RESEARCH PAPER

Prevalence and Pattern of Road Traffic Injuries Reported to Tertiary Care Hospital in Kanchipuram District - A Record-Based Study

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ABSTRACT

Introduction: Road Traffic Injuries (RTIs) are a major global health issue, causing significant morbidity, mortality, and economic loss. India records an alarmingly high number of RTIs, with motorcyclists and pedestrians being the most vulnerable groups. This study aims to analyse the prevalence, demographic distribution, and injury patterns of RTIs reported to a tertiary care hospital in Kanchipuram district, Tamil Nadu.
Methods: A retrospective, record-based study was conducted using hospital data from February 2018 to September 2022. A pretested, semi-structured questionnaire was used to collect information on patient demographics, accident characteristics, injury types, treatment details, and outcomes. Data were analysed using SPSS software, with Chi-square tests applied to assess statistical significance.
Results: Among 293 cases, males (75%) were disproportionately affected, with motorcyclists accounting for 77.82% of accidents. The most common injury mechanism was collisions with stationary objects (39.4%). Head and neck injuries had the highest disability and fatality rates. ICU admission, surgical intervention, and blood transfusion were significantly associated with poorer outcomes ($p<0.05$). The majority (96.6%) recovered fully, while 2.4% sustained disabilities, and the fatality rate was 1%.
Discussion: The study highlights the burden of RTIs in Kanchipuram, with young males and motorcyclists being at high risk, which emphasizes the urgent need for target interventions to reduce RTIs. Strengthening road safety policies, enforcing traffic regulations, and promoting the use of protective gear such as helmets and seatbelts are crucial measures. Additionally, improving emergency trauma care, including faster treatment initiation and better access to surgical and intensive care, may enhance survival rates and recovery outcomes.

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INTRODUCTION

A road traffic accident is any accident involving at least one road vehicle in motion on a public road or private road to which the public has right of access, resulting in at least one injured or killed person (United Nations, European Union and the International Transport Forum at the OECD, 2019). This can include collisions between vehicles, a vehicle hitting a pedestrian, cyclist, or stationary object, and other events causing unintended harm. RTIs are generally characterized by their sudden and unexpected nature and can range from minor fender-benders to severe crashes with significant consequences. Road traffic injuries (RTIs) are a significant global health concern, leading to substantial human and economic losses annually. Key statistics highlighting the global burden include approximately 1.19 million fatalities and injuries of 20 to 50 million individuals, of which many lead to disabilities. Road traffic injuries are the leading cause of death in children and young adults between the ages of 5 and 29. In addition to this, RTIs cost up to 5% of the global gross product[1]. Road traffic injuries (RTIs) in India have a significant impact, both in terms of human casualties and economic costs. According to the national reports in 2022, the country reported approximately 461,312 road accidents, resulting in 168,491 fatalities and 443,366 injuries. On average, this translates to about 1,264 accidents and 462 deaths each day, or roughly 53 accidents and 19 deaths every hour. These accidents also impose significant economic strain, accounting for around 3 to 5% of India's annual GDP[2].

The high incidence of road traffic injuries (RTIs) in India is driven by multiple interrelated factors that require urgent attention to mitigate their frequency and impact. Speeding is one of the primary contributors, as vehicles traveling at excessive speeds reduce the reaction time for drivers and increase the severity of collisions[3]. Reckless driving further exacerbates the problem, with behaviors such as aggressive overtaking, tailgating, and failure to adhere to traffic signals [4]. Such actions not only endanger the lives of the drivers themselves but also other road users. Many roads in India suffer from inadequate maintenance, featuring potholes, uneven surfaces, and poorly marked lanes, which increase the likelihood of accidents. In rural areas, unpaved roads and the lack of proper signage further contribute to hazardous driving

conditions[5]. Overloading of vehicles, both passenger and freight, is another significant issue. Overcrowded buses and goods-laden trucks compromise vehicle stability, braking efficiency, and overall safety. This practice, often driven by economic pressures, increases the risk of rollovers, mechanical failures, and severe accidents. Additionally, the inadequate implementation of road safety rules and precautions plays a critical role[6]. Addressing these factors requires a multifaceted approach, including stricter enforcement of traffic laws, public awareness campaigns on road safety, investment in improving road infrastructure, and introducing technology-driven solutions such as speed cameras and automated traffic management systems.

In India, road traffic injuries (RTIs) have a disproportionate impact on vulnerable groups such as pedestrians, cyclists, motorcyclists, children, and economically disadvantaged communities. Pedestrians and cyclists are particularly at risk due to insufficient pathways and cycling facilities, while motorcyclists add to a significant portion of fatalities, often linked to a lack of helmet use, speeding, and rash driving[3]. Children and young adults, especially in urban areas, face heightened dangers, with RTIs being a leading cause of death among those aged 5–29[7].

This study is to address the growing public health burden of road traffic injuries (RTIs) in India, particularly in Kanchipuram district, where there is a lack of region-specific data. By analyzing hospital records, the study aims to identify the prevalence, demographic distribution, and injury patterns associated with RTIs, helping to pinpoint at-risk populations and contributing factors. This data will support healthcare planning, resource allocation, and the development of targeted interventions and policies to reduce road traffic-related morbidity and mortality, ultimately improving patient care and road safety in the region.

METHODOLOGY:

This is a retrospective study aimed at determining the prevalence of road traffic injuries reported to a tertiary care hospital in Kanchipuram district of Tamil Nadu , South India. The study covers all cases of Road traffic injuries reported to emergency department of the tertiary care hospital over a five-year period from February 2018 to September 2022 from the hospital medical records.

A pretested semi-structured questionnaire was designed and validated by the Department of Community Medicine experts. Questionnaire included Socio demographic details of the patients, specifics of accidents such as place, time and date of the accidents, object of collision, treatment provided, hospital stay duration and outcome.

Participant identity was always kept confidential, and the data was used only for research purposes. The procedures followed were per the Institutional Ethical Committee and with the Helsinki Declaration of 1975 as revised in 2000. The baseline data was collected using the Questionnaire by Google Forms and was compiled using Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) software version 25 for Windows. The final data was tabulated, and percentages were calculated for categorical variables, and mean, and standard deviation were calculated for measurable data. The associations were analyzed by crosstabs and the Chi-square ($\chi 2$) test was used for statistical significance.

RESULTS:

Table 1: Sociodemographic profile of the study participants

S.No	Variables	Categories	N=293 Percentage (%)
1	Gender	Male	218(75)
		Female	75(25)
2	Age(in years)	<18	9(3.1)
		18-25	87(29.7)
		26-35	99(33.78)
		36-45	46(15.69)
		46-55	30(10.23)
		>55	22(7.5)
3	Religion	Hindu	183 (62.5)
		Others	110 (37.5)

5	Education	Literate	172 (58.7)
		Illiterate	121 (41.3)

The incidence of road traffic injuries was significantly higher among **males (74.74%)** compared to **females (25.26%)**, suggesting a gender-based disparity in exposure to road traffic risks. (Table 1). Table 1 results suggests that 33% of the patients admitted due to RTI were between age group of 26-35 years and were mostly literates(58.7%). Majority of them (68%) belonged to Hindu Religion.

Table 2: Descriptive table of Various variables involved in RTI

S.No	Variables	Categories	N=293 Percentage (%)
1	Mode of Transport	Motorcycle	228(77.81)
		Car	19(6.48)
		Others	46(15.71)
2	Object of Collision	Stationery object	67(39.4)
		Pedestrians	30(17.6)
		Vehicle	65(38.2)
		Other	8(4.8)
3	Road involved in the accident	Highway	184 (62.8)
		Main roads(Broader)	96 (32.8)
		Streets(Narrow)	13(4.4)
5	Person affected	Driver	198(67.6)
		Passenger	72(24.6)
		Pedestrian	23(7.8)

Table 2 shows that Motorcycles were the most frequently involved mode of transport, accounting for 77.82% of cases, followed by cars (6.48%) and other transport modes (3.07%).

The high involvement of motorcycles indicates their potential contribution to road traffic injuries in the studied population. Collisions with stationary objects were the most common (39.4%), followed by vehicle-vehicle collisions (38.2%). Pedestrian-related accidents accounted for 17.6%, while other types of collisions constituted 4.7%.

Table 2 suggests that the majority of the accidents takes place in highways (62.8%) and the Driver (67.6%) of the vehicle is the most affected person during the RTI and then followed by passengers(24.6%) and Pedestrians (7.8%).

Table 3: Multiple factors involved in the RTI

S.No	Variables	Categories	N=293 Percentage (%)
1	Human Factors	Distracted Driving	95(32.4)
		Driving under the influence of Alcohol and other psychoactive substance	50(17.1)
		Speeding	24(8.2)
		Non-use of Motor cycle Helmets, Seatbelts, child restraints	19(6.5)
2	Environmental and Infrastructural Factors	Slip and Fall	73(24.9)
		Unsafe Road infrastructure	22(7.5)

3	Regulatory and Policy Gaps	Inadequate Law enforcement of Traffic laws	7(2.4)
4	Miscellaneous	Rare events	3(1)

Table 3 highlights multiple contributing factors to road traffic injuries (RTIs) among 293 cases. Human factors were the most prevalent, with distracted driving (32.4%), driving under the influence of alcohol or psychoactive substances (17.1%), speeding (8.2%), and lack of protective gear use (6.5%) being key contributors. Environmental and infrastructural factors also played a significant role, particularly slip and fall incidents (24.9%) and unsafe road conditions (7.5%). Regulatory and policy shortcomings were evident, with inadequate traffic law enforcement (2.4%) linked to accidents. Additionally, rare and miscellaneous incidents (1%), such as a saree getting entangled in a wheel or being struck by a vehicle while disembarking from a bus, were recorded

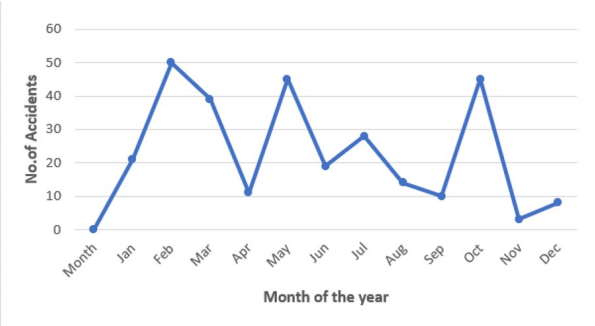

FIG 1 Seasonal Trends Of Road Traffic Injuries

The seasonal trend of road traffic injuries demonstrates significant monthly variations, as illustrated in Figure 1. The incidence of RTIs peaked in February (n ≈ 55) and exhibited another notable increase in May and October, each surpassing 40 reported cases. Conversely, April, September, and November witnessed a sharp decline, with reported accidents dropping below 10. A fluctuating pattern was observed during the mid-year period (June–August), where RTAs showed intermittent rises and falls without a consistent trend.

Table 4 Descriptive table on various variables involved in RTIs

S.No	Variables	Categories	N=293 Percentage (%)
1	Body parts involved	Head and Neck injuries	240(81.9)
		Upper limb	14(4.8)
		Lower limb	14(4.8)
		Trunk	25(11.9)
2	ICU Admission	No	225(76.8)
		Yes	68(23.02)
3	Nature of the treatment	Surgical	182(62.1)
		Non-Surgical	111(37.9)
4	Blood transfusion	No	241(82.2)
		Yes	52(17.8)
5	Total no. of days of hospitalization	1-7 days	247(84.3)
		7 days -2 weeks	30(10.2)
		2 weeks – 4 weeks	13(4.4)
		More than a month	3(1.1)
6.	Outcome	Recovered	283(96.6)
		Disabled	7(2.3)
		Fatal	3(1.1)

Table 4 results suggests that majority of the patients admitted suffered from head and neck injuries (81.9%) and the majority of injured individuals (96.6%) recovered fully, while 2.4% were left with disabilities. The fatality rate was 1%, indicating a relatively low but significant burden of mortality associated with road injuries. The majority of cases required hospitalization for 1–7 days (84.3%), whereas 10.2% required hospitalization for 7 days to 2 weeks. Extended hospital stays of 2 weeks to 1 month were observed in 4.4%, while only 1% required hospitalization for more than a month.

Table 5: Association between treatment outcome and Various variable

S.No	Variables	Categories	Outcome			Ch i-s	p-value
			Disabled	Fatal	Recovered		

						quare test	
1	Age (in years)	Below 18	3	0	84	13.7	0.189
		18-25	2	0	97		
		26-35	1	1	44		
		36-45	1	2	27		
		46-55	0	0	22		
		>55	0	0	9		
2	Body parts involved	Head and Neck injuries	5	2	233	51.3	**0.005***
		Upper limb	1	0	13		
		Lower limb	1	0	13		
		Trunk	0	1	34		
3	Time taken to begin the treatment	Less than 1 hour	1	1	120	4.58	0.802
		1-3 hours	4	2	110		
		3-6 hours	2	0	38		
		6-12 hours	1	0	7		
		More than 12 hours	0	0	8		
4	ICU Admission	No	2	0	223	19.7	**0.001***
		Yes	5	3	60		
5	Nature of the treatment	Surgical	1	0	181	12.1	**0.002***
		Non Surgical	6	3	102		
6	Blood transfusion	No	1	0	240	37.3	0.001*
		Yes	6	3	43		
7	Total no. of days of hospitalization	1-7 days	1	2	244	35.5	0.001*
		7 days -2 weeks	4	1	25		
		2 weeks – 4 weeks	1	0	12		
		More than a month	1	0	2		

***p≤0.05 is statistically significant**

The association between treatment outcomes (recovered, disabled, and fatal cases) and various independent variables was analyzed using the Chi-square test to determine statistical significance. The key findings are as follows:

There was no statistically significant association between age and treatment outcomes (χ^2 = 13.7, p = 0.189). The majority of patients across all age groups recovered, with minimal variations in disability and fatality rates. This suggests that age alone may not be a primary determinant of patient prognosis following trauma.

A significant association was observed between the anatomical site of injury and treatment outcome (χ^2 = 51.3, p = 0.005). Patients with head and neck injuries constituted the largest proportion of cases (n = 240, 81.9%), with a higher incidence of disability (n = 5) and fatality (n = 2). Trunk injuries also contributed to one fatality. In contrast, injuries confined to the upper or lower limbs had no recorded fatalities, indicating a lower severity compared to head, neck, or trunk injuries.

The time taken to initiate treatment did not exhibit a statistically significant association with treatment outcome (χ^2 = 4.58, p = 0.802). Most patients (n = 230, 78.5%) received medical care within three hours of injury, but no substantial differences in recovery, disability, or fatality rates were observed across different treatment initiation times.

A Significant association was found between ICU admission and patient outcomes (χ^2 = 19.7, p = 0.001). Patients requiring ICU care had higher fatality (n = 3) and disability rates (n= 5) compared to those who did not require ICU admission. This underscores the role of injury severity in determining the need for intensive care and its impact on patient prognosis. Surgical intervention was significantly associated with better outcomes (χ^2 = 12.1, p = 0.002). Patients undergoing surgical procedures had a higher recovery rate (n = 181), while non- surgical management was linked to a greater number of disability (n = 6) and fatality (n = 3) cases. This suggests that definitive surgical management may improve patient survival and functional recovery.

A statistically significant association was found between blood transfusion and treatment outcomes (χ^2 = 37.3, p = 0.001). Patients who required blood transfusions had a disproportionately higher rate of disability (n = 6) and fatality (n = 3) compared to those who did not require transfusion. This may indicate that blood loss and hemorrhagic shock contribute to worse prognosis.

A significant correlation was observed between hospital stay duration and treatment outcome (χ^2 = 35.5, p = 0.001). The majority of patients with shorter hospital stays (1–7 days) recovered (n = 244), whereas prolonged hospitalization (≥2 weeks) was associated with an increased incidence of disability. This could reflect the severity of injuries requiring extended medical care.

DISSCUSSION:

This study provides an in-depth analysis of the prevalence and patterns of road traffic injuries (RTIs) reported at a tertiary care hospital in Kanchipuram district. The findings align with existing literature in several aspects but also present some contradictions that warrant further exploration.

The study found a significantly higher prevalence of RTIs among males (74.74%) compared to females (25.26%), which is consistent with global and national studies indicating that men are more prone to road accidents due to increased exposure to traffic, risk-taking behaviors, and occupational hazards [8,9]. Similar trends have been reported in studies from India, where males constitute 80–85% of RTI victims, particularly due to increased motorcycle use [10].

The lack of statistical significance between age and treatment outcomes (χ^2 = 13.7, p = 0.189) suggests that factors such as injury severity, healthcare access, and treatment quality may play a more decisive role in recovery. This finding contrasts with studies suggesting that older adults have poorer prognoses due to frailty and comorbidities [11]. However, the relatively low representation of elderly patients (>55 years) in this study may have influenced this result.

A strong association was found between the anatomical site of injury and treatment outcome (χ^2 = 51.3, p = 0.005), with head and neck injuries accounting for the highest number of fatalities and disabilities. This aligns with studies showing that traumatic brain injuries (TBIs) are the leading cause of RTI-related deaths [12]. In contrast, limb injuries were associated with better recovery rates, consistent with findings that extremity fractures, while serious, are less likely to be fatal [13].

A significant association between ICU admission and poorer outcomes (χ^2 = 19.7, p = 0.001) underscores the severity of injuries requiring intensive care. Similar findings have been reported, where prolonged ICU stays are linked to higher mortality and disability rates in trauma patients [14]. This supports the idea that injury severity rather than ICU care itself is the primary determinant of

prognosis.

Contrary to expectations, there was no statistically significant association between treatment initiation time and outcomes ($\chi^2 = 4.58$, $p = 0.802$). This finding contradicts existing literature that highlights early intervention as a critical factor in reducing mortality and long-term disability [15]. One possible explanation is that most patients in this study received treatment within three hours, making time differences less impactful. Additionally, the nature and severity of injuries may have played a greater role than treatment timing.

Surgical intervention was significantly associated with better outcomes ($\chi^2 = 12.1$, $p = 0.002$), with higher recovery rates in patients who underwent surgical procedures. This aligns with studies emphasizing that definitive surgical management reduces complications and improves survival in trauma cases [16]. Conversely, non-surgical management was associated with higher disability and fatality rates, likely reflecting cases where conservative treatment was inadequate for severe injuries.

A significant correlation was observed between the need for blood transfusion and poor outcomes ($\chi^2 = 37.3$, $p = 0.001$), reinforcing the role of hemorrhagic shock as a major contributor to RTI-related deaths [17]. Patients requiring transfusions had higher rates of disability and mortality, which aligns with previous findings that severe blood loss is a key determinant of trauma prognosis [18].

A statistically significant association was found between prolonged hospitalization and disability ($\chi^2 = 35.5$, $p = 0.001$). Similar to other studies, extended hospital stays were linked to severe injuries requiring long-term care [11]. The fact that most patients (84.3%) recovered within 1–7 days suggests that a majority of cases were either mild or well-managed with early interventions.

LIMITATIONS: This study being a retrospective, hospital-based study, it relies on pre-recorded data, which may lead to reporting biases or missing information**.**

CONCLUSION:

This study provides valuable insights into the prevalence and patterns of road traffic injuries (RTIs) in Kanchipuram district, India, with a significant burden observed among young males and motorcyclists. Head and neck injuries were associated with the highest disability and fatality rates, while ICU admission, blood transfusion, and prolonged hospitalization were strong indicators of severe outcomes. The findings highlight the need for stringent road safety measures, including enhanced enforcement of helmet and seatbelt use, improved road infrastructure, and stricter regulations on speeding and reckless driving.

In the Indian context, the government has introduced initiatives such as the Motor Vehicles (Amendment) Act, 2019, which enforces stricter penalties for traffic violations, and the Integrated Road Accident Database (iRAD) for better surveillance. Recent advances in trauma care, including AI-driven accident detection, pre-hospital emergency response systems, and improved rehabilitation services, have shown promise in reducing RTI-related mortality and long-term disabilities. However, challenges remain in ensuring widespread implementation and accessibility, particularly in rural areas. Future research should focus on multi-centre studies incorporating pre-hospital data, advanced trauma care interventions, and behavioural risk assessments to develop evidence-based, region-specific preventive strategies.

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