Epidemiology of Fatal Road Traffic Accidents: A Six Year Retrospective Study in the Medico legal Centre of a Tertiary Care Health Set Up in Western Maharashtra

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Abstract

Road Traffic Accident (RTA) is a public health concern globally. Rapid urbanisation and increase in the number of motor vehicles, lack of discipline and violation of traffic regulations has led to a rapid rise in the deaths in vulnerable road users. A retrospective study was undertaken in the autopsy centre of a tertiary care hospital to observe the pattern and trends of deaths between 2013-2018 due to RTAs. Out of 248 RTA cases analysed in this study, 75.4% were male and 24.6% were female. The most vulnerable age group was 21-40 years in both two-wheeler and four-wheeler accidents while in pedestrians it was 41-50 years. High rate of accidents was seen during summer in afternoon in cases of pedestrians as well as motor vehicle occupants and in the evening after 6 PM in two-wheeler motorcyclists. Observation of the pattern of head injuries showed fracture of the skull was a common occurrence in two and four-wheeler accidents whereas a greater number of pedestrians reported no skull fracture. Non helmet users suffered higher mortality in the age group of 21-30 years. Subdural haemorrhage caused maximum deaths in two-wheeler motorcyclists and pedestrians while sub arachnoid haemorrhage was seen in four-wheeler accidents. Our study agreed with the WHO report of 2018 and various other studies from India and abroad. Increased number of fatalities was found to occur at a particular time of the day with seasonal preference. Two-wheeler motorcyclists without a helmet suffered maximum deaths. Real time analysis of data in various parts of the country would help in ensuring safe road user practices.

Keywords: *Road traffic accidents, head injuries, helmets.*

Introduction

Road Traffic Accident (RTA) remains a major public health concern at a national level and worldwide. The World Health Organisation (WHO) in its Global Status Report on Road Safety 2018[1] stated that 1.35 million people are killed in road traffic accidents worldwide with 90% of casualties taking place in the developing countries. As per the annual report "Road Accidents in India 2018 "by the Ministry of Road Transport and Highways[2], a total of 1,51,417 deaths were attributed to traffic accidents on the road. India is signatory to the Brasilia Declaration to half global deaths due to RTAs by 2020. Though the country has been trying to honour the commitments to minimise the loss of young productive lives by enactment of Motor Vehicle Amendment Act 2019[3] the fatalities continue to rise due to the lack of discipline and responsible attitude amongst road users.

The most vulnerable of the road users are the pedestrians, cyclists and motorcyclists. Risk factors in them include speed, drunken drivers or pedestrians, neglecting road rules, failure to use helmets and seatbelts.

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The victims of RTAs die due to head injuries, spinal injuries, crush injuries, abdominal injuries. Head injuries are the leading cause of trauma and death especially in motorised vehicles. Traumatic skull and brain injury manifests in these victims as Extradural, Subdural and Sub arachnoid Haemorrhage (EDH, SDH and SAH) with or without a fracture. Usage of standardised helmets by cyclists and motorised two and three wheelers reduce the percentage of head injuries and thus death in these group of road users.

NCRB in their 2014 report[4] declares, 'it is of vital consequence to understand the tendency and patterns of traffic accidents'. This study tried to analyse the patterns and trends in road traffic accidents over a period of time in an urban part of the country to aid in the data collection for a causative real time analysis of road accidents.

Material and Method

A retrospective observational study of deaths due to fatal road traffic accidents brought to the medico legal centre of a tertiary care setup in Western Maharashtra between 2013 and 2018 was undertaken. A total of 248 cases involving two-wheeler and four-wheeler motor vehicle occupants and pedestrians were included in the study. For the purpose of this study, an RTA was defined as an accident on the road between two or more objects, one of which must be any type of moving vehicle.

Data collected from autopsy reports was analysed according to the kind of road users (pedestrian, two-wheeler motorcyclists and four-wheeler motor vehicle occupants). Age & sex wise distribution, time and season of the mishap, use of helmets and the pattern of cranio-cerebral trauma were studied. Medico legal post-mortem records and fatal case documents of the victims were referred to for collecting information and cross checked. Data was analysed by using Microsoft office excel.

Results

During the study period, total number of autopsies performed was 1467, of which the number of RTAs was 248 (16.9%). Of these, 187 were male victims (75.4%) and 61 were female (24.6%). The male/female ratio was approximately 3:1. Number of pedestrian fatalities was 45 (18.2%) and fatalities by two-wheeler and four-wheeler motor vehicles were 144 (58.1%) and 59 (23.8%) respectively. **[Table** 1].

Table 1: Sex wise distribution and Category of Road Users

Road Users	No. of cases out of 248	Percentage (%)
Male	187	75.4
Female	61	24.6
Two-wheeler motorcyclists	144	58.1
Four-wheeler occupants	59	23.8
Pedestrian	45	18.2

Highest number of RTA fatalities was recorded in the age group of 21-40 years in both two-wheeler (41.9% n=65) and four-wheeler (35.9% n=14) occupants while in pedestrians it was in the 41-50-year age group. (20.4% n=11). Lowest number was noted in elderly above 80 years of age (1.8% n=1) **[Table 2].**

Table 2: Age Distribution of Cases

Age Group (yrs)	Two-wheeler		Four-wheeler		Pedestrian	
	No	%	No	%	No	%
0 -10	0	0	0	0	9	16.7
11-20	23	14.8	1	2.6	1	1.8
21-30	65	41.9	12	30.8	3	5.6

Age Group (yrs)	Two-wheeler		Four-wheeler		Pedestrian	
	No	%	No	%	No	%
31-40	35	22.6	14	35.9	6	11.1
41-50	25	16.1	8	20.5	11	20.4
51-60	4	2.6	3	7.7	9	16.7
61-70	2	1.2	1	2.6	8	14.8
71-80	1	0.6	0	0	6	11.1
81 and above	0	0	0	0	1	1.9
Total	**155**		**39**		**54**	

When the time of the accident was taken into consideration, large number of RTA cases (43.8%, n=68) were reported to occur by two-wheelers between 6 PM to 12 midnight. Pedestrian (44.4% n=24) and four-wheeler motor vehicles (41% n=16) accidents were found to occur from 12 noon to 6 O'clock in the evening. **[Table 3].**

Summer (36.3%, n=90) accounted for the maximum number of RTAs followed by rainy and winter seasons (31.9%, n=79).

Table 3: Time of Accident

Time Interval (hours)	Two-wheeler		Four-wheeler		Pedestrian	
	No	%	No	%	No	%
0600-1200	45	29.0	14	35.9	21	39.6
1200-1800	37	23.8	16	41.02	24	44.4
1800-0000	68	43.8	7	17.9	9	16.9
0000-0600	5	3.2	2	5.1	0	0
Total	**155**		**39**		**54**	

Age group between 21-30 years has the highest death rate and most of these victims did not use helmets. Helmets were reportedly used by a majority of the individuals in the age group of 31-40 years **[Table 4]**

Table 4: Relationship between helmets and death relative to age

Helmets (Age group)	Used		Not Used	
	No	%	No	%
0 to 10	0	0	0	0
11 to 20	3	12	20	15.4
21 to 30	1	4	64	49.2
31 to 40	10	40	25	19.2
41 to 50	8	32	17	13.08
51 to 60	3	12	1	0.76
61 to 70	0	0	2	1.53
71 to 80	0	0	1	0.76
81 and above	0	0	0	0
Total	**25**		**130**	

Fracture of the skull was a common occurrence in two and four-wheeler accidents whereas a greater number of pedestrians reported no skull fracture. Communited fracture (29% n=45) followed by linear fracture (23.9% n=37) was predominantly seen in two-wheeler RTAs and 29% (n=45) of the cases were seen to have no fracture of the skull. Linear skull fractures (25.6% n=10) were maximum in four-wheeler motor vehicle occupants followed by basal fracture (17.9% n=7) and 33.3% (n=13) had no evidence of fracture. 42.6% (n=23) cases of pedestrians had no fracture of the skull with 20.3%(n=11) cases having a communited fracture followed by 16.7%(n=9) cases having a linear fracture. **[Table 5].**

Table 5: Types of Skull fractures

Types of skull fracture	Two-wheeler		Four-wheeler		Pedestrian	
	No	%	No	%	No	%
Linear	37	23.9	10	25.6	9	16.7
Communited	45	29	4	10.3	11	20.3
Depressed	7	4.5	2	5.1	0	0
Sutural	0	0	0	0	1	1.9
Basal Fracture	8	5.1	7	17.9	6	11.1
Basal + Linear	3	1.9	3	7.7	2	3.7
Crush Fracture of Skull	10	6.5	0	0	2	3.7
No Fracture	45	29	13	33.3	23	42.6
Total	**155**		**39**		**54**	

Traumatic brain injury was observed in all victims of RTAs irrespective of the category of road user. In the two-wheeler motorcyclists, 69.8% were found to have subdural haemorrhage (SDH) followed by extradural haemorrhage (EDH) in 66.6% of cases. Subarachnoid haemorrhage (SAH) was seen in 48.9% of cases. In all these cases intracranial haemorrhage was found with no evidence of fracture of skull. In cases of two-wheeler motorcyclists with skull fracture, SDH was found in 26.6% cases, EDH in 33.3% and SAH in 36.1% cases. In the four-wheeler occupants EDH was not seen on autopsy. SDH accounted for the maximum cases in both skull with (58.8%) and without fracture (41.1%). SAH was seen in 66.7% of cases with skull fracture and 33.3% cases without fracture. In pedestrians without skull fracture 85.7% of SDH,75%of EDH and 64.2% of SAH was seen and in those with skull fractures maximum number of cases had SAH (35.7%) followed by EDH (25%) and SDH (14.2%) **[Table 6].**

Table 6: Intra Cranial Haemorrhages

Motor vehicles	Head Injury			%		
Two-wheelers	EDH	SDH	SAH	EDH	SDH	SAH
Skull without Fracture	2	97	23	66.6	69.8	48.9
Skull with Fracture	1	37	17	33.3	26.6	36.1
Four-wheelers	EDH	SDH	SAH	EDH	SDH	SAH
Skull without Fracture	0	14	2	0	41.1	33.3
Skull with Fracture	0	20	4	0	58.8	66.7
Pedestrian	EDH	SDH	SAH	EDH	SDH	SAH
Skull without Fracture	6	18	18	75	85.7	64.2
Skull with Fracture	2	3	10	25	14.2	35.7

Discussion

We observed that the most vulnerable category of road users in our study were males probably due to gender ratio on the streets. WHO in their gender wise comparison in RTAs between 2016-2018 revealed a much higher ratio of males (86%) compared to our study. Male preponderance is noted in other studies in various parts of India by Kumar A et al.[5] and Saksham et al [6]. Singh D et al[7] observed a ratio of 3:2 between the genders.

Recent report by WHO show that two-wheelers constitute the maximum share of road crash deaths (36.6%) in the year 2018. Four wheelers are the next higher contributors (16.6%) followed by pedestrians (15%). Similar findings were found byus with Pathak SM et al[8] and Kumar. S[9] et al substantiating us in their studies while Singh et al[7] and Toro et al[10] found maximum deaths in pedestrians.

21-40 year old individuals suffered the maximum fatalities in our study which is consistent with various other studies available from India.[5,11,12,13] In its report the WHO observes that age profile with maximum fatalities between 18-45 years remain constant from 2016-2018 accounting for 69.6% of all RTAs which is much higher than what we found in that age group. In contrast the study of Toro etal[10] found that victims belonged to an older age group and died of trauma difficulties after hospitalization.

As per the data given by WHO, afternoon and evening witnessed the maximum fatalities. We reported more two-wheeler accidents in evening after 6 PM, whereas maximum incidence of four-wheeler accidents and pedestrian injuries were seen in the afternoon hours with a peak in the summer.

Durkin et al.[14] reported that peak incidence of pedestrian and motorcyclist injuries occurred during the summer months. In studies conducted in Mangalore[15] most of the accidents took place during the afternoon and evening hours. Singh D et al reported more fatalities between 12 to 4 PM but in the months of September to October. Pathak et al observed most cases occurred in the monsoons and between 6 and 10 PM. Kumar S et al found that January and evening was the time of the day with maximum accidents.

In 2018 not wearing helmets caused 28.8% of total road traffic deaths[1]. In our study the mortality rates were more in non-helmet users (49.2) than in helmet users (4%) in the age group of 21-30 years but in the age group between 31-50 years helmet users (40%) had more fatalities than non-users (19.2%) probably because of use of sub standardised devices and improper fastening of chin straps. Most commonly found intracranial haemorrhage was subdural haemorrhage and subarachnoid haemorrhage while extradural haemorrhage was observed in the least which is consistent with the findings by other researchers.[5,15] Use of standardised head protective devices decreased the mortality as suggested by Cawich SO etal.[16] and Nzegwu.etal.[17] in their studies. Aowen et al[18] in their six-year study in China found that 75.2% suffered both skull fracture and intracranial injury while 24.1% have an intracranial injury with no skull fractures and that helmets improved the chances of survival in head injuries. Tripathi et al[19] found that helmeted users suffered a smaller number of head injuries compared to non-users. Sola Kim et al[20] observed preventive aspects of helmets much more in low impact crashes.

Conclusion

This study again emphasised the fact that fatal head injuries were common among two wheelers motorcyclists due to lack of standardised protective head gear. Responsible attitude of road users will avert a majority of road traffic accidents. This observational data on fatalities might be helpful in a real time causative analysis of road traffic accidents essential in the design and implementation of road safety programmes.

Limitations: This study took into account only those cases received at our centre and may not represent the entire region.

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