



Clinical Profile of Road Traffic Accidents in a Tertiary Care Hospital in India

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Abstract

In India, approximately 28% of the total disability-adjusted life years lost due to injuries are attributed to road traffic injuries (RTIs) alone. In 2016, there were 150,785 deaths occurring in 480,652 road crashes. The aim is to assess the various epidemiological factors of road traffic accidents at a tertiary care hospital. It is a prospective observational study involving 1000 cases conducted in Department of Orthopaedics, Saveetha Medical College and Hospital, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, India between 2021 – 2023 using questionnaire and specific parameters. The mean age of patients included in our study was 37.02 ± 15.65 . Out of the 1000 patients, 25.7% were between 31 – 40 years of age and 83.4% were males with skid and fall from 2 wheeler being the most commonest mechanism of injury. Thiruvallur (42.9%) was the most commonest district with time of injury being between 8pm-1:59am (40.1%). The most common site involved in RTA was found to be Lower limbs (54.9%) followed by upper limb (44.1%). The mean ISS was 38 ± 7 . The mortality rate was 1.7%. There is a need of more scientific studies on the subject and road users need to be educated on factors involved in the road accidents. Implementation of various safety measures in a multipronged strategy is the need of hour.

Introduction:

In India, approximately 28% of the total disability-adjusted life years lost due to injuries are attributed to road traffic injuries (RTIs) alone. In 2016, there were 150,785 deaths occurring in 480,652 road crashes. Further, RTI-related deaths have increased by 43% over the last 10 years. Unless new initiatives and intense efforts are made, the total number of road traffic deaths in India is likely to surpass 250,000 by 2025 (1). The more progressive and developed states such as Andhra Pradesh, Maharashtra, and Tamil Nadu are the most affected by road traffic accidents (RTAs). According to State Crime Record Bureau of Chennai, the total number of RTAs reported in the state of Tamil Nadu in the year 2016 is about 71,000 accidents, involving nearly 1 lakh individuals, highest in India; among these, about 17,000 are fatal. Chennai city accounts for highest incidence of RTAs than any other city in India (2).

Although the number of lives lost in road accidents in high-income countries indicate a downward trend in recent decades, for most of the world's population, the burden of road-traffic injury in terms of societal and economic costs is rising substantially (3). The highest burden of injuries and fatalities is borne disproportionately by poor people, as they are mostly

pedestrians, cyclists, and passengers of buses and minibuses(4).

The data for fatal accidents presented to the Parliament by the Ministry of Road Transport and Highways for year 2008 shows that 119,860 people perished in mishaps that year and the national and state highways accounted for nearly half of all road accidents (5). Deaths due to road accidents in 2009 were reported to be 126,896 and in 2010 it increased to 133,938 which is about 5.5% over and above the previous year's deaths. Tamil Nadu, Andhra Pradesh, Maharashtra, Karnataka, and Rajasthan have accounted for 11.5%, 10.5%, 7.1%, and 6.8%, respectively, of total "Road Accident" deaths in the country(6). The trend is alarming and is leading to a frightening situation day by day.

The purpose of this study was to assess the epidemiology of road traffic accidents based on the number of patients reporting to Department of Orthopaedics, Saveetha Medical College and Hospital, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, India in order to obtain a figurative value of trauma patients being treated at our tertiary care centre.



Materials and Methods:

This prospective observational study was conducted in Department of Orthopaedics, Saveetha Medical College and Hospital, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, India on 2021-2023 with a sample size of 1000 cases.

Study population:

For the purpose of the study, a Road Traffic Accident (RTA) was defined as accident, which took place on the road between two or more objects, one of which must be any kind of a moving vehicle.

Inclusion criteria:

All patients involved in road traffic accidents visiting the hospital. Patients who received initial treatment elsewhere including primary procedure presenting within 15 days

Exclusion criteria:

Patients presenting later than 15 days
Industrial accidents, trivial fall at home
Patients with incomplete data

Methodology:

Based on the parameters specially designed for the purpose of this study, accident victims were assessed

through patient medical records. In the event of unavailability of data, the files were accessed through patient's case files in the ICU/ward or through a telephonic conversation with the patients attenders. The parameters included:

Parameters:

Demographic details of Patient

Injury details:- Date of injury, Time of injury, Location of injury

Brought by whom

Mechanism of injury

Driver/Pillion rider/Accompanying person

Symptoms- Loss of consciousness, Event amnesia, ENT bleed, Vomiting, Seizures

Injury pattern:

Head

Face

Chest

Spine

Pelvis

Upper limb

Lower limb

Injury severity score:

Regions	Abbreviated Injury Scale (AIS)
Head, neck and C-spine	1 (Minor)
Face including nose, mouth, eyes, ears	2 (Moderate)
Thorax, thoracic spine, diaphragm	3 (Serious)
Abdomen and lumbar spine	4 (Severe)
Extremities including pelvis	5 (Critical)
External soft tissue injury	6 [Maximal (untreatable)]
Calculate AIS for most severely injured body part in each region. ISS is calculated as sum of square of AIS for the 3 most injured body regions. Maximum score is 75. If any body region is assigned a 6, the overall ISS is automatically 75.	

Mortality- If present – brought dead/death in casualty even after resuscitation

Results:

Age Distribution-



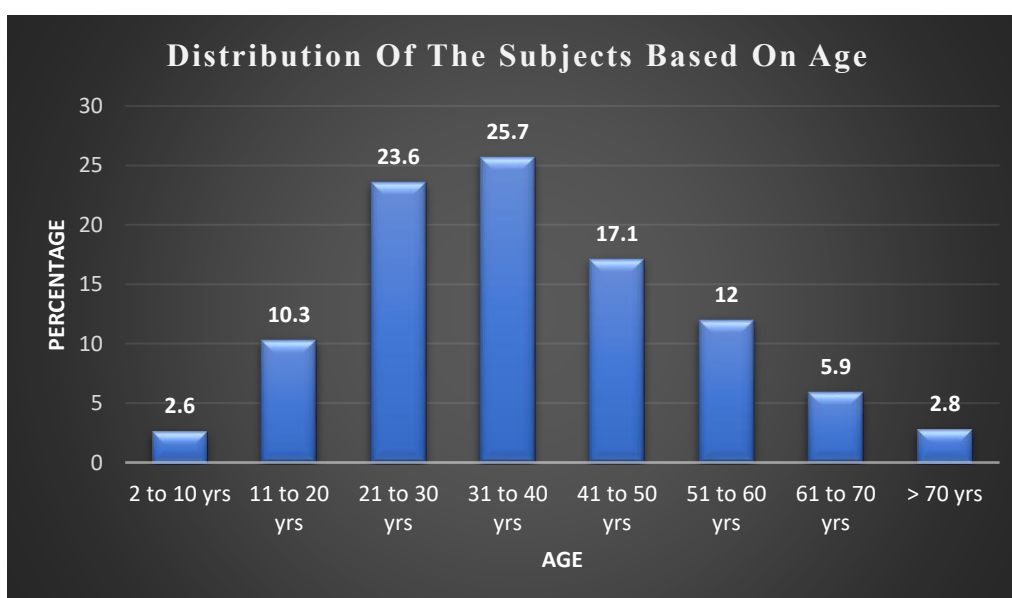
Table 1: Mean Age Distribution Of The Subjects

	N	Minimum	Maximum	Mean	S.D
Age	1000	2	78	37.02	15.653

Interpretation: The mean age of patients included in our study was 37.02 ± 15.65 .

Table 2: Distribution Of The Subjects Based On Age

Age	Frequency	Percent
2 to 10 yrs	26	2.6
11 to 20 yrs	103	10.3
21 to 30 yrs	236	23.6
31 to 40 yrs	257	25.7
41 to 50 yrs	171	17.1
51 to 60 yrs	120	12.0
61 to 70 yrs	59	5.9
> 70 yrs	28	2.8
Total	1000	100.0



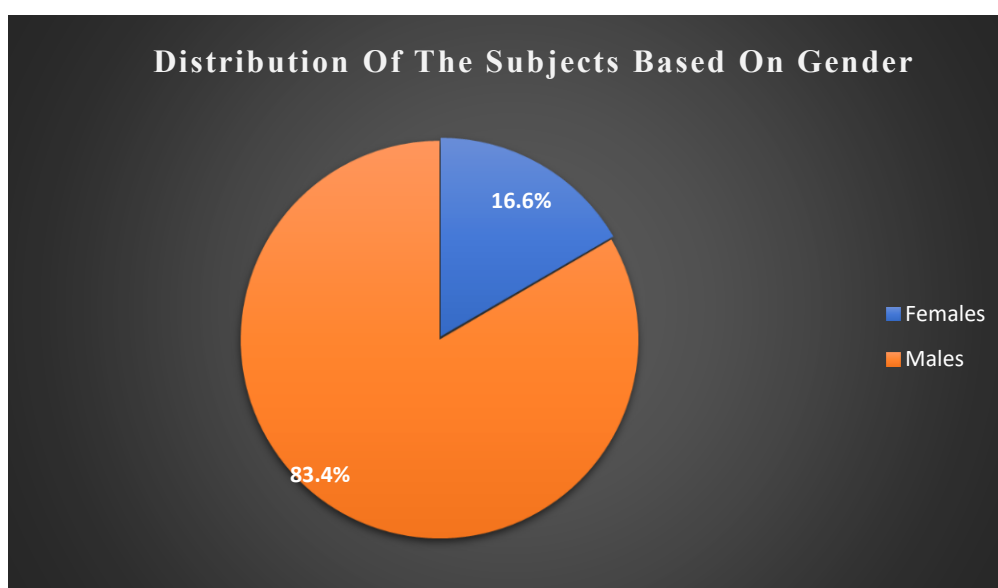
Interpretation: Out of the 1000 patients, 26 patients (2.6%) were between 2 to 10 years of age, 103 patients (10.3%) were between 11-20 years of age, 236 patients (23.6%) were between 21-30 years of age, 257 patients (25.7%) were between 31-40 years of age, 171 patients (17.1%) were between 41-50 years of age, 120 patients (12%) were between 51-60 years of age, 59 patients (5.9%) were between 61-70 years of age and 28 patients (2.8%) were above 70 years of age.

Gender Distribution-



Table 3: Distribution Of The Subjects Based On Gender

Sex	Frequency	Percent
Females	166	16.6
Males	834	83.4
Total	1000	100.0

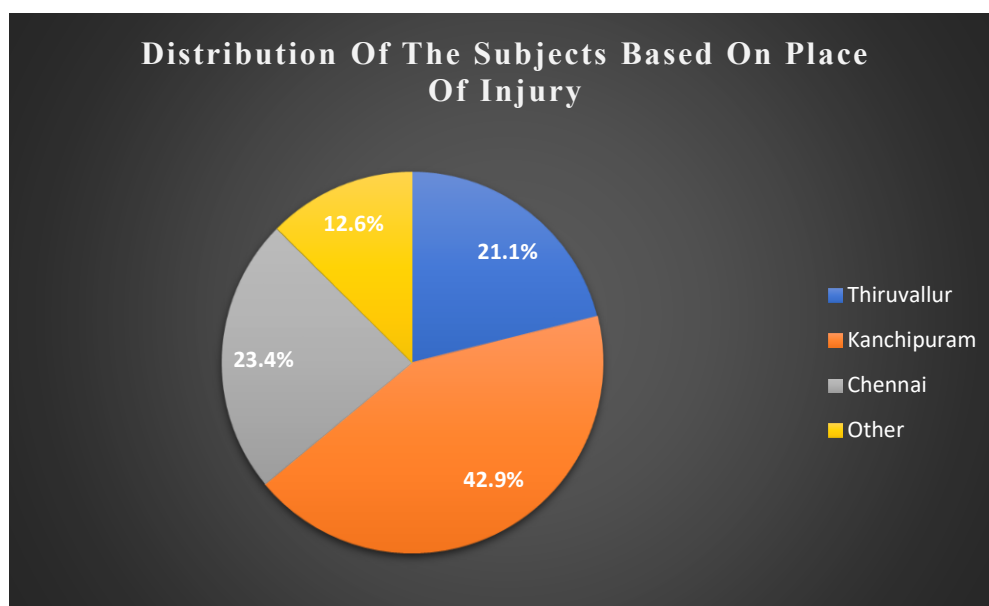


Interpretation: Out of the 1000 patients, 834 (83.4%) were males and 166 (16.6%) were females.

Place Of Injury-

Table 4: Distribution Of The Subjects Based On Place Of Injury

Place of injury	Frequency	Percent
Thiruvallur	211	21.1
Kanchipuram	429	42.9
Chennai	234	23.4
Other	126	12.6
Total	1000	100.0

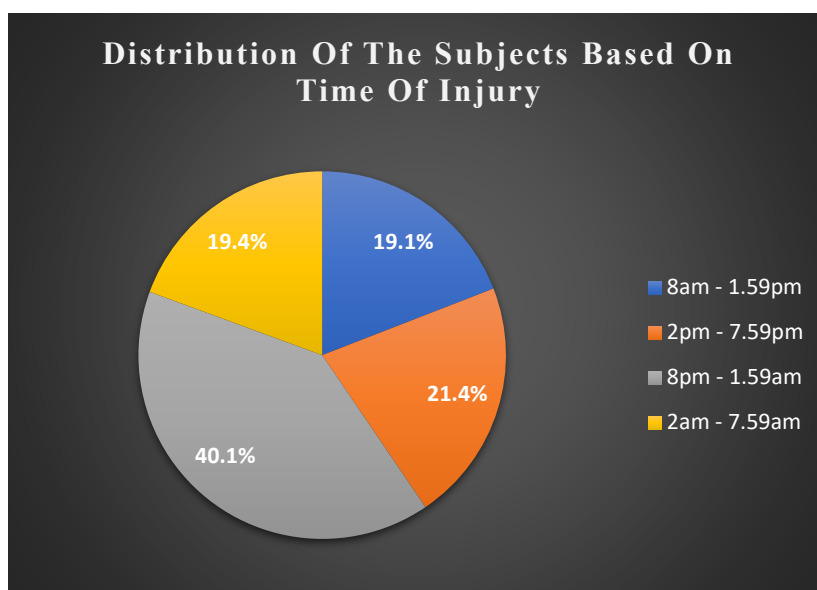


Interpretation: The district wise distribution showed that 211 patients (21.1%) were from Thiruvallur, 429 patients (42.9%) were from Kanchipuram, 234 patients were from Chennai (23.4%) and 126 patients (12.6%) were from other districts.

Time Of Injury

Table 5: Distribution Of The Subjects Based On Time Of Injury

Time Of Injury	Frequency	Percent
8am - 1.59pm	191	19.1
2pm - 7.59pm	214	21.4
8pm - 1.59am	401	40.1
2am - 7.59am	194	19.4
Total	1000	100.0

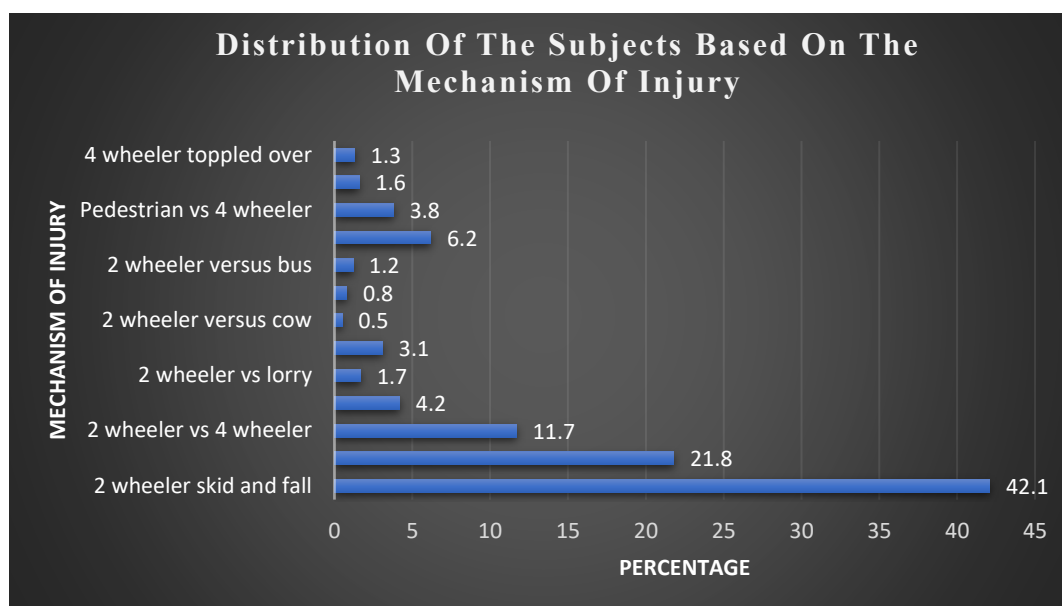


Interpretation: The time of injury between 8am - 1.59pm in 191 patients (19.1%), between 2pm- 7.59pm in 214 patients (21.4%), between 8pm- 1.59am in 401 patients (40.1%) and between 2am - 7.59am in 194 patients (19.4%)

Mechanism Of Injury

Table 6: Distribution Of The Subjects Based On The Mechanism Of Injury

Mechanism Of Injury	Frequency	Percent
2 wheeler skid and fall	421	42.1
2 wheeler vs 2 wheeler	218	21.8
2 wheeler vs 4 wheeler	117	11.7
4 wheeler vs 4 wheeler	42	4.2
2 wheeler vs lorry	17	1.7
2 wheeler versus auto	31	3.1
2 wheeler versus cow	5	.5
Pedestrian versus auto	8	.8
2 wheeler versus bus	12	1.2
Pedestrian vs 2 wheeler	62	6.2
Pedestrian vs 4 wheeler	38	3.8
4 wheeler versus lorry	16	1.6
4 wheeler toppled over	13	1.3
Total	1000	100.0



Interpretation: The mechanism of injury was skid and fall from 2 wheeler in 421 cases (42.1%). 2 wheeler versus 2 wheeler in 218 cases (21.8%), 2 wheeler versus 4 wheeler in 117 cases (11.7%), 4 wheeler versus 4 wheeler in 42 cases (4.2%), 2 wheeler versus lorry in 17 cases (1.7%), 2 wheeler versus auto in 31 cases (3.1%), 2 wheeler versus cow in 5 cases (0.5%), pedestrian versus auto in 8 cases (0.8%), 2 wheeler versus bus in 12 cases (1.2%), pedestrian versus 2 wheeler in 62 cases (6.2%), pedestrian versus 4 wheeler in 38 cases (3.8%), 4 wheeler versus lorry in 16 cases (1.6%), 4 wheeler toppled over in 13 cases (1.3%).

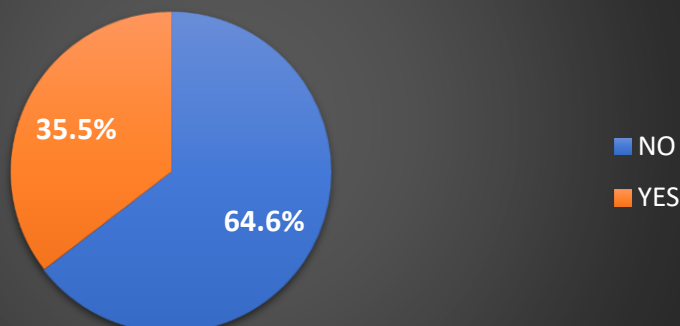
Initial Treatment

Table 7: Distribution Of The Subjects Based On The Initial Treatment Taken

Initial Treatment	Frequency	Percent
NO	645	64.6
YES	355	35.5
Total	1000	100.0



Distribution Of The Subjects Based On The Initial Treatment Taken



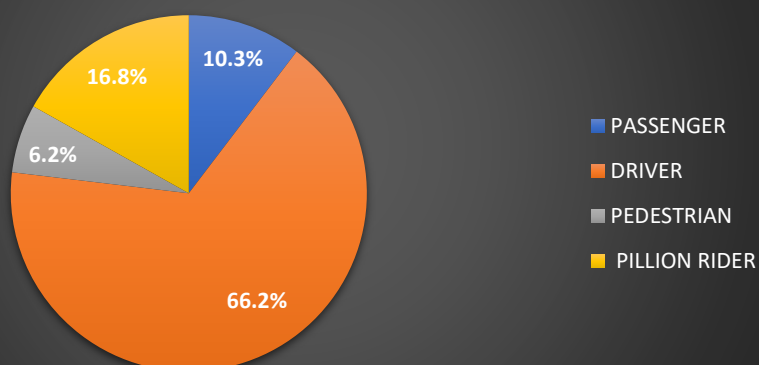
Interpretation: Out of the 1000 patients, 355 patients (35.5%) received first aid at outside hospital and 645 patients (64.5%) did not before being brought to our hospital.

Person Involved In RTA-

Table 8: Distribution Of The Subjects Based On The Person Involved In Rta

	Frequency	Percent
PASSENGER	103	10.3
DRIVER	662	66.2
PEDESTRIAN	62	6.2
PILLION RIDER	168	16.8
Total	1000	100.0

Distribution Of The Subjects Based On The Person Involved In Rta



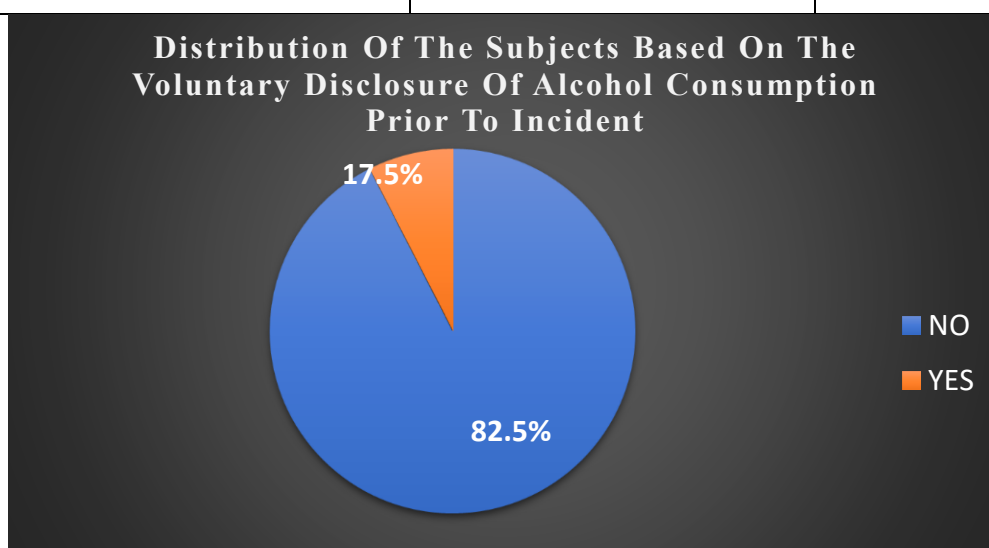
Interpretation: Out of the 1000 patients, 103 (10.3%) were passengers, 662 patients (66.2%) were drivers, 62 patients (6.2%) were pedestrians, 168 patients (16.8%) were pillion riders.



Voluntary Disclosure Of Alcohol Consumption

Table 9: Distribution Of The Subjects Based On The Voluntary Disclosure Of Alcohol Consumption Prior To Incident

	Frequency	Percent
NO	825	82.5
YES	175	17.5
Total	1000	100.0

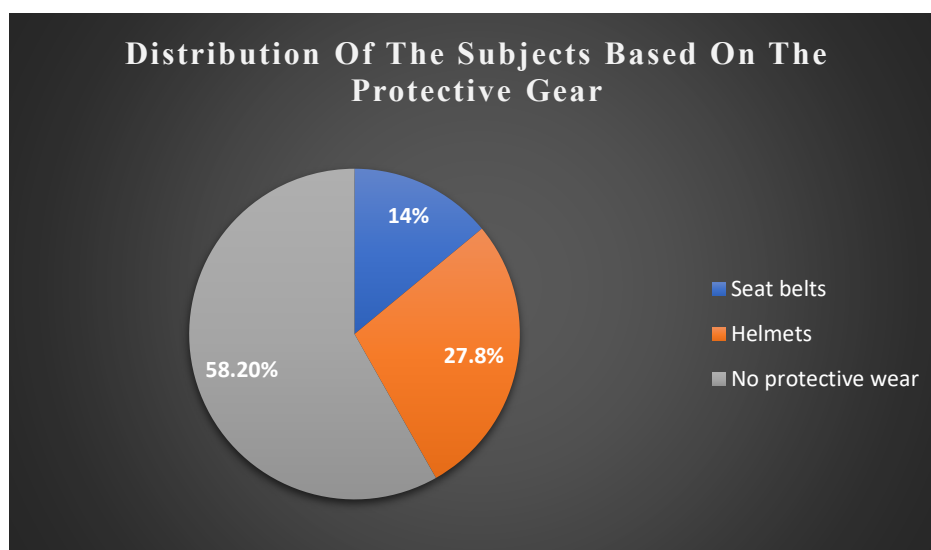


Interpretation: Out of the 1000 patients, 175 patients (17.5%) were under the influence of alcohol and 825 patients (82.5%) were not.

Protective Gear-

Table 10: Distribution Of The Subjects Based On The Protective Gear

	Frequency	Percent
Seat belts	140	14.0
Helmet		
NO	582	58.2
YES	278	27.8
Total	1000	100.0

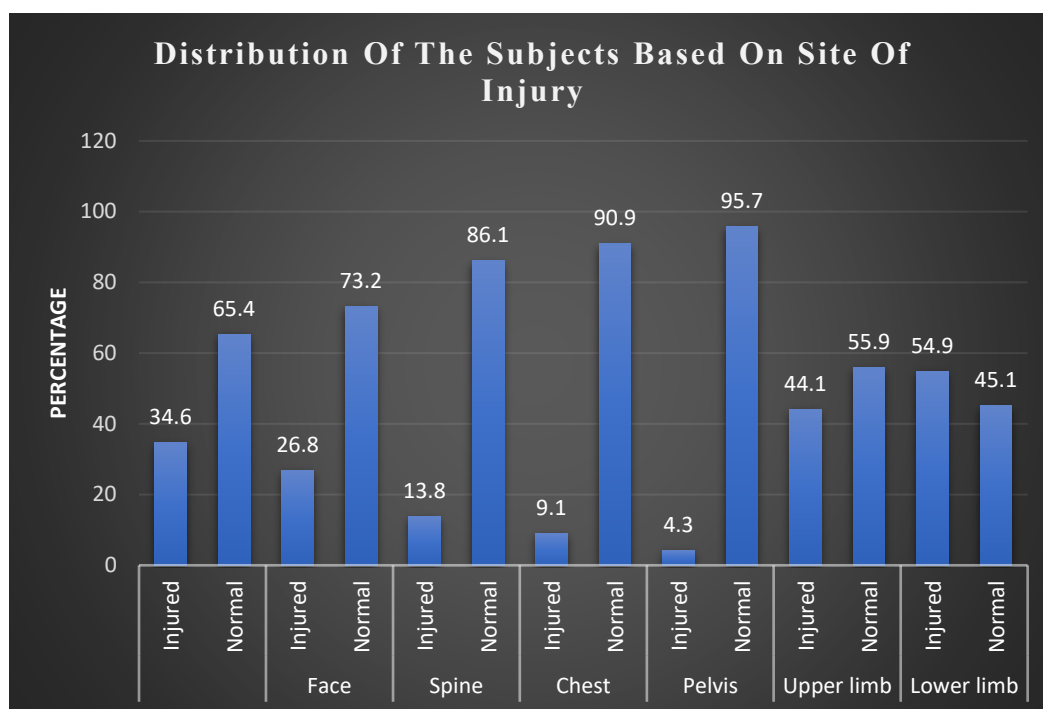


Interpretation: Out of the 1000 patients, 278 patients (27.8%) wore helmets, whereas, 582 patients (58.2%) did not and 140 (14%) patients wore seat belts.

Site Of Injury

Table 11: Distribution Of The Subjects Based On Site Of Injury

		Frequency	Percent
Head	Injured	346	34.6
	Normal	654	65.4
Face	Injured	268	26.8
	Normal	732	73.2
Spine	Injured	138	13.8
	Normal	862	86.2
Chest	Injured	91	9.1
	Normal	909	90.9
Pelvis	Injured	43	4.3
	Normal	957	95.7
Upper limb	Injured	441	44.1
	Normal	559	55.9
Lower limb	Injured	549	54.9
	Normal	451	45.1

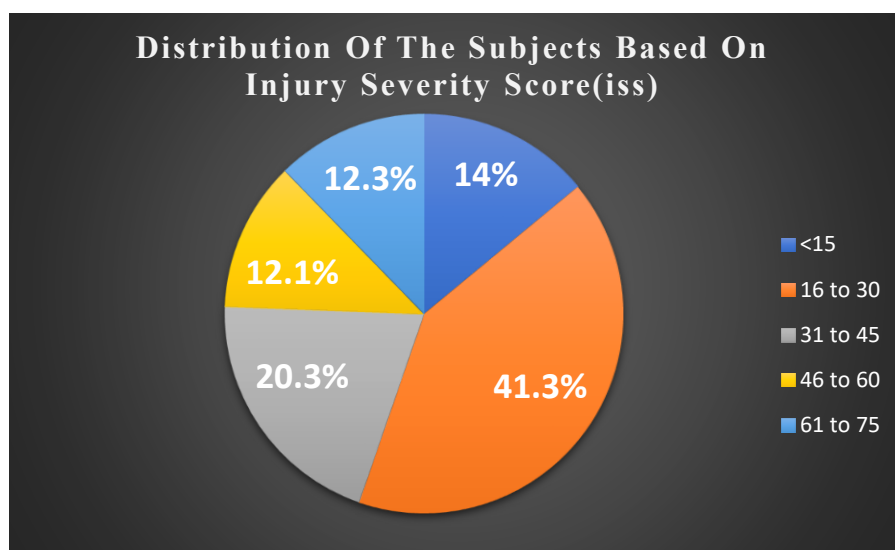


Interpretation: The site of injury was head in 346 patients (34.6%), face in 268 patients (26.8%), chest in 91 patients (9.1%), spine in 138 patients (13.8%), upper limb in 441 patients (44.1%), lower limb in 549 patients (54.9%) and pelvis in 43 patients (4.3%). The most common site involved in RTA was found to be Lower limb. In lower limb, the incidence of femur fractures were found to be higher than tibia fractures. In upper limb, the incidence of clavicle fractures were found to be higher than radius fractures followed by humerus fractures.

Injury Severity Score

Table 13: Distribution Of The Subjects Based On Injury Severity Score(Iss)

	Frequency	Percent
<15	140	14.0
16 to 30	413	41.3
31 to 45	203	20.3
46 to 60	121	12.1
61 to 75	123	12.3
Total	1000	100.0

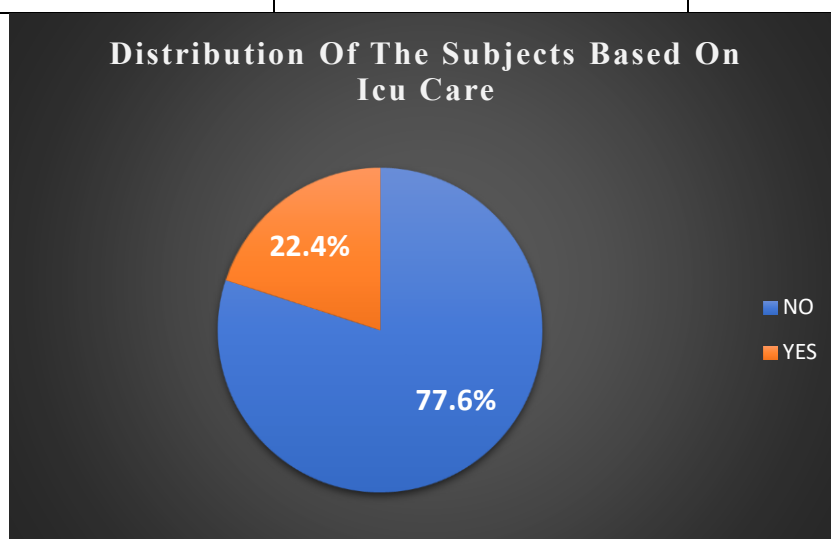


Interpretation: Out of the 1000 patients, 140 patients (14%) had a ISS <15, 413 (41.3%) had ISS between 16-30, 203 patients (20.3%) had ISS between 31-45, 121 patients (12.1%) had ISS between 46-60 and 123 patients (12.3%) had ISS between 61-75. The mean ISS was 38 ± 7 .

Based On Icu Care

Table 14: Distribution Of The Subjects Based On Icu Care

Icu Care	Frequency	Percent
NO	776	77.6
YES	224	22.4
Total	1000	100.0



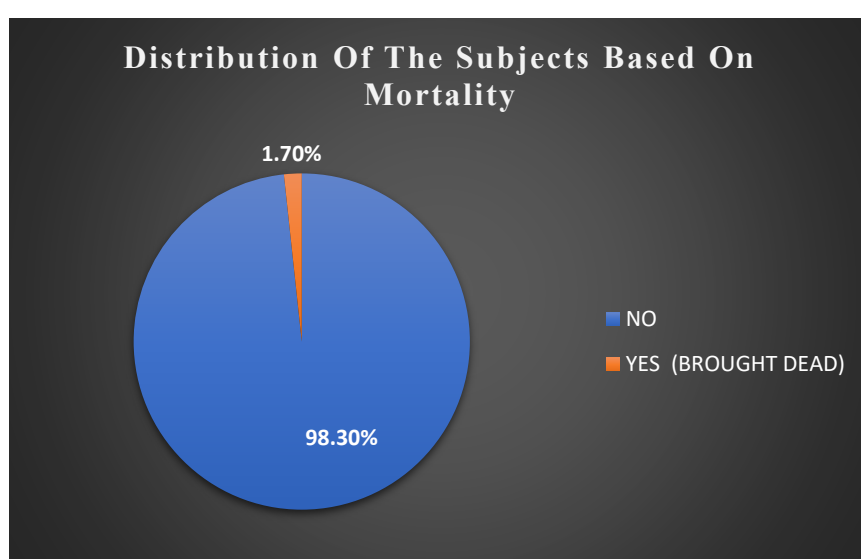
Interpretation: Out of the 1000 patients, 224 (22.4%) required ICU care and 77.6 (77.6%) did not.



Mortality

Table 15: Distribution Of The Subjects Based On Mortality

Mortality	Frequency	Percent
NO	983	98.3
YES (BROUGHT DEAD)	17	1.7
Total	1000	100.0



Interpretation: Out of 1000 patients, 17 (1.7%) were brought dead.

Discussion:

Trauma is a major problem in India with severe and wide-ranging consequences for individuals and society as a whole. In our study, out of the 1000 patients, 26 patients (2.6%) were between 2 to 10 years of age, 103 patients (10.3%) were between 11-20 years of age, 236 patients (23.6%) were between 21-30 years of age, 257 patients (25.7%) were between 31-40 years of age, 171 patients (17.1%) were between 41-50 years of age, 120 patients (12%) were between 51-60 years of age, 59 patients (5.9%) were between 61-70 years of age and 28 patients (2.8%) were above 70 years of age. The mean age of patients included in our study was 37.02 ± 15.65 . Similar finding of predominance of young and productive age group was reported by Badrinarayan Mishra et al (29) in west Nepal and Manna N et al (30) in a tertiary care hospital in Kolkata,

Nilambar Jha et al (31) from South India and Abhishek Singh et al (32) in a tertiary care hospital in rural Haryana.

In our study, the district wise distribution showed that 211 patients (21.1%) were from Thiruvallur, 429 patients (42.9%) were from Kanchipuram, 234 patients were from Chennai (23.4%) and 126 patients (12.6%) were from other districts.

In our study, the male to female ratio of RTA was 8:2. Our values were concurrent in a study by Manna et al (30), however, was not concurrent with the ratio of 5.6:1 in a study by Badrinarayan et al (29).

In our study, the time of injury was between 8am - 1.59pm in 191 patients (19.1%), between 2pm - 7.59pm in 214 patients (21.4%), between 8pm - 1.59am in 401 patients (40.1%) and between 2am - 7.59am in 194 patients (19.4%). Similarly, V Anantharaman et al (33) reported that more



than one third of the accidents took place between 6pm to 12 mid night in his study. These findings were in congruence with studies by Nilambar Jha et al(31), Abhishek S et al(32) and BMishra et al (29).

Motorized two-wheelers clearly outnumbered all modes of travel in this study. In a study conducted by Singh et al(34) similar findings were revealed. 40-60 km/h was the commonest speed range just before the accident in this study. In a study conducted in Nepal, vehicles speeding at 40-60 km/h were responsible for a high percentage of accidents. A study conducted by Taylor (35) states that higher speed leads to an increased frequency of accidents.

Polytrauma represents a number of severe, life threatening injuries that lead to death, without active and intensive approach to diagnosis and treatment. The incidence of polytrauma in our study was 48% and the incidence of fracture was found to be 57%.

The site of injury was head in 346 patients (34.6%), face in 268 patients (26.8%), chest in 91 patients (9.1%), spine in 138 patients (13.8%), upper limb in 441 patients (44.1%), lower limb in 549 patients (54.9%) and pelvis in 43 patients (4.3%). The most common site involved in RTA was found to be Lower limb. In lower limb, the incidence of femur fractures were found to be higher than tibia fractures. In upper limb, the incidence of clavicle fractures were found to be higher than radius fractures followed by humerus fractures. Similar findings were observed by Manna N et al(30), Tiwary RR et al(36) and Patil SS et al(37), in contrast Khare Neeraj et al(38) reported head injury(59.3%) and Biswas et al(39) head and neck injury (56.4%) as the most common site of RTA. Abhishek Singh et al(32) reported that the maximum numbers of injuries were seen in the abdomen and the least in the upper limb.

A study by B Mishra et al(29) showed that 32 (46.37%) were found to have some evidence of alcohol consumption, and out of the 32 with these evidence 27 (84.37%) succumbed to their injury. However, in our study, out of the 1000 patients, 175 patients

(17.5%) were under the influence of alcohol and 825 patients (82.5%) were not.

In a study by Mauritz et al in 2013(40), bystanders were present in 57% of the cases. The most frequently required first aid measures were "application of a dressing" and "positioning" of the patient. 355 patients (35.5%) in our study received first aid at outside hospital. Out of the 1000 patients, 355 patients (35.5%) received first aid at outside hospital and 645 patients (64.5%) did not before being brought to our hospital. Similarly, in a study by B Mishra et al(29), the first-aid coverage was 213 (59.16%); however, the coverage for fatally injured was at a low at 45.45% (30 victims) in comparison to non-fatally injured at 62.24% (183 cases). Out of the 1000 patients, 103 (10.3%) were passengers, 662 patients (66.2%) were drivers, 62 patients (6.2%) were pedestrians, 168 patients (16.8%) were pillion riders.

B Mishra et al(29) stated that medical conditions, personal problems and psychosocial conflicts were found to be significantly association with RTA. Out of the 1000 patients, 32 (3.2%) had bronchial asthma, 112 (11.2%) had CAD, 206 (20.6%) had DM, 173 (17.3%) had hypertension, 53 (5.3%) had hypothyroidism, 47 (4.7%) had seizure disorder and 377 (37.7%) had no known comorbid.

Headgear had a protective effect on head injuries. There was a significant association between the speed of travel and the severity of injury. This is in concurrence with a study carried out on students of college in Taiwan where it was concluded that an increased riding speed was significantly associated with a greater level of injury severity. In our study, Out of the 1000 patients, 278 patients (27.8%) patients wore helmet, whereas, 582 patients (58.2%) did not and 140 (14%) patients wore seat belts.

The Injury Severity Score (ISS) is an established medical score to assess trauma severity. It correlates with mortality, morbidity and hospitalization time after trauma. It is used to define the term major trauma. A major trauma (or polytrauma) is



defined as the Injury Severity Score being greater than 15. In our study, Out of the 1000 patients, 140 patients (14%) had a ISS <15, 413 (41.3%) had ISS between 16-30, 203 patients (20.3%) had ISS between 31-45, 121 patients (12.1%) had ISS between 46-60 and 123 patients (12.3%) had ISS between 61-75. The mean ISS was 38 ± 7 .

Khare Neeraj et al(38) reported a mortality rate of 3.1% .D. Sharma et al(40) reported 1.65 percent in their studies. In our study, 17 were brought dead accounting for a mortality rate of 1.7%. However, in our study, Out of the 1000 patients, 224 (22.4%) required ICU care and 77.6 (77.6%) did not.

Conclusion:

In our study, there was a high preponderance of young males between 21-40 years. The most common mechanism of injury involved in RTA was skid and fall from 2 wheeler followed by 2 wheeler versus 2 wheeler, the most common district being Kanchipuram, the most common time of injury being the night between 8pm -1.59pm out of which only 35.5% received first aid at an outside hospital. The Drivers were predominantly involved in RTA followed by pillion riders of which only 17.5% had given information about voluntary disclosure of alcohol. The most common site of injury involved in RTA was Lower limb followed by Upper limb. In lower limb, the commonest injury was found to be Femur fractures followed by Tibia fractures. In upper limb, the commonest injury was found to be Clavicle fractures followed by radius fractures. The most common ISS was between 16-30 of which only 22.4% required ICU care. The mortality rate was found to be 1.7%.

It is evident that multiple factors are involved in road traffic accidents. Scientific evidence from high income countries exists for the effectiveness of interventions such as helmet use, preventing drinking and driving, safety belts, trauma care, use of signages and child safety seats.

Implementation of these measures in a multipronged strategy is the need of hour. There is a need of more scientific studies on the subject and road users need to be educated on factors involved in the road accidents.

Limitations:

Our study is an observational study and we didn't have any control group for comparison. Hence, we were not able to establish a statistical analysis like odd's ratio or logistic regression analysis for proving the association between various epidemiological factors of RTA.

The data provided by case records of RTA victims and the latter cannot be cross-questioned to ascertain the details of other important aspects which led to the RTA.

Reference:

1. A bibliometric analysis of the published road traffic injuries research in India, post-1990. Sharma N, Bairwa M, Gowthamghosh B, Gupta SD, Mangal DK Health Res Policy Syst. 2018 Mar 1; 16(1):18.[PubMed] [Ref list] "Accident details for Tamil Nadu in certain years" (PDF). State Transport Authority, Government of Tamil Nadu. 2013. [Last retrieved on 2014 Mar 22]. Available from: <http://www.tn.gov.in/sta/ra1.pdf>
2. Ameratunga S, Hajar M, Norton R. Road-traffic injuries: Confronting disparities to address a global-health problem. [Last cited on 2011 June 27]; Lancet. 2006 367:1533–40. Available from, [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(06\)68654-6/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(06)68654-6/fulltext) [PubMed] [Google Scholar]
3. Nantulya VM, Reich MR. The neglected epidemic: Road traffic injuries in developing countries. [Last cited 2011 June 27]; BMJ. 2002 324:1139–41. Available from: www.bmj.com/content/324/7346/1139 [PMC free article] [PubMed] [Google Scholar]
4. Killer Roads. The Hindu. May 23. 2011. [Last cited 2011 Sept 17]. Available from: <http://www.thehindu.com/opinion/editorial/article2042983.ece>
5. Accidental Deaths and Suicides in India – 2010. National Crime Records Bureau. Ministry of Home Affairs. Government of India. [Last cited 2012 April 16]. Available from:



- <http://www.ncrb.nic.in/ADSI2010/ADSI2010-full-report.pdf>
6. Accidental Damages. Times of India. Chennai Edition Oct 23. 2008. [Last cited on 2011 Sept19]. Available from, <http://www.timesofindia.indiatimes.com/home/opinion/edit-page/Accidental-Damage/articleshow/3630126.cms>
7. Report of Transport Department for the State Road Safety Council. Government of TamilNadu. 2012. [Last cited on 2012 April 18]. Available from, <http://www.thehindu.com/news/states/tamil-nadu/article2787268.ece>
8. Road Accidents in India 2011. [Last cited on 2012 April 18]. Available from: <http://freedrivetest.in/road-accidents-in-india-a-concern.html>
9. Geneva: Global Road Safety Partnership; 2007. [Last cited on 2012 April 18]. Drinking and Driving: A road safety manual for decision-makers and practitioners. Available from: http://www.who.int/roadsafety/projects/manuals/alcohol/drinking_driving.pdf [Google Scholar]
10. Indian Driving Schools. Road Safety; Drunken Driving. 2011. [Last cited on 2012 April 18]. Available from, <http://www.indiandrivingschools.com/drunken-driving.html>
11. Saradadevi M, Bajaj P. Driver fatigue detection using mouth and yawning analysis. Int J Comput Sci Netw Secur. 2008;8:183–8. [Google Scholar]
12. World Health Day: 2004 road safety. [Last cited on 2011 Sept 16]. Available from: www.who.int/world-health-day/previous/2004/en/index.html
13. United Nations Road Safety Collaboration. World unites to halt death and injury on the road. WHO. 2011. [Last cited on 2011 Sept 16]. Available from: <http://www.who.int/roadsafety/en>
14. Government of India. Ministry of Road Transport and Highways (Road Safety). Observance of 22nd Road Safety Week from 1st to 7th January. 2011. [Last cited on 2011 Sept 24]. Available from <http://www.morth.nic.in/writereaddata/sublimages/RoadSafetyWeek8241614630.pdf>
15. Jacobs G, Aaron-Thomas A, Astrop A. Estimating global road fatalities. TRL Report 445. 2000 ISSN 0968-4107. Transport Research Laboratory. 2000 [Google Scholar]
16. Jha, Nilambar & Srinivasa, DK & Roy, Gautam & Jagdish, Sadasivan & Minocha, RK. (2004). Epidemiological Study of Road Traffic Accident Cases: A Study from South India. Indian Journal of Community Medicine. 29(1).
17. Anantharaman, V.V. & Muthunayanan, Logaraj. (2015). Epidemiology of Road Traffic Accidents (RTA) Reported at a Tertiary Care Hospital in Chennai. NJRCM. 4.
18. Kandpal SD, Vyas S, Deepshikha, Semwal J. Epidemiological profile of Road Traffic Accidents reporting at a Tertiary Care Hospital in Garhwal Region of Uttarakhand. Indian J Comm Health. 2015; 27, 2: 235-240.
19. Pathak SM, Jindal AK, Verma AK, Mahen A. An epidemiological study of road traffic accident cases admitted in a tertiary care hospital. Med J Armed Forces India. 2014 Jan;70(1):32-5. doi:10.1016/j.mjafi.2013.04.012 Epub 2013 Aug 30. PMID: 24623944; PMCID: PMC3946410
20. Abhilash KP, Tephilah R, Pradeeptha S, Gunasekaran K, Chandy GM. Injury patterns and outcomes of trauma in the geriatric population presenting to the emergency department in a tertiary care hospital of South India. J Emerg Trauma Shock 2019;12:198-202
21. Kumar S, Mahima, Srivastava DK, Kharya P, Sachan N, Kiran K. Analysis of risk factors contributing to road traffic accidents in a tertiary care hospital. A hospital based cross-sectional study. Chin J Traumatol. 2020 Jun;23(3):159-162. doi: 10.1016/j.cjtee.2020.04.005. Epub 2020 Apr 22. PMID: 32381399; PMCID: PMC7296353.
22. Mohit Goyal, Dhananjay Dobhal, Ashutosh Sayana, Saly Dobhal, Aditya Goyal. Study of epidemiology of road traffic accidents. IAIM, 2018; 5(4): 23-28.
23. Manna, Nirmalya et al. "Epidemiological Factors of Road Traffic Accidents: A Study in a Tertiary Care Setting in India." (2013). Khare N, Gupta SK, Varshney A, Athavale AV. Epidemiological Study of Road Traffic Accident Cases Attending Tertiary Care Hospital, in Bhopal Madhya Pradesh. Natl J Community Med 2012; 3(3):395-9
24. Solanki HL, Mittal H. An Epidemiological Study of Road Traffic Accident Cases at a Tertiary Care Hospital in Udaipur. Int J Cur Res Rev. 2016; 8(7):32-36



25. Chauhan A, Ahmed N, Singh JV, Singh VK, Singh A, Kumar S. Epidemiology of Road Traffic Injuries in a Tertiary Care Centre of Lucknow. *Ind J Comm Health*. 2014;26 (2); 181-186.
26. Wang X, Yu H, Nie C, Zhou Y, Wang H, Shi X. Road traffic injuries in China from 2007 to2016: the epidemiological characteristics, trends and influencing factors. *PeerJ*. 2019;7:e7423. Published 2019 Aug 6. doi:10.7717/peerj.7423
27. Badrinarayan Mishra, Nidhi D Sinha (Mishra), SK Sukhla, AK Sinha. Epidemiological Study of Road Traffic Accident Cases from Western Nepal. *Indian J Community Med*. 2010; 35(1):115–121.
28. Manna N, Mallik S, Mandal PK, Chakraborty D, Sardar JC, Pritibikash H, Gupta SD. Epidemiological factors of road traffic accidents: a study in a tertiary care setting in India. *J Pak Med Stud*. 2013; 3(1):48-53.
29. Nilambar Jha, Srinivasa D K, Gautam Roy, Jagdish S. Epidemiological study of road traffic accident cases: a study from South India. *Indian Journal of Community Medicine*. 2004;29(1): 20-24.
30. Abhishek S. An Epidemiological study of road traffic accident cases at a tertiary care hospital in rural Haryana. *IJCM*. 2011;23(2): 53-55.
31. Anantharaman, V.V. & Muthunarayanan, Logaraj. (2015). Epidemiology of Road Traffic Accidents (RTA) Reported at a Tertiary Care Hospital in Chennai. *NJRCM*. 4.
32. Mishra B, Sinha N, Shukla SK, Sinha AK. Epidemiological study of road traffic accident cases from western Nepal. *Indian J Community Med*. 2010;35(1):115e121.
33. Taylor MC, Lynam DA, Baruya A. The Effect of Drivers' Speed on the Frequency of Road Accidents. *Transport Research Laboratory Report 421*; 2001:2.
34. Tiwary RR, Ganveer GB. A study on human risk factors in non-fatal road traffic accidents at Nagpur. *IJPH* 2008; 52(4):197- 99.
35. Patil SS, Kakade RV, Durgawale PM, Kakade SV. Pattern of road traffic injuries: a study from Western Maharashtra. *IJCM* 2008; 33(1):56-7.
36. Khare Neeraj, Gupta Sanjay K, Varshney Atul, Athavale AV. Epidemiological Study of Road Traffic Accident Cases Attending Tertiary Care Hospital, In Bhopal Madhya Pradesh. *National Journal of Community Medicine*. 2012; 3(3): 395-99.
37. Biswas G, Verma SK, Sharma JJ, Aggarwal NK. Pattern of Road Traffic Accidents in North East Delhi. *Journal of Forensic Medicine & Toxicology*. 2003; 20(1):27-32.
38. Mauritz W, Pelinka LE, Kaff A, Segall B, Fridrich P. MassnahmendurchErsthelfer am Unfallort. Eine prospektive, epidemiologische Studie im Raum Wien [First aid measures by bystanders at the place of accident. A prospective, epidemiologic study in the Vienna area] *Wien Klin Wochenschr*. 2003 Oct 31;115(19-20):698-704. German. doi: 10.1007/BF03040885. PMID: 14650944.
39. Sharma D, Uday Shankar Singh, Sidhyartha Mukherjee. A Study on road traffic accidents in Anand-Gujarat, *Healthline*. 2011; 2(2):12-15.