

ANALYSIS OF ROAD TRAFFIC ACCIDENTS IN THANE CITY

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ABSTRACT

This cross-sectional descriptive complete enumeration study was conducted in Thane city, Maharashtra state to determine the pattern and distribution of road traffic accidents. The data on road traffic accidents for the years 2015 and 2016 were obtained from the Traffic Police Department, Thane after obtaining written permissions from appropriate authorities. The difference in month-wise distribution of accident-related deaths was not significant for males as well as females. The gender differences for fatal, serious and minor injuries were significant for the years 2015 ($p=0.0004$) and 2016 ($p=0.0029$). The month-wise diurnal variation was not significant for 2015 ($p=0.711$) and 2016 ($p=0.535$). Though a majority of the victims were young adults, the month-wise differences in age of victim were highly significant for 2015 ($p<0.0001$). Most accidents occurred on roads other than National or State highways, with significant difference for 2015 ($p=0.00008$) and 2016 ($p=0.00001$). Light motor vehicles were frequently involved in accidents and the difference in distribution of type of vehicles was highly significant for 2016 ($p<0.001$). Prevention of road traffic accidents would require multi-pronged strategies including public-private partnership for awareness programmes that would appeal to various age groups.

KEY WORDS: Gender differences, Road traffic accidents, Road traffic injuries, Vehicles.**INTRODUCTION**

Roads are vital for the development of nations and people by improving transport, communication and access to information and resources, leading to better health outcomes among populations.^[1] Worldwide, the increasing number of vehicles and road traffic has led to increased likelihood of road traffic accidents (RTAs) with associated injuries, deaths and disabilities.^[1] RTAs are one of the leading causes of morbidity and mortality globally, with a huge impact on disability-adjusted life years (DALYs).^[2] Road traffic injuries (RTIs) are expected to become the sixth commonest cause of death by the year 2020 and the fifth by 2030.^[3] RTAs are events on public or private roads, which may result in unintended injury, death or property damage and involving at least one moving vehicle.^[3-6]

Though India is one of the world's largest manufacturers of automobiles, its RTA rate is one of the highest in the world with an associated high RTA fatality rate.^[7, 8] The reasons for high incidence of RTAs, in India include numerous factors, including lack of investments in safety interventions and appropriate research.^[9] Another reason is that the road infrastructure is designed on the basis of homogeneous traffic models, while the reality is that

Indian roads have mixed traffic comprising modern automobiles along with three-wheelers, two-wheelers, bicycles, cycle rickshaws and animal/human-drawn carts.^[10]

Due to "hit and run" cases, the source of data on RTIs in India is mainly from individuals with non-fatal injuries seeking outpatient or inpatient services (2.3%), emergency departments (24.6%) and from fatal injuries reported to the police (77.8%) or presenting to emergency departments (98.1%).^[11] In India, emergency services are accessed through diverse phone numbers, such as, 100 (Police), 101 (Fire), 102 (Ambulance) & 108 (Emergency Disaster Management). Since 2019, a single emergency phone number "112", approved by the Telecom Regulatory Authority of India,^[12] enables simultaneous transfer of information to the police, emergency medical services, fire brigade, ambulance, etc. In India, the duration of stay in hospital is more than seven days for about 43% of RTI cases, which increases out-of-pocket expenses.^[13] Treatment and patient care leads to substantial emotional burden and long-lasting indebtedness on the affected families.^[10] The costs due to injuries have been categorized into medical costs, other

resource costs, work loss costs and costs associated with loss of quality of life to the victims and their families.^[14]

RTAs are, by and large, preventable health-related phenomena, with their own natural history and are influenced by epidemiological factors, such as, agent (increased road traffic), host (age, gender, risky behaviours, fatigue) and environment (unsafe roads) and analysis of RTAs would reveal location-specific time and place distribution^[15] that would facilitate in formulating suitable interventions.

The present study was conducted to determine the pattern and distribution of RTAs in an urban area.

MATERIAL AND METHODS

This cross-sectional descriptive complete enumeration study was conducted in Thane city, Maharashtra state. The data on road traffic accidents for the years 2015 and 2016 were obtained from the Offices of Deputy Police Commissioners, Traffic Police Department, Thane Zones 1-5 after obtaining written permissions from [i] Police Commissioner, Traffic Police Department, Thane Central Office, [ii] Deputy Police Commissioners, Traffic Police Department, Thane Zones 1-5, and [iii] the Institutional Clinical Ethics Committee of Rajiv Gandhi Medical College, Kalwa, Thane. The data were entered in Microsoft Excel spreadsheet (Microsoft Corporation, Redmond, WA, USA) and analyzed using SPSS statistical software Windows Version 25.0 (IBM Corporation, Armonk, NY, USA). The Chi-square value was calculated and the statistical significance was determined at $p < 0.05$.

RESULTS AND DISCUSSION

Month-wise differences: The difference in month-wise distribution of deaths due to RTAs was not significant for males (Fig 1) as well as females (Fig 2) for the years 2015 and 2016. Rainy weather causes impaired visibility and judgement of the driver in addition to causing skidding of vehicles. The frequencies of RTAs during rainy weather, reported by various studies, were 81.66%,^[4] 78%,^[16] 46.7%,^[17] and 14.5%;^[18] but such increased incidence during rainy season (June to September) was not observed in the present study.

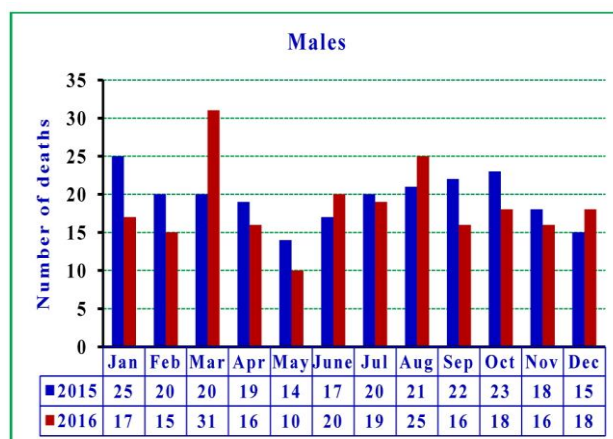


Fig 1: Month-wise distribution of deaths due to road traffic accidents (Males).

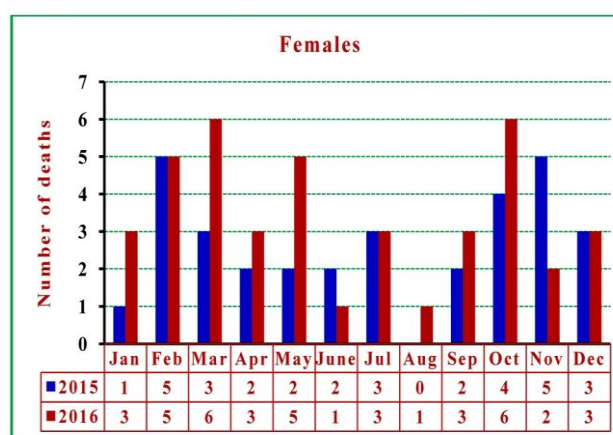


Fig 2: Month-wise distribution of deaths due to road traffic accidents (Females).

Gender differences: The gender differences for fatal, serious and minor RTIs were significant for both years 2015 and 2016 (Table 1). The male:female ratios for RTIs reported by various studies were – 5.66:1,^[4] 5.7:1,^[17] 7.77:1,^[19] 3.33:1^[20] and 4.69:1.^[21] This preponderance of male involvement in RTAs has been attributed to limited exposure of women to out-door activities and their limited access to vehicles^[22] and is substantiated by the increasing proportion of women victims in recent years due to increasing out-door employment of women. Moreover, more men indulge in risky behaviours, such as, rash driving and alcohol or substance abuse.^[23] Alcohol consumption was revealed in 46.37%^[4] and 38.8%^[20] RTAs.

Table 1: Gender differences in type of road traffic injury.

Type of road traffic injury	Year: 2015		Year: 2016	
	Male (n=1252)	Female (n=328)	Male (n=994)	Female (n=226)
Fatal injury	235	32	221	41
Serious injury	657	186	460	87
Minor injury	360	110	313	98
Chi square value	15.367		11.628	
'p' value	0.0004 *		0.0029 *	

*Significant at $p < 0.05$

Table 2: Diurnal variation in occurrence of road traffic accidents.

Period of the year (months)	Year: 2015		Year: 2016	
	6 am to 6 pm	6 pm to 6 am	6 am to 6 pm	6 pm to 6 am
January to March	299	182	221	139
April to June	214	153	190	133
July to September	217	147	159	118
October to December	221	147	145	115
Chi square value	1.375		2.184	
'p' value	0.711		0.535	

Not significant at $p < 0.05$

Diurnal variation: The diurnal variation from 6 am to 6 pm (approximately from sunrise to sunset) and from 6 pm to 6 am (approximately from sunset to sunrise) was not significant across various months for both years 2015 and 2016 (Table 2). In the present study, though marginally more RTA occurred during the daytime, the diurnal variation in RTA was not significant for both 2015 and 2016. Similar results have been obtained by a Puducherry-based study, which found that 59% of RTA occurred during day time (6 am to 6 pm).^[20] However, other studies have reported higher frequencies of RTAs between 3 pm and 7 pm,^[4] 6 pm and 12 midnight,^[16] 5 pm and 8.59 pm,^[24] and 4 pm and 7 pm.^[25] The lack of significant diurnal variation in the present study may be attributed to constant traffic throughout the day in Thane city, which is located near the metropolis of Mumbai.

Age of victim: The age of majority of the victims was between 25 and 44 years in the present study. The month-wise differences in age of victim was highly significant for the year 2015 but was not significant for the year 2016 (Table 3). Frequencies of young adult victims reported by various studies are 40.83%,^[4] 34.62%,^[17] and 51.8%.^[19] Young adults venture out of their homes for education or employment and also have a propensity to indulge in high risk behaviours. Many studies^[26-29] have reported the strong association of medical conditions, personal problems (deviance, hyperactivity, low tolerance, inattentiveness)^[4] and psychosocial conflicts with RTA. 10.83% had history of conflict on the day of accident, while 61.53% were involved in some form of conflict prior to the accident.^[4] Use of mobile phone was associated with 51.9%^[20] and 42.3%^[30] RTAs.

Table 3: Age of victim.

Period of the year (months)	Year: 2015				Year: 2016			
	<18 years	18-24 years	25-44 yrs	45+ years	<18 years	18-24 years	25-44 yrs	45+ years
Jan to Mar	6	99	298	78	25	46	144	105
Apr to Jun	13	72	216	66	29	43	144	90
Jul to Sep	32	57	194	81	26	56	120	64
Oct to Dec	27	83	169	89	32	55	156	85
Chi square value	53.818				11.47			
'p' value	<0.0001 *				0.248			

*Significant at $p < 0.05$

Type of road: In the present study, a high number of RTAs occurred on roads other than National or State highways, with significant difference for the both years 2015 and 2016 (Table 4). A study from Puducherry (South India) reported that 71.5% of RTAs occurred in rural areas.^[20] 26.53% of non-collision RTAs occurred

on narrow and defective roads, while 61.97% collision-type RTAs occurred on wide roads.^[4] 42.3% of RTAs occurred due to skidding of the victim's vehicle, loss of balance of vehicle, crashing against a divider or tree, etc.^[17]

Table 4: Type of road.

Period of the year (months)	Year: 2015			Year: 2016		
	National Highway	State Highway	Other roads	National Highway	State Highway	Other roads
Jan to Mar	46	32	403	52	26	282
Apr to Jun	45	32	290	59	31	233
Jul to Sep	63	25	276	56	42	179
Oct to Dec	71	12	285	67	29	164
Chi square value	28.269			26.830		
'p' value	0.00008 *			0.00001 *		

*Significant at $p < 0.05$

Table 5: Type of vehicle.

Type of vehicle	Year: 2015				Year: 2016			
	Jan to Mar	Apr to Jun	Jul to Sep	Oct to Dec	Jan to Mar	Apr to Jun	Jul to Sep	Oct to Dec
Bicycles	04	0	0	06	05	02	04	01
Light motor vehicles	235	163	177	202	149	182	134	191
Heavy motor vehicles	15	27	48	13	27	17	22	25
Other vehicles	81	85	100	40	17	02	16	50
Total	417	366	423	374	311	294	256	359
Chi square value	80.624				61.271			
'p' value	1				<0.001 *			

*Significant at $p < 0.05$

Type of vehicle: In the present study, the commonest vehicles involved in RTAs were light motor vehicles and the difference in distribution of type of vehicles was highly significant for 2016 (Table 5). On the other hand, various studies have reported the frequency of involvement of motorized two-wheelers in RTAs as 54.6%,^[20] 71.9%^[17] and 77.5%.^[19] More than 80% of riders of motorized two-wheelers were males^[31] and men were more likely to suffer non-fatal RTI that required longer recovery periods.^[32] Majority of female victims of RTA were pedestrians^[31] or pillion riders,^[33] with a gender difference in the type of injuries sustained by pillion riders. Since most female pillion riders sit side-ways, they suffered from fewer fractures of lower extremities but more injuries to the head, neck and torso.^[33]

CONCLUSION

The gender differences for fatal, serious and minor road traffic injuries were significant. Majority of the victims were young adults. A high number of road traffic accidents occurred on roads other than National or State highways and light motor vehicles were frequently involved. Prevention of road traffic accidents would require multi-pronged strategies that would include improved road designing and construction with easily readable multi-lingual road signs, enforcing speed limits, mandatory child safety seats and use of seat belts, compulsory use of helmets by both the driver and pillion rider in motorized two-wheelers, campaign against driving under influence of alcohol, installation of speed detection cameras, traffic control and regular awareness programmes. Public-private partnerships using "corporate social responsibility" funds would go a long way in designing awareness programmes that appeal to various age groups.

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