Original Research Paper

Profile of Road Traffic Fatalities in Adults A 40 Year Study in Chandigarh Zone of North West India

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Abstract

Road Traffic Accidents are one of the leading causes of morbidity & mortality in the world. The present study was based on the autopsy records of unnatural deaths occurred in a leading tertiary health care center of North West India. The adult road traffic fatalities constituted 41% of all unnatural deaths with male preponderance (89.6%) throughout the study period. People in the age group 21-30 years (32%) particularly from rural areas (57%) were most affected. The pedestrians and two wheeler users formed the majority of fatalities (78%). Collision between two wheeler and light motor vehicle was the most common crash pattern and injury to head & neck region was the most common cause of death. Maximum number of accidents occurred between 4pm to 8pm (28%) and in the month of November (11%). Unskilled workers, agricultural workers and government employees constituted a larger proportion of fatalities (45%).

Key Words: Accidents, Two-wheeler, Pedestrian, Crash pattern, Unnatural Death

Introduction:

Road Traffic Accidents (RTAs) have emerged as a new health challenge in the world which not only leads to injuries, disabilities and loss of precious human lives but also imparts a substantial economic burden on the family concerned and the nation as whole.

After Ms. Mary Ward, who was the first documented victim of automobile accident that took place on August 31, 1869, [1] the global road traffic fatalities count has raised to about 1.2 million/year. [2] RTAs are the eighth leading cause of death in the world and are expected to rise to the fifth position by the year 2030, if adequate measures are not taken. [2]

Road traffic injuries account for about 38 million disability-adjusted life years (DALYs) lost worldwide. [3] In India one person dies every four minutes as a result of RTAs. [4] In 2010 about 133,938 fatalities occurred in India as a result of RTAs which were 5.5 % more when compared with the previous year. [5]

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In order to implement preventive measures a detailed epidemiological data is inevitably required, but unfortunately a complete data is not available even in some of the developed nations like the United Kingdom and the New Zealand. [6]

This study aims to provide a baseline data on RTAs in North West India for the policy makers to plan the human habitation, implement preventive measures and to equip the health care institutions.

Methods and Materials:

This retrospective study analyzed the autopsy records of unnatural deaths in adults that occurred between 1971-2010 at Postgraduate Institute of Medical Education and Research (PGIMER) Chandigarh, India.

Post-mortems on these cases were carried out in the Department of Forensic Medicine.The subjects in the present study were victims of RTAs, between 18-60 years of age and mostly belonged to the states of Punjab, Haryana, Himachal Pradesh and the Union Territory of Chandigarh. (Fig. 1)

The information regarding age, sex, occupation of the deceased, time and mode of accident etc., was obtained from the autopsy records. The road users were classified as occupants of two wheeler, three wheeler, light motor vehicle (cars, jeeps etc.), heavy motor vehicles (trucks, buses etc.), pedestrians and others (animal drawn vehicles like bullock carts, etc.).

Fig. 1:

The results were analyzed using Microsoft excel and a statistical software, SPSS 20.

Results:

Out of 15212 unnatural deaths reported in the institution, the adult road traffic fatalities constituted 41% (n=6307). There was a gradual rise in adult road traffic fatalities in the first 25 years of the study varying from 1.5% in the block year 1971-75 to 6% in the block year 1991-95 but after this period the fatalities rose much more steeply and constituted 35% of the total fatalities in the last five years of this study. (Fig. 2) Statistically significant ($p<0.01$) male preponderance (89.6%) was observed throughout the study period with male to female ratio of 8.6:1.

The most vulnerable age group was found to be 21-30 (31.68%) years, followed by 31-40 years (26.42 %). (Table 1)The fatalities gradually decreased as the age group increased above 30 years. The distribution of fatalities indifferent age groups in the study period was found to be statistically significant ($p<0.01$).

The RTA fatalities from the state of Punjab (37.51%) were consistently higher than other states viz. Haryana (28.35%), Union Territory of Chandigarh (13.26%) and Himachal Pradesh (9.81%). The rest of the victims (11.07%) belonged to other neighboring states. The proportion of fatalities from Union Territory of Chandigarh gradually reduced after 1995.

The fatalities from rural population were 57.21% and outnumbered urban counterpart in most of the years of the study period. The distribution of fatalities among various states and within rural & urban regions in the study period was found to be statically significant ($p<0.01$). (Fig. 2, 3)

Highest number of accidents in the study period occurred between 4pm-8pm (28.03%) followed by 8pm-12am (21.67%) and least between 12am-4 am (3.95%). (Fig. 4)

The maximum number of accidents occurred in the month of November (10.94%) while the minimum recorded in the month of January (6.33%).

Unskilled workers were most commonly involved in RTAs (21.82%) followed by government employee (11.75%) and agricultural workers (11.45%). The mortality in different time intervals, months and occupation over a period of 40 years was found to be statically significant. (Table 1)The most common cause of death in the study period was due to head and neck injuries (82.29%) followed by injuries to multiple regions of the body (8.26%) and abdominal injuries (4.50%). (Table 1)

Difference in fatalities associated with various fatal injuries was found to be statistically significant ($p<0.01$).

Analyzing the victims of head & neck injury and the vehicle they used, 57.59% of causalities were occupants of two wheelers (2WH), 22.72% were pedestrians, 9.19% were occupants of light motor vehicle (LMV), 7.15% were occupants of heavy motor vehicle (HMV), and 2.50% were occupants of three wheelers and 0.85 % was other road users.

The incidence of head injury associated with different types of vehicle users was found to be statistically significant ($p<0.01$).

In the first 25 years of the study, there was a gradual rise in pedestrian and two wheeler fatalities but after this period the rise was steeper. Fatalities in occupants of three wheelers, light motorized vehicles and heavy motor vehicles were constantly low in the study period. (Fig. 5) On analysis, difference in fatalities with regard to different road users was found to be statically significant ($p<0.01$).

Two-wheeler hit by a light motor (14.17%) vehicle was the most common type of collision observed in the study period. The other common collisions observed were 2WH hit by HMV (12.11%), pedestrian hit by LMV (6.80%), pedestrian hit by HMV (5.42%) etc.(Table 1)

Skidding and pillion rider falling down (14.48%) were the other common type of accidents occurred in two wheeler users.

About 2.92% of accidents occurred when the vehicles crashed against road side structures like trees, road dividers etc., and 1.41% of accidents occurred due to stray animals on the roads. In 14.36% of fatalities exact crash pattern was not known.

Discussion:

The number of fatalities in RTAs is like a tip of an ice berg when compared with the total number of accidents. According to Martinez, the

ratio between road accident deaths, serious injuries and minor injuries were 1:13:102. [7]

In the present study the number of deaths due to road accidents increased by a factor of 75 (from 7 victims in 1971 to 531 victims in 2010) over a period of 40 years.

From the WHO data it is evident that the road traffic fatalities in the world have increased about 12 times over the past 40 years. [8, 9] Concordant findings were reported from studies conducted in India and other parts of the world. [10, 11] Male preponderance was observed in all age groups and in all years of the study period which was similar to the findings of other studies conducted in India [5, 6, 12-16] i.e. 89% from Rohtak, [13] and 90 % from Delhi. [14]

It might be because of the fact that males are the main bread earners in the Indian families.

They have to move out of their dwellings more frequently and are more exposed to accident prone situations. Moreover, it was also reported that men have a higher level of rule-breaking behavior, thus greater frequency of violating the traffic regulations. [17]

The 21-30 years of age was the most commonly affected (32%) group in the present study which is in harmony with the findings of many studies conducted in India. [12, 14] about 26% and38 % of fatalities belonged to this age group in a similar study conducted in Manipal and Delhi respectively. [12, 14]

More involvement of this age group might be because of the fact that they use the road more frequently for education, employment, recreational activities etc., than other age groups**.** It was also noted that the fatalities gradually decreased as the age group increased above 30 years and concordant findings were reported from studies conducted in other parts of India. [12, 14] The proportion of fatalities from Union Territory of Chandigarh reduced gradually in the last 15 years of the study.

The possible reason might be that the UT of Chandigarh is a well-planned city with strict enforcement of traffic rules. [18]

Most of the roads in Chandigarh have sidewalks for pedestrian and perhaps the most walk able city in India with a walk ability index (depends on foot path and facilities available for pedestrian) of 0.91. [19]

The rural preponderance (57.20%) might be because lack of awareness about traffic rules, lack of adequate and immediate medical facilities, inadequate use of protective gears, unsafe roads and vehicles, fatigue associated with travelling long distances. [20]

Unskilled workers, agriculturist and government employees constituted a majority of the fatalities in the present study, which is similar to the observations of other studies from India and abroad. [15,16] The possible reason might be that the people employed in these occupations use the road more frequently than those involved in other occupation.

Head & neck injuries were the most common cause of death (82.3%) and comparable results were seen in a study conducted in Haryana (50.4%). [13] Less use of protective gears (like helmet) could be attributed for such high incidence of head injuries. [21]

Moreover, helmet wearing laws are not strictly enforced in India. [2] Also the dominant populations of Punjab belonging to a particular religion are exempted from wearing helmets. [22]The occupants of two wheelers were most commonly involved in road accidents (55%) followed by pedestrian population (22%).

Studies from other regions of India also show a similar pattern. [23, 24] This might be due to the fact that the two wheelers are more affordable and are much more in number when compared with other vehicles. [7]

In some studies pedestrian forms the majority of fatalities. [14, 25] Two-wheeler hit by the light motor vehicle was the most common type of crash pattern which was similar to a study conducted in Gujarat. [23]

Conclusion and Suggestions:

The vehicle population and the RTAs have increased significantly over the last forty years with maximum fatalities in pedestrians and two wheeler occupants. It is thus the need of the hour to take suitable preventive measures, so that loss of precious lives can be brought down to a minimum.

The following changes in road infrastructure and policy reforms are suggested:

1. The State should have a zero tolerance policy for violation of traffic rules and drunken driving.
2. Since the road accident deaths exceeds more than a lakh per year in India, a separate department to prevent RTA and deaths should be established by a joint venture of Road Transport and Health Ministry.
3. Educating the public regarding traffic rules and lifesaving first aid skills should be done regularly by expert lectures, media and also by including it in teaching curriculum for schools and colleges. Adequate training in first aid methods should also be given before issuing driving licenses.

4. Sidewalks for pedestrians should be made available in all rural and urban roads.
5. Separation of slow and fast moving vehicles by assigning different roads / lanes.
6. The roads should be properly maintained, well illuminated at night and cleared from stray animals.
7. Efficient crash reporting and monitoring system with well-equipped police control room should be established to coordinate immediate rescue measures.
8. Strict enforcement of wearing of helmets should be done for motorized and non-motorized two wheelers.
9. Use of public transport facilities should be encouraged to reduce the road congestion and pollution.

More research should be conducted on the collision dynamics of road accidents and appropriate new technologies should be introduced in vehicles to prevent fatal injuries in different road users.

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Fig. 2: Area and Gender Wise Trend of RTA Fatalities

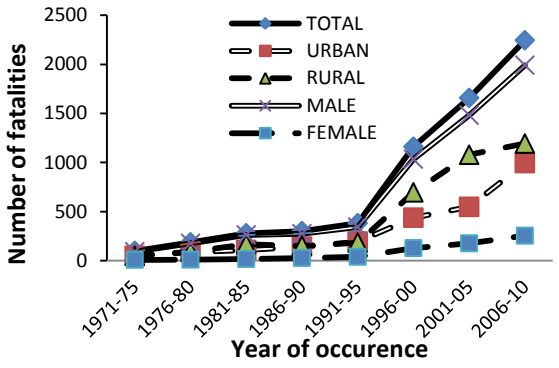

Fig. 3: Trend of RTA Fatalities across Different States

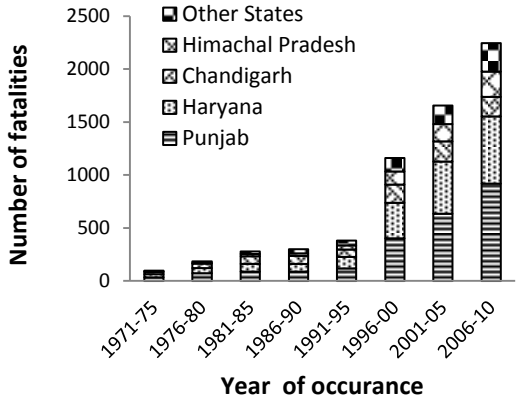

Fig. 4: Trend of RTA Fatalities in Different Time Intervals

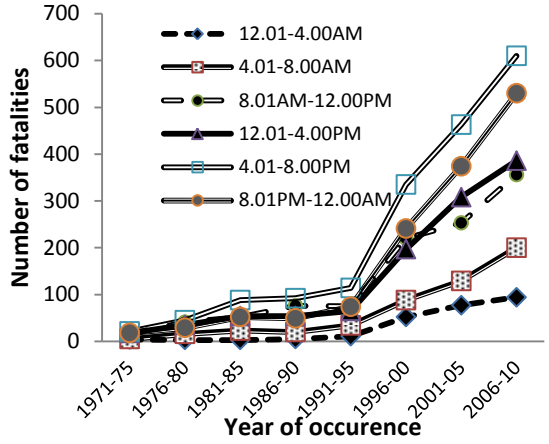

Fig. 5: Trend of RTA Fatalities in Different Road Users

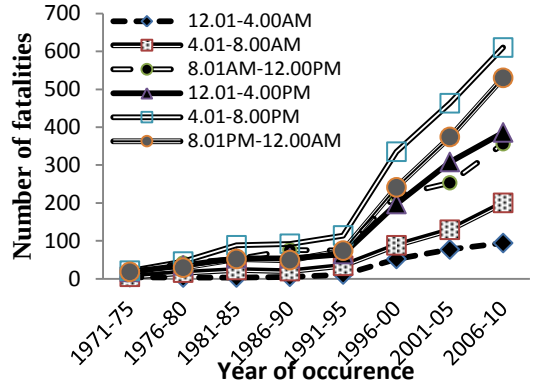

Table 1: Distribution of Descriptive Characteristics of Road Traffic Victims over 40 years (1971to 2010)

Variables	n	%	Statistical significance
Sex			
Male	5649	89.6	p<0.01, X^2=3949.593
Female	658	10.4	
Age			
<20	447	7.1	p<0.01 ,X^2=1206.901
21-30	1998	31.7	
31-40	1666	26.4	
41-50	1321	20.9	
51-60	875	13.9	
Area			
Urban	2556	40.5	p<0.01, X^2=3002.229
Rural	3608	57.2	
Unknown	143	2.3	
Cause Of Death			
Head/neck injury	5190	82.3	p<0.01, X^2=15373.297
Injury to multiple regions	521	8.3	
Abdominal injury	284	4.5	
Injuries to extremities	229	3.6	
Chest injury	83	1.3	
Road Users			
2WH	3495	55.4	p<0.01, X^2=7929.206
Pedestrian	1429	22.7	
LMV	649	10.2	
HMV	502	8.0	
3 WH	117	2.8	
Others#	55	0.9	
Occupation			
Unskilled Worker	1376	21.8	p<0.01, X^2=4491.951
Government Job	741	11.8	
Agricultural activity	722	11.4	
Sales /Business	569	9.0	
Domestic Worker	505	8.0	
Skilled worker	417	6.6	
Transport worker	394	6.3	
Private Job	325	5.2	
Student	274	4.3	
Professional	153	2.4	
Others and unknown	831	13.2	
Crash pattern*			
2WH – LMV	894	14.2	p<0.01, X^2=1841.28
2WH- HMV	764	12.1	
Pedestrian – LMV	429	6.8	
Pedestrian – HMV	342	5.4	
2WH -2WH	339	5.4	
Pedestrian – 2WH	295	4.7	
LMV–HMV	265	4.2	
HMV - HMV	150	2.4	
LMV - LMV	94	1.5	
2WH-3WH	64	1.0	

2 WH- Two wheelers, 3WH- Three wheelers, LMV-Light motor vehicle, HMV- heavy motor vehicle, # Animal drawn vehicles, X^2-Chi square

*Crashes with less than 1% of incidence and unknown crash patterns were not mentioned