

Epidemiological Study of Victims of Two-wheeler Road Traffic Accidents: A Tertiary Care Hospital Based Study.

Javed Ullah Chauhan, Nair Furqan, Mohammad Rayaz, Gourav Singh Saini.

Abstract

Introduction:

Road Traffic Accidents (RTA) can be defined as “An accident that occurred on a way or street open to public traffic; resulting in persons being killed or injured and where at least one moving vehicle was involved”. Road Traffic Accidents (RTAs) have emerged as a new health challenge in the world leading to injuries, disabilities and loss of precious human lives, apart from causing a substantial economic burden on the family concerned, as well as, on the nation. A road traffic fatality is considered to be a “death occurring within 30 days of a road traffic crash”.

Methods:

Our study entailed a prospective study of 400 patients admitted in the emergency ward under the Department of Surgery, in Government Medical College, Jammu, as sufferers/victims of two-wheeler road traffic accident. The data was collected from sufferers/ victims. In cases where the patients were not in a condition to give the history, the information was collected from the attendants or police personnel or any other person accompanying the victim in the causality and/or an eye-witness to the accident.

Results:

The present study highlights that two-wheeler road traffic accidents are a serious threat to the youth. Victims were mostly males. The current study also reveals that human factors have a more important role to play as compared to the environmental and vehicle factors in the occurrence of two wheeler road traffic accidents.

Conclusion:

According to the present study, the important aspects that need attention are speeding, drink driving, no use of helmets, distracted driving due to use of mobile phones or listening to music and disobedience of traffic rules while driving.

JK-Practitioner2026(31(1):26-35

Introduction

Road Traffic Accidents (RTAs) have emerged as a new health challenge in the world leading to injuries, disabilities and loss of precious human lives, apart from causing a substantial economic burden on the family concerned, as well as, on the nation. Ms. Mary Ward was the first documented victim of automobile accident that took place on 31st August, 1869 and since then RTAs are rapidly on the increase and appear to emerge as one of the leading cause of morbidity and mortality. According to World Health Organization, Accident is defined as “an unpremeditated event resulting in recognizable damage”. RTAs are ‘hidden epidemic’ which, though a priority, have received much less attention. Road Traffic Accidents (RTA) can be defined as “An accident that occurred on a way or street open to public traffic; resulting in persons being killed or injured and where at least one moving vehicle was involved”. Thus, RTA is collision between vehicles, between vehicles and pedestrians; between vehicles and animals; or between vehicles and geographical or architectural obstacles. RTA is one of the varieties of transportation injuries. Road Traffic Injuries are defined as “fatal or nonfatal injuries incurred as a result of a road traffic crash”. A road traffic fatality is considered to be a “death occurring within 30 days of a road traffic crash” (WHO 2008).

Aims And Objectives

- To study the profile of injuries in victims of two-wheeler accidents.
- To study the influence of various factors leading to vehicular accidents involving two wheelers.

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Indexed

EMBASE, SCOPUS, IndMED, ESBCO, Google Scholar besides other national and international databases.

Cite this article as

Chauhan J, Furqan N, Rayaz M, Saini GS. Epidemiological Study of Victims of Two-wheeler Road Traffic Accidents: A Tertiary Care Hospital Based Study. JK Pract2026;31(1):26-35

Full length article available at jkpractitioner.com one month after publication

Keywords

Accident, Disability, Road, Traffic

- To assess the effectiveness of protection
- offered by wearing helmet

Methods

This study entailed a prospective study of 400 patients admitted in the emergency ward under the Department of Surgery, in Government Medical College, Jammu, as sufferers/victims of two-wheeler road traffic accidents. The data was collected from sufferers/ victims. In cases where the patients were not in a condition to give the history, the information was collected from the attendants or police personnel or any other person accompanying the victim in the causality and/or an eye-witness to the accident.

A detailed history regarding the accident was obtained and following information was sought:

- Socio-demographic characteristics of the victim
- General information regarding the accident
- Possible Human factors involved
- Associated Environmental factors leading to RTA
- Profile of injuries sustained by the victim

The patients were interviewed only after they had received the necessary emergency first aid care and were in a comfortable state. Informed Verbal consent was taken from all the patients/guardians after briefing them about the study.

Inclusion criteria:

Victims of Two Wheeler Motor vehicle accidents

- Driver/ Pillion rider
- Hit by Light Motor Vehicle/ Heavy Motor Vehicle / Self Fall.
- Brought dead directly to the casualty or
- died in the hospital in spite of treatment.

Exclusion criteria

- Victims of motorcycle accidents other than riders and pillion riders.
- Decomposed bodies of motorcycle accident victims.
- Bodies which are severely mutilated.
- Unknown bodies with vague history.
- Unclaimed bodies.

Results

All the data was plotted on a master chart and calculations was done in terms of numbers and proportions. Appropriate statistical techniques were applied to find out the statistical significance of any apparent association between different variables.

Table1: Distributions of the Respondents interviewed in case of two-wheeler RTA.

Respondent	Number	Percentage
Patient	273	68.25
Attendant	105	26.25
Person who brought the patient to the hospital	22	5.50
TOTAL	400	100

Table 2: Age wise distributions of two wheeler RTA victims.

S. No.	Age Groups (in years)	Number	Percentage
1.	0-10	4	01.00
2.	11-20	103	25.75
3.	21-30	138	34.50
4.	31-40	98	24.50
5.	41-50	37	09.25
6.	51-60	14	03.50
7.	61-70	4	01.00
8.	71-80	2	00.50
9.	81-90	0	00
TOTAL		400	100

Table 3: Sex wise distributions of two-wheeler RTA victims

Sex	Number	Percentage
Male	352	88.00
Female	48	12.00
TOTAL	400	100

Table 4: Age and Sex wise distributions of two wheeler RTA

Age Groups (in Years)	Sex				Total	
	Male		Female		Number	%age
	Number	%age	Number	%age		
0-10	3	0.85	01	2.08	04	1.00
11-20	94	26.71	09	18.75	103	25.75
21-30	122	34.65	16	33.33	138	34.50
31-40	88	25.00	10	20.83	98	24.50
41-50	29	08.24	08	16.67	37	09.25
51-60	12	03.40	02	4.17	14	03.50
61-70	03	0.85	01	2.08	04	1.00
71-80	01	0.28	01	2.08	02	0.50
81-90	00	00	00	00	00	00
TOTAL	352	100	48	100	400	100

Table 5: Distribution of two wheeler RTA victims according to their Residence

Residence	Number	Percentage
Rural	187	46.75
Urban	213	53.25
TOTAL	400	100

Table 6: Distribution according to Day of accident

S. No.	Day of Accident	Number	Percentage
1.	Monday	58	14.50
2.	Tuesday	16	4.00
3.	Wednesday	33	8.25
4.	Thursday	20	5
5.	Friday	40	10
6.	Saturday	142	35.5
7.	Sunday	91	22.75
	TOTAL	400	100

Table 7: Distribution of cases according to the type of accident

Type of RTA	Number	Percentage
Collision	255	63.75
Non- collision	145	36.25
TOTAL	400	100

Table 8: Distribution showing the type of two wheeler RTA according to time of accident.

Time of accident	Collision		Non collision		Total	
	No	%age	No	%age	No	%age
12 midnight to 6 a.m.	2	0.78	9	6.21	11	2.75
6 a.m. to 12 noon	63	24.32	26	17.93	89	22.25
12 noon to 6 p.m.	101	39.62	76	52.41	177	44.25
6p.m. to 12 midnight	89	34.94	34	23.45	123	30.75
TOTAL	255	100	145	100	400	100

Table 9: Distribution of two wheeler RTAs according to offending vehicle/ pedestrian / stationary object

S.No.	Offending object/vehicle	Number	Percentage
1	Pedestrian	5	01.96
2	Animal	2	00.78
3	Two wheeler	63	24.71
4	Three wheeler	3	01.18
5	Car/LMV	112	43.92
6	Bus/truck/HMV	58	22.75
7	Stationary object	12	04.71
	TOTAL	255	100.00

Table10: Distribution of victims according to their company (pillion rider) at the time of accident

Pillion rider	Number	Percentage
Present	52	13.00
Absent	348	87.00
TOTAL	400	100.00

Table 11: Distribution according to place of death for fatal two wheeler RTA cases

S. No.	Place of death	Number	Percentage
1	Accident site	5	12.20
2	En route to hospital	10	24.40
3	Hospital	26	63.41
	Total	41	100.00

Table 12: Distributions of victims involved in conversation at the time of accident

Conversation	Number	Percentage
Yes	49	12.25
No	351	87.75
TOTAL	400	100

Table 13: Distributions of victims according to use of mobile phone at the time of accident.

Use of mobile phone at the time of accident	Number	Percentage
Yes	12	3.00
No	388	97.00
TOTAL	400	100.00

Table 14: Distributions of victims according to their behavior regarding listening to music at the time of accident

Listening to music at the time of accident	Number	Percentage
Yes	7	1.75
No	393	98.25
TOTAL	400	100.00

Table 15: Distributions of victims according to use of protective gear (Helmet) at the time of accident.

Wearing protective gear (Helmet)	Number	Percentage
Yes	98	24.75
No	302	75.50
TOTAL	400	100.00

Table 16: Distributions of victims according to their behavior regarding following of traffic rules

Behavior regarding following of traffic rules	Number	Percentage
Always follow	99	24.75
Occasionally follow	301	75.25
Rarely follow	0	0
TOTAL	400	100.00

Table 17: Distributions of victims according to possession of valid driving license

Posses valid driving license	Number	Percentage
Yes	236	67.82
No	112	32.18
TOTAL	348	100.00

Table 18: Distribution of victims according to presence of light at the time of accident.

Light present	Number	Percentage
Yes	301	75.25
No	99	24.75
TOTAL	400	100.00

Table 19: Distributions showing past history of RTA for the victims

Past history of RTA	Number	Percentage
Yes	41	10.25
No	359	89.75
TOTAL	400	100.00

Table 20: Number of previous accidents in victims with past history of RTA

Number of accidents in the past	Frequency	Percentage
One	35	85.36
Two	6	14.64
TOTAL	41	100.00

Table 21: Distributions of victims according to their Addictions

S. No.	Type of addiction	Number	Percentage
1.	Alcohol	79	19.75
2.	Tobacco	17	4.25
3.	Both alcohol and tobacco	40	10.00
4.	None	264	66.00
	TOTAL	400	100.00

Table 22: Distribution according to the influence of alcohol or any drug at the time of accident.

Influence of alcohol or any drug at the time of accident	Number	Percentage
Yes	29	24.37
No	90	75.63
TOTAL	119	100.00

Table 23: Distribution according to driving speed reported by the drivers

S. No.	Speed	Number	Percentage
1.	Slow (<40 km/ hr)	6	1.72
2.	Average (40-60 k/hr)	320	91.49
3.	Fast (> 60 km/hr)	22	6.32
	TOTAL	348	100.00

Table 24: Distributions of drivers over speeding at the time of accident

Over speeding at the time of accident	Number	Percentage
Yes	52	14.94
No	296	85.06
TOTAL	348	100.00

Table 25: Distributions of drivers overtaking at the time of accident

Overtaking at the time of accident	Number	Percentage
Yes	12	3.45
No	336	96.55
TOTAL	348	100.00

Table 26: Distributions according to the site of impact to the victim

S. No.	Site of impact to the victim	Number	Percentage
1.	Anterior	188	47.00
2.	Lateral	209	52.25
3.	Posterior	3	0.75
	TOTAL	400	100.00

Table 27: Distribution of Two wheeler RTA victims according to number of body regions involved

Number of body regions involved	Number	Percentage
Single site	104	26.00
Multiple sites	296	74.00
TOTAL	400	100.00

Table 28: Distribution of region of body involved.

S. No.	Body region	Frequency	Percentage
1.	Head, face and neck	310	31.16
2.	Thorax, abdomen and pelvis	89	8.94
3.	Upper limb	382	38.39
4.	Lower limb	214	21.51
	TOTAL	995	100.00

Table 29: Distribution according to type of injury

S. No.	Type of Injury	Frequency	Percentage
1.	Superficial	304	35.23
2.	Open wound	140	16.22
3.	Fracture	198	22.94
4.	Dislocation, sprain and strain of joints and ligaments	30	3.5
5.	Eye and orbit injury	73	8.5
6.	Intracranial injury	74	8.6
7.	Muscle and tendon	4	0.5
8.	Intra abdominal organ injury	34	3.9
9.	Crushing injury	1	0.1
10.	Thoracic organ injury	1	0.1
11.	Traumatic organ injury	2	0.2
12.	Others	2	0.2
	TOTAL	863	100.00

Table 30: Distribution of type and surface of road

Type of road	Surface of road				Total	
	Black - topped		Unfinished			
	No	%age	No	%age	No	%age
Four way One lane	27	7.9	1	1.6	28	7.00
Two way One lane	119	34.89	7	11.86	126	31.50
Both way	150	43.98	36	61.01	186	46.50
City road	43	12.6	2	3.4	45	11.25
Rural road	2	0.6	13	22.03	15	03.75
TOTAL	341		59		400	100.00

Table 31: Distribution according to weather condition at the time of accident

S. No.	Weather condition	Number	Percentage
1.	Hot and dry	298	74.50
2.	Heavy rainfall	14	3.50
3.	Foggy	26	6.50
4.	Wet road	61	15.25
5.	Not known	1	0.25
	TOTAL	400	100.00

Table 32: Distribution of victims according to post trauma Chest X-ray changes

S. No.	Chest X-ray	Number	Percentage
1.	Fracture	28	7.00
2.	Fracture + Pneumo haemothorax	30	7.50
3.	Normal	342	85.50
	TOTAL	400	100.00

Table 33: Distribution of victims according to post trauma USG FAST

USG FAST	Number	Percentage
Positive	44	11.00
Negative	356	89.00
TOTAL	400	100.00

Discussion

The present study on epidemiology of victims of two wheeler road traffic accidents was conducted in Government Medical College and Hospital, Jammu. A total of 400 two wheeler road traffic accident victims were studied and information related to socio-demographic characteristics, injuries sustained by the victims, various environmental, human and vehicle factors was obtained with help of an interview schedule.

The main findings have been summarized as under:

- The study revealed that the majority of the cases of road traffic accidents occurred in young age group of 20-30 years.
- Majority of the two wheeler RTA victims were male (88%) with females being involved in 12% cases.
- In our study, majority of the victims (55.25%) were residents of urban areas while 46.75% were residing in rural areas.
- Majority of two wheeler accidents were of collision type (63.75%) as compared to non collision type(36.25%).
- Greater number of accidents occurred on weekends with majority being on Saturdays (35.5%) followed by Sundays (22.75%).
- Out of total 400 cases, 177 (44.25%) took place between 12 noon to 6 pm, followed by 30.75% between 6pm to 12 midnight.
- Majority of the victims were drivers (87%) followed by pillion rider (13%).
- 74% of the victims had injuries involving multiple sites, while 26% of the victims had single site injuries.

- Most common region of the body involved was upper limb (38.39%) followed by head, face and neck (31.16%).
- Out of 348 drivers, 236 (67.82%) had a valid driving license while 112 (32.18%) did not.
- Out of 119 patients, 29 (24.37%) reported or were found to be under the influence of alcohol at the time of the accident.
- Out of 400 patients, only 98 (24.50%) were wearing helmets at the time of the accident.
- Out of 400 patients, 12 (3%) admitted that they were using mobile phone at the time of the accident.
- Out of 400 victims, 9 (2.25%) reported the vehicle to be overcrowded.
- Majority of the accidents were reported to occur on both-way road (186 out of 400 i.e. 46.5%) followed by two lane one way road (126 out of 400 i.e. 31.5%).
- Majority of the victims sustained superficial injuries (35.23%) followed by fractures (22.94%) and open wound (16.22%). Among associated superficial injuries maximum number of patients (55.49%) had associated abrasions and lacerations.
- The most common finding on post trauma chest X-ray was fracture (19.5%) followed by pneumohaemothorax (12.5%).
- Among 400 patients, 62 (15.5%) were reported to have positive FAST scan.
- CT imaging revealed that maximum number of patients (112 i.e. 48.70%) had cranial and facial bone fractures followed by intracranial injuries (74 i.e. 32.17%). Intraabdominal injuries were seen in 34 (14.78%) patients.
- Maximum number (347 i.e. 86.75%) of two wheeler road traffic accident victims were managed conservatively. 23 patients underwent surgical intervention, out of which 12 survived. In all 41 (10.25%) patients expired.

The present study highlights that two wheeler road traffic accidents are a serious threat to the youth. Victims were mostly males. The current study also reveals that human factors have a more important role to play as compared to the environmental and vehicle factors in the occurrence of two wheeler road traffic accidents. According to the present study, the important aspects that need attention are speeding, drink driving, non use of helmets, distracted driving due to use of mobile phones or listening to music and disobedience of traffic rules while driving. The human loss and sufferings that occurs due to two-wheeler road traffic deaths and injuries is preventable.

Table 34: Distribution of victims according to post trauma CT changes

S. No.	CT	Number	Percentage
1.	Intracranial injury	74	32.17
2.	Fracture of cranial/facial bones	112	48.70
3.	Spinal fracture	08	3.48
4.	Intra abdominal organ injury	34	14.78
5.	Thoracic organ injury	02	0.87
	TOTAL	230	100.00

Table 35: Distribution according to final outcome of two wheeler RTA

S. No.	Final outcome	Number	Percentage
1.	Managed conservatively	347	84.43%
2.	Surgical intervention	23	5.6%
3.	Expired	41	9.98%
	TOTAL	411	100.00

The lack of laws for road safety, insufficient law enforcements and worn out roads are factors that are placing people at increased risk of road traffic accidents. The government needs to prepare a road safety strategy and plan of action for which political will and commitment are essential and without them little can be achieved. Roads that cater to the needs of all road users such as pedestrian and children should be developed. The road should be designed in such a way that they have controlled crossing for pedestrians and street lights. Also, speed limits should be enforced to the function of specific roads. The laws requiring riders of motorized two wheelers to wear helmets; enforcing blood alcohol concentration limits for drivers, with

random breath testing at sobriety checkpoints should be put into practice. The government should train local volunteers in providing emergency first aid services to RTA victims so that more lives can be saved. The rising number of road traffic accidents can be curtailed by creating awareness about road safety through workshops and seminars as well as educating children by incorporating basic road safety lessons in their syllabus right from the outset. Adequate knowledge about traffic lights, road signs and use of helmet can contribute significantly in this regard. Awareness generation and implementation of stringent traffic rules is the need of the hour.

The infrastructure of Jammu division has seen tremendous growth and advancement in the form of development of black top roads and introduction of a variety of motor vehicles since independence. In the current scenario, road traffic accidents have materialized to become an important consequence of urbanization in Jammu region. Moreover, the number of accidents is increasing gradually, year after year, as can be inferred from the hospital records. The present study endeavoured to study the injury patterns in victims of two wheeler road traffic accidents and various risk factors associated with them, which may be in the form of socio demographic, human, vehicle and environmental causes, so that, important recommendations could be made for lowering the occurrence of road traffic accidents which would also have a great impact in decreasing the hospital load and socioeconomic burden in the region .

Further Reading

- 1 **Aggarwal A, Kour S, Dhillon MS.** Sociodemographic Profile of Road Traffic Accidents Victims admitted at Emergency Surgical OPD of a Tertiary Care Hospital. *Journal of post graduate Medicine, Education and Research.* 2012;46(1):15-18.
- 2 **Aslam M, Taj TM, Ali SA, Mirza WA, Badar N.** Non-fatal limb injuries in motorbike accidents. *J Coll Physicians Surg Pak.* 2008; 18(10):635-8.
- 3 **Boniface R, Museru L, Kiloloma O, Munthali V.** Factors associated with Road Traffic Injuries in Tanzania. *Pan African Medical Journal.* 2016; 23(46):1-8.
- 4 **Calil AM, Sallum EA, Domingues CA, Nogueira LS.** Mapping injuries in traffic accidents victims: a literature review. *Rev Latino-am Enfermagem.* 2009; 17(1):120-25.
- 5 **Celine TM, Antony J.** A Study on injuries sustained in Road Traffic Accidents at a tertiary care level. *International Journal of Environmental Health Engineering.* 2014;3(1):38-44.
- 6 **Dandona R, Kumar GA, Raj TS, Dandona L.** Patterns of road traffic injuries in a vulnerable population in Hyderabad, India. *Injury prevention.* 2006;12(3):183-88.
- 7 **Dandona R, Kumar GA, Dandona L.** Risky behavior of drivers of motorized two wheeled vehicles in India. *Journal of Safety Research.* 2006; 37(2):149-58.
- 8 **Das A, Gjerde H, Gopalan SS, Normann PT.** Alcohol, Drugs, and Road Traffic Crashes in India: A systematic Review. *Traffic Injury Prevention.* 2012;13:544-53.
- 9 **Dischinger PC, Ryb GE, Ho SM, Braver ER.** Injury patterns and severity among hospitalized motorcyclists: a comparison of younger and older riders. *Annu Proc Assoc Adv Automot Med.* 2006;50:226-38.

- 10 **Fitzharris M, Dandona R, Kumar GA, Dandona L.** Crash characteristics and patterns of injury among hospitalized motorized two-wheeled vehicle users in urban India. *BMC Public Health.* 2009;9(11):1-12.
- 11 **Ganveer GB, Tiwari RR.** Injury pattern among non-fatal road traffic accident cases: A cross-sectional study in Central India. *Indian Journal of Medical Sciences.* 2005;59(1):9-12.
- 12 **Gururaj G.** Road traffic injuries alcohol and road traffic injuries in South Asia: challenges for Prevention *JCPSP.* 2004;14:1-2.
- 13 **George AS, Poduval M.** Analysis of Limb Injury Patterns in Victims of Two Wheeler Accidents. *Asian Journal of Medical Sciences.* 2010;1(1):14-15.
- 14 **Gupta S, Monga S, Paul R, Dhingra R, Arora H, Rupali et al.** A Study of Antecedent Factors influencing the Road Traffic Accidents in Malwa Region of Punjab. *J Adv Med Dent Scie Res.* 2014;2(4):6-14.
- 15 **Haque MM, Chin HC, Huang H.** modeling fault among motorcyclists involved in crashes. *Accident Analysis and Prevention.* 2009; 41: 327-35.
- 16 **Hemalatha N, Gambhir Singh O.** Patterns of Cranio-intracranial injuries In Fatal Head Injuries Cases. *J Indian Acad Forensic Med.* 2013;35(2).
- 17 **Jha N, Srinivasa DK, Roy G, Jagdish S.** Injury pattern among road traffic accident cases. A study from south India. *Indian J community Med.* 2003;28(2):84-90.
- 18 **Jha N, Srinivasa DK, Roy G, Jagdish S.** Epidemiological study of road traffic accident cases: A study from South India. *Indian Journal of Community Medicine.* 2004;39(1):20-4.
- 19 **Jha S, Yadav BN, Aggrawal A, Goutam AP.** Epidemiological study of fatal head injury in road traffic accident cases: A study from BPKIMS, Dharan. *Health Renaissance.* 2010;8(2):97-101.
- 20 **Kakkar R, Aggarwal P, Kakkar M, Deshpande K, Gupta D.** Road Traffic Accident: Retrospective study. *Indian J Sci Res.* 2014;5(1):59-62.
- 21 **Khajuria B, Sharma R, Verma A.** A Profile of the Autopsies of Road Traffic Accident Victims in Jammu. *Journal of Clinical and Diagnostic Research.* 2008; 2: 639-42.
- 22 **Kortor JN, Yinusa W, Ugbeye ME.** Lower limb injuries arising from motorcycle crashes. *Niger J Med.* 2010; 19(4):475-78.
- 23 **Kuchewar SV, Meshram RD and Gadge SJ.** Demographic Study and Medico-legal aspect of Fatal Road Traffic Accident in Aurangabad. *J life Sci.* 2012; 4(1): 7-10.
- 24 **Kumar N, Kumar M.** Medicolegal Study of Fatal Road Traffic Accidents in Varanasi Region. *International Journal of Science and Research (IJSR).* 2015; 4(1): 1492-96.
- 25 **Kumar PR.** A Study on pattern of head injuries in two wheeler road traffic accidents. *Int J Health Sci Res.* 2017; 7(4): 217-23.
- 26 **Lateef F.** Riding motorcycles: is it a lower limb hazard? *Singapore Med.* 2002; 43(11): 566-69.
- 27 **Li MD, Dong JL, Huang WS, Lai CH, Jeng MC.** Survival hazards of road environment factors between motor vehicles and motor cycles. *Accident Analysis and Prevention.* 2019; 41:938-47.
28. **Mallikarjuna SK, Krishnappa P.** Prevalence of maxillofacial injuries by motorized two wheeler road traffic accidents in Bangalore city. *Dental Traumatology.* 2009; 25:599-604.
29. **Marak F, Sangma MMB, Kumar G, Priyadarshini M.** Pattern of injuries associated with deaths following Road Traffic Accidents as seen in tertiary care hospital in Puducherry. *Indian Journal of Forensic and Community Medicine.* 2016; 3(4):257-62.

- 30 **Markogiannakis H, Sanidas E, Messaris E, Koutentakis D, Alpantaki K, Kafetzakis A, et al**. Motor vehicle trauma: analysis of injury profiles by road-user category. *Emerg Med J*. 2006; 23:27-31.
- 31 **Menon A, Pai VK and Rajeev A**. Pattern of fatal head injuries due to vehicular accidents in Mangalore. *J Forensic Leg Med*. 2008; 15(2):75-77.
- 32 **Mishra BK, Banerji AK**. Two wheeler injuries in Delhi, India: a study of crash victims hospitalized in a neurosurgery ward. *Accid. Anal. & Prev*. 1984; 16(5/6):407-416.
- 33 **Naik L, Kainoor SK, Sangram R, Neeta PN**. Epidemiological study of two wheeler traffic accident victims in medicolegal autopsies. *International Journal of Forensic Medicine and Toxicological Sciences*. 2016;1(1):11-13.
- 34 **Nantulya VM, Reich MR**. Equity dimensions of road traffic injuries in low and middle-income countries. *Injury control and safety promotion*. 2003; 10(1-2):13-20.
- 35 **Nja O, Nesvag SM**. Traffic behaviour among adolescents using moped and light motorcycles. *Journal of Safety Research*. 2007; 38:481-92.
- 36 **Oberoi SS, Aggarwal KK, Bhullar DS, Kumar R**. Pattern and distribution of injuries in fatal two wheeler accidental cases. *J Punjab Acad Forensic Med Toxicol*. 2010; 10: 11-13.
- 37 **Oberoi SS, Aggarwal KK, Walia DS, Kumar R, Sandhu H**. Profile of fatal two wheeler accidental cases. *J Punjab Acad Forensic Med Toxicol*. 2010; 10(2):72-75.
- 38 **Oginni FO, Ajike SO, Obuekwe ON, Fasola O**. A prospective multicenter study of injury profile, severity and risk factors in 221 motorcycle-injured Nigerian maxillofacial patients. *Traffic Injury Prev*. 2009; 10(1): 70-75.
- 39 **Pathak A, Desania NL, Verma R**. Profile of Road Traffic Accidents and Head Injury in Jaipur (Rajasthan). *J Indian Acad Forensic Med*. 2008;30(1):6-9.
- 40 **Pathak SM, Jindal AK, Verma AK, Mahen A**. An epidemiological study of road traffic accident cases admitted in a tertiary care hospital. *Medical Journal Armed Forces India*. 2014; 70:32-35.
- 41 **Peek-Asa C, Kraus JF**. Injuries sustained by motorcycle riders in the approaching turn crash configuration. *Accident Analysis & Prevention*. 1996; 28(5):561-69.
- 42 **Pothireddy S, Karukutla N**. Pattern of injuries to motorcyclists in fatal road traffic accidents. *J Biosci Tech* 2013; 4(2):513-18.
- 43 **Prasannan K, Sheeju PA**. A descriptive study of pattern of injuries in Driver and Pillion Rider Victims of fatal Two Wheeler Accidents. *Asian Journal of Biomedical and Pharmaceutical Sciences*. 2015; 5(45):29-32.
- 44 **Rao D, Mukherjee S**. A study of pattern of injuries in road traffic collisions. *J Punjab Acad Forensic Med Toxicol*. 2010; 10:14-16.
- 45 **Saadat S, Soori H**. Epidemiology of traffic injuries and motor vehicles utilization in the capital of Iran: A population based study. *BMC Public Health*. 2011; 11:488.
- 46 **Shah A, Jarwani B**. Study of patients of road traffic accidents arriving in emergency department [ED] of V.S. hospital at Ahmedabad city, single centre pilot study. *NHL Journal of Medical Sciences*. 2014; 3(2):23-26.
- 47 **Sharma D, Singh US, Mukherjee S**. Patterns of Injuries in Road Traffic Accidents in a Rural Tertiary hospital. *Indian Medical Gazette*. 2014; 360-64.
- 48 **Singh D, Moorthi K, Singh SP, Goel S**. Profile of Road Traffic Fatalities in Adults: A 40 year Study in Chandigarh Zone of North West India. *J Indian Acad Forensic Med*. 2014; 36(1):47-51.
- 49 **Singh A, Bhardwaj A, Pathak R, Ahluwalia SK**. An epidemiological study of road traffic accident cases at a tertiary care hospital in rural Haryana. *Indian Journal of Community Health*. 2011; 23(2):53-55.