



## “A CROSS-SECTIONAL STUDY OF PATTERN OF NON-FATAL INJURIES IN ROAD TRAFFIC ACCIDENT IN A TERTIARY CENTRE IN NORTH INDIA.”

Dr.Satbir Singh<sup>\*1</sup>, Dr.Bhuwnesh Singh<sup>2</sup>

<sup>1</sup>\* Assistant Professor Department of Forensic Medicine and Toxicology Government Medical College Udhampur Jammu and Kashmir .

<sup>2</sup>Assistant Professor Department of Forensic Medicine and Toxicology MuzaffarNagar Medical College UP

**\*Corresponding Author:** Dr.Satbir Singh\*

\*E-mail: drsatbirsingh81@gmail.com

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### Abstract

**Background:** Road traffic accidents (RTAs) continue to be a leading cause of non-fatal injuries worldwide, disproportionately affecting young and economically productive populations. Non-fatal injuries, although often underreported compared to fatalities, impose a significant burden on healthcare systems and society, particularly in regions with challenging terrains like Jammu and Kashmir.

**Objectives:** To assess the demographic profile, pattern, and clinical spectrum of non-fatal injuries sustained in road traffic accidents in patients presenting to a tertiary care centre in Udhampur, Jammu and Kashmir.

**Methods:** A hospital-based cross-sectional study was conducted at Government Medical College, Udhampur, from June 2022 to May 2023. A total of 625 adult patients aged 21–60 years who sustained non-fatal RTA injuries were included using purposive sampling. Data on demographics, vehicle involved, mechanism and time of accident, and type and site of injuries were collected using a structured proforma. Data analysis was performed using SPSS version 26, and statistical significance was considered at  $p < 0.05$ .

**Results:** The majority of victims were in the 31–40 years age group (29.8%) and predominantly male (62.4%). Two-wheelers were involved in 52.8% of RTAs, followed by light motor vehicles (20.2%) and heavy vehicles (14.4%). The most common mechanism was collision with another vehicle (44.5%), and evening hours (6 PM–12 AM) recorded the highest accident frequency (33.8%). Soft tissue injuries (43.4%) and fractures (36.6%) were the most common types of trauma. Lower limbs were the most frequently affected site (41.1%), followed by upper limbs (34.4%) and head and face (22.7%).

**Conclusion:** This study highlights that young adult males, especially two-wheeler riders, form the majority of non-fatal RTA victims. The findings underscore the need for targeted preventive strategies, road safety reforms, and enhanced trauma care infrastructure, especially in geographically vulnerable regions like Jammu and Kashmir.

**Keywords:** Road traffic accidents, non-fatal injuries, soft tissue injury, fractures, two-wheeler, trauma pattern, Jammu and Kashmir, hospital-based study.

## **Introduction:**

Road traffic accidents (RTAs) are a major global public health issue, representing one of the leading causes of morbidity and mortality worldwide. Non-fatal injuries due to RTAs often result in long-term disability, psychological trauma, and significant socioeconomic burden, especially in developing countries where trauma care services are inadequately equipped [1].

Globally, according to the World Health Organization (WHO), approximately 1.19 million people die annually due to RTAs, while an estimated 20 to 50 million people suffer non-fatal injuries, often leading to long-term disabilities [2]. Low- and middle-income countries (LMICs) account for over 93% of all road traffic deaths despite having only about 60% of the world's vehicles [3].

In India, RTAs have become an alarming concern, with 412,432 road accidents reported in 2021, causing 153,972 deaths and injuring 384,448 persons [4]. Non-fatal injuries, particularly among the working-age population, have a significant impact on productivity and healthcare systems. The Ministry of Road Transport and Highways (MoRTH) highlights that the majority of accidents involve two-wheelers and occur among individuals aged 18–45 years [5].

The Union Territory of Jammu and Kashmir, due to its hilly terrain and challenging road infrastructure, is especially vulnerable to RTAs. In 2021 alone, over 5,000 accidents were reported, resulting in nearly 900 deaths and thousands of injuries. The district of Udhampur, being a major transit route, sees frequent accidents, many of which lead to serious but non-fatal outcomes [6,7].

Despite the high burden, limited data exists on the nature and distribution of non-fatal injuries in RTAs in Jammu and Kashmir. This gap in knowledge hinders the development of targeted interventions and trauma care strategies [8].

There is a lack of systematic data regarding the patterns, types, and causes of non-fatal injuries due to RTAs in the region of Udhampur, Jammu and Kashmir. Without this, healthcare systems cannot adequately plan resources, nor can public health programs effectively mitigate the consequences of these injuries.

Understanding the demographic profile, mechanism of injury, types of injuries, and outcomes of RTA victims who sustain non-fatal injuries can help improve emergency response, road safety policies, and rehabilitative services. The findings will be instrumental in framing localized trauma management protocols and road safety regulations, particularly for a vulnerable and underserved population like that of Jammu and Kashmir.

This study is expected to provide:

- A comprehensive overview of non-fatal injury patterns in RTA victims in a hilly region.
- Data to support evidence-based improvements in trauma care systems and preventive strategies.
- A basis for future research and public health initiatives aimed at reducing the burden of RTAs in the region.

## **Aims and Objectives**

### **Aim:**

To assess the pattern and characteristics of non-fatal injuries sustained in road traffic accidents among patients reporting to a tertiary care centre in Udhampur, Jammu and Kashmir.

### **Objectives:**

1. **To determine the demographic profile** (age, gender, residence) of patients with non-fatal injuries due to road traffic accidents.
2. **To analyze the type and mechanism** of road traffic accidents leading to non-fatal injuries.
3. **To identify the pattern distribution** of injuries sustained in these accidents.
4. **To assess the use of safety measures** such as helmets and seatbelts among the accident victims.
5. **To evaluate the immediate clinical management** received by the victims at the tertiary care centre.
6. **To examine the association between demographic and accident-related variables** with the severity and type of non-fatal injuries.

### **Materials and Methodology:**

This cross-sectional observational study was conducted over a period of one year, from June 2022 to May 2023, at Government Medical College, Udhampur, located in the Union Territory of Jammu and Kashmir. The institution functions as a tertiary care centre, catering to trauma cases from surrounding hilly and semi-urban regions, making it a suitable location to evaluate the pattern of non-fatal injuries sustained in road traffic accidents (RTAs).

The study population comprised adult patients aged between 21 and 60 years who sustained non-fatal injuries as a result of road traffic accidents and reported to the emergency or surgical departments of the hospital during the study period. Patients were included if they presented within 24 hours of the incident and provided informed consent for participation. Exclusion criteria included patients who were below 21 or above 60 years of age, those who had sustained fatal injuries, or were unconscious and unable to provide consent, as well as those who declined to participate.

The sample size was calculated using the standard prevalence formula:

$$n = 4pq/l^2,$$

where ‘p’ represents the estimated prevalence, taken as 50% (to allow for maximum variability), ‘q’ is 100 – p (i.e., also 50%), and ‘l’ is the allowable error, set at 4%. Substituting the values gives:

$$n = 4 \times 50 \times 50 / (4)^2 = 625$$

Thus, a final sample size of 625 participants was selected to ensure adequate statistical power and generalizability of the results.

Participants were selected using a purposive sampling method based on their eligibility and presentation during the study period. No stratification by gender was applied, allowing for natural distribution based on the population presenting to the emergency department. Data were collected using a pre-tested and structured proforma that included detailed demographic information, accident characteristics such as type of vehicle involved and time of incident, as well as clinical information including the type and site of injury. All patients underwent clinical examination and, where indicated, radiological investigations to confirm injuries.

Data were entered in Microsoft Excel and analyzed using SPSS software version 26. Descriptive statistics such as frequencies and percentages were used to summarize the variables, and chi-square tests were employed to examine associations between categorical variables. A p-value less than 0.05 was considered statistically significant.

The study was approved by the Institutional Ethics Committee of Government Medical College, Udhampur. Informed written consent was obtained from all participants prior to enrollment, and confidentiality of all personal data was strictly maintained throughout the study.

## Results:

A total of 625 patients who sustained non-fatal injuries due to road traffic accidents were included in the study. The age distribution showed that the majority of victims were in the 31–40 years age group (29.8%), followed closely by the 41–50 years group (26.2%) and 21–30 years group (24.5%). The least affected age group was 51–60 years, accounting for 19.5% of cases. The gender distribution reflected a natural trend, with males comprising 62.4% and females 37.6% of the study population. Urban residents made up 56.8% of the cases, while 43.2% were from rural areas.

With regard to educational status, most victims had secondary-level education (34.1%), followed by higher secondary (26.4%) and primary education (18.6%). Only 13.9% were graduates and 7% were illiterate. Occupational distribution showed that private-sector employees (21.6%) and daily wage laborers (19.5%) were most frequently involved, followed by unemployed individuals or students (17.9%), drivers or transport workers (15.4%), and farmers (12.3%).

Analysis of accident characteristics revealed that two-wheelers were the most common vehicles involved (52.8%), followed by light motor vehicles (20.2%) and heavy vehicles (14.4%). Pedestrians constituted 12.6% of the cases. The most common mechanism of injury was collision with another vehicle (44.5%), followed by slipping or skidding on the road (26.9%), fall from the vehicle (18.6%), and being hit as a pedestrian (10%). Most accidents occurred during evening hours

(6 PM–12 AM), accounting for 33.8% of the cases, followed by the afternoon period (12 PM–6 PM) at 28.3%.

In terms of clinical presentation, soft tissue injuries were the most frequently observed (43.4%), followed by fractures (36.6%) and head injuries (22.7%). Injuries to the chest or abdomen were seen in 9.9% of cases. The lower limb was the most commonly affected anatomical site (41.1%), followed by upper limb (34.4%), head and face (22.7%), and thorax/abdomen (9.9%). All patients received immediate clinical evaluation and appropriate management, with those requiring specialist care referred accordingly. No fatalities occurred among the study participants, confirming that all injuries were non-fatal as per the inclusion criteria.

These findings underscore the demographic vulnerability of middle-aged individuals and highlight the predominance of soft tissue and skeletal injuries among RTA survivors, with two-wheelers being the major contributors to trauma in this region.

**Table 1: Demographic Profile of RTA Victims (n = 625)**

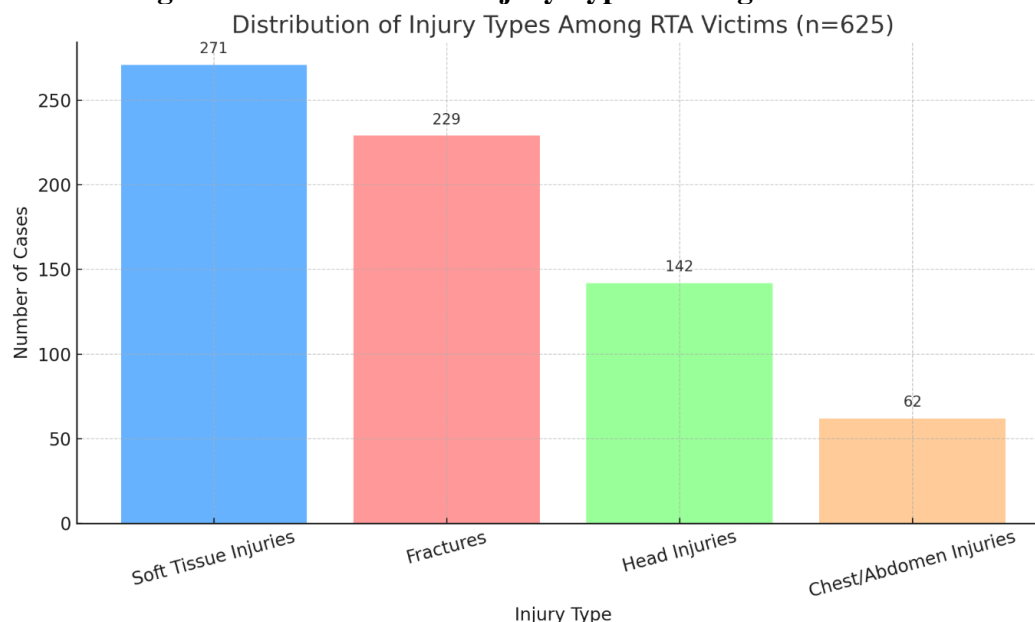
Variable	Category	Frequency	Percentage (%)
<b>Age Group (Years)</b>	21–30	153	24.5%
	31–40	186	29.8%
	41–50	164	26.2%
	51–60	122	19.5%
<b>Gender</b>	Male	390	62.4%
	Female	235	37.6%
<b>Residence</b>	Urban	355	56.8%
	Rural	270	43.2%
<b>Education Level</b>	Illiterate	44	7.0%
	Primary School	116	18.6%
	Secondary School	213	34.1%
	Higher Secondary	165	26.4%
	Graduate and above	87	13.9%
<b>Occupation</b>	Unemployed/Student	112	17.9%
	Daily Wage Laborer	122	19.5%
	Driver/Transport Work	96	15.4%
	Farmer	77	12.3%
	Private Job	135	21.6%
	Government Employee	83	13.3%

**Table 2: Injury Characteristics and Accident Details (n = 625)**

Variable	Category	Frequency	Percentage (%)
<b>Vehicle Involved</b>	Two-Wheeler	330	52.8%
	Car/Light Motor Vehicle	126	20.2%
	Heavy Motor Vehicle	90	14.4%
	Pedestrian	79	12.6%
<b>Mechanism of Injury</b>	Collision with Vehicle	278	44.5%
	Skid/Slip on Road	168	26.9%
	Fall from Vehicle	116	18.6%
	Hit as Pedestrian	63	10.0%
<b>Time of Accident</b>	Morning (6 AM–12 PM)	108	17.3%
	Afternoon (12 PM–6 PM)	177	28.3%
	Evening (6 PM–12 AM)	211	33.8%
	Night (12 AM–6 AM)	129	20.6%
<b>Type of Injury</b>	Soft Tissue Injuries	271	43.4%
	Fractures	229	36.6%
	Head Injuries	142	22.7%
	Chest/Abdomen Injuries	62	9.9%

Site of Injury	Lower Limb	257	41.1%
	Upper Limb	215	34.4%
	Head and Face	142	22.7%
	Thorax/Abdomen	62	9.9%

**Figure 1: Distribution of Injury Types Among RTA Victims**



## Discussion:

This study analyzed the demographic characteristics, accident patterns, and injury profiles of 625 patients with non-fatal road traffic accident (RTA) injuries presenting to a tertiary care centre in Udhampur, Jammu and Kashmir. The findings were compared with similar studies from other parts of India and abroad to contextualize the results and derive meaningful public health insights.

In the present study, the majority of RTA victims belonged to the 31–40 years age group (29.8%), followed by the 41–50 years (26.2%) and 21–30 years groups (24.5%). This age distribution reflects the vulnerability of the active and economically productive segment of the population. These findings are consistent with those of Gopalakrishna et al. in Bengaluru, who also reported that most RTA victims were in the 21–40 years age range, emphasizing the societal and economic burden posed by such injuries in young adults [9]. Similarly, Bener et al. in Qatar observed that more than 60% of RTA victims were under the age of 40, reinforcing the global trend of younger adults being disproportionately affected [10].

In terms of gender, males constituted 62.4% of the study population, which aligns with the results of Patil et al. from Maharashtra, where males accounted for more than 75% of RTA victims [11]. This male predominance may be attributed to their greater involvement in outdoor activities, occupational exposure, and higher vehicle usage. However, compared to earlier studies, the present study shows a relatively higher proportion of female victims, which may reflect evolving gender roles and increasing mobility among women in semi-urban regions.

Two-wheelers were the most frequently involved vehicles in RTAs, accounting for 52.8% of cases, followed by cars/light motor vehicles (20.2%) and heavy vehicles (14.4%). These figures are in line with findings by Jha et al. in Delhi, who also reported that over half of RTA victims were two-wheeler users [12]. The high vulnerability of two-wheeler riders to trauma, especially in regions with challenging road conditions, remains a consistent finding across various studies.

The predominant mechanisms of injury in this study were collision with another vehicle (44.5%), skidding/slipping (26.9%), and falling from the vehicle (18.6%). These patterns are similar to those observed by Kumar et al. in Tamil Nadu, where collisions and road surface instability were the

leading causes of accidents [13]. Notably, 12.6% of the victims in the current study were pedestrians, which is comparable to findings in urban India where unprotected road users represent a significant proportion of the trauma burden. Soft tissue injuries (43.4%) and fractures (36.6%) were the most common injury types observed in this study. Head injuries were present in 22.7% of cases, while chest and abdominal injuries were less common (9.9%). Singh et al. in Punjab reported similar findings, with soft tissue trauma (48%) and fractures (35%) dominating the clinical spectrum [14]. The prevalence of head injuries in our study is slightly lower than the 32% reported by Sharma et al. in Himachal Pradesh, likely due to regional differences in impact types and trauma mechanisms [15]. Regarding the timing of accidents, most occurred in the evening (6 PM–12 AM), accounting for 33.8% of cases, followed by the afternoon period (12 PM–6 PM) with 28.3%. These peak periods match the observations by Kaul et al. in Srinagar, who noted increased accident incidence during dusk and early night due to reduced visibility and traffic congestion [16]. Overall, the findings of this study resonate with existing national and international literature, reaffirming the high-risk profile of young male two-wheeler users and the predominance of soft tissue and skeletal injuries. The study emphasizes the need for region-specific preventive strategies, road safety enforcement, and improved trauma care services to mitigate the burden of non-fatal RTAs in areas with mixed urban and hilly terrain like Jammu and Kashmir.

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