
4. Ghosh P. K. (1992): Epidemiological study of the victims of vehicular accidents in Delhi, Journal of Indian Medical Association 90 (12): 309-312.
5. Edwards J. B (1999): The temporal distribution of road accidents in adverse weather, Meteorological Applications, 6(1), 59 - 68, Article first published online: 29 DEC 2006.
6. Peden M et al., eds (2004): World report on road traffic injury, Geneva, World Health Organization, http://www.who.in/violence_injury_prevention/publications/road_traffic/world_report/en/index.html.
7. Mircea -Paul A. and D. B. Frost (1998): Weather and traffic accidents in Montreal, Canada, Clim Res, Vol 9, 225 – 230
8. Bruce B. and Karsten B. (1997): Seasonal Variation in Frequencies and Rates of Highway Accidents as Function of Severity, Transportation Research Record, Vol. 1581/1997 59-65 Online Date Wednesday, January 24, 200
9. Wan-Fairos W. Y., M. A. Lazim and Y. B. Wah (2011). Applying Fixed Effects Panel Count Model to Examine Road Accident Occurrence, Journal of Applied Sciences, 11: 1185-1191.
10. Menon A, Pai VK. Pattern of fatal head injuries due to vehicular accidents in Mangalore. J Forensic Le Med. 2008 Feb; 15(2): 75-7.
11. Bansal YS and Dikshit PC . Pattern of chest injuries in fatal vehicular accidents in central Delhi. International Journal of Medical Toxicology & Legal Medicine (2001); 4(1): 21-26.
12. Biswas G, Verma SK et al . Pattern of road traffic accidents in North- East Delhi. JFMT, January- June 2003, (20) 1; 27-32.

Table 1: Demographic distribution of victims of road traffic accidents. (n=98)

Characteristics	Total No. (%)	
Age group (yrs)	00-09	05(5.10)
	10-19	08(8.16)
	20-29	13(13.26)

	30-39	26(26.53)
	40-49	13(13.26)
	50-59	17(17.34)
	>60	16(16.32)
Sex	Male	74(75.51)
	Female	24(24.48)
Occupational status	Farmer	13(13.26)
	Laborer	19(19.38)
	Student	09(9.18)
	Govt.employee	07(7.14)
	Business	19(19.38)
	Privateemployee	12(12.24)
	Dependent	29(29.59)
	Unknown	02(2.04)
Educational status	Primaryschool	19(19.38)
	High school	22(22.44)
	Jr.college	14(14.28)
	Graduation&above	16(16.32)
	Uneducated	24(24.48)
	Unknown	03(3.06)

Table 2: Distribution of victims of road traffic accident according to month, weekdays and season. (n=98)

Variable		No. ofcases(%)
Month	January	11(11.22)
	February	05(5.10)
	March	10(10.20)
	April	10(10.20)
	May	10(10.20)
	June	03(3.06)
	July	06(6.12)
	August	07(7.14)
	September	08(8.16)

	October	06(6.12)
	November	13(13.26)
	December	09(9.18)
Season	Winter (October, November, December, January)	39 (39.80)
	Summer (February, March, April, May)	35 (35.71)
	Rainy(June,July, August,September)	24(24.49)
Weekly	Monday	16(16.32)
	Tuesday	11(11.22)
	Wednesday	15(15.30)
	Thursday	11(11.22)
	Friday	17(17.34)
	Saturday	17(17.34)
	Sunday	11(11.22)

Table 3: Distribution of victims of road traffic accident according to type of road Network & time of accident. (n=98)

Road type	Time of accidents					
	(0-6) hrs No. (%)	(6-12) hrs No. (%)	(12-18) hrs No. (%)	(18-24) hrs No. (%)	Unknown No.(%)	Total No. (%)
Primary system (National Highway)	02(2.04)	06(6.12)	10(10.20)	06(6.12)	0	24(24.48)
Secondary system (state highways and major district highways)	06(6.12)	06(6.12)	18(18.36)	16(16.32)	01(1:02)	47(47.97)
Tertiary system (other district roads, rural and village roads)	03(3.06)	04(4.08)	10(10.20)	10(10.20)	0	27(27.55)
Total No. (%)	11(11.22)	16(16.32)	38(38.77)	32(32.67)	01(1.02)	98(100)

Value of $X^2 = 15.67$, d.f.=8, $p < 0.05$, significant