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Original Research Article

A Hospital-Based Epidemiological Study of Fractures Secondary to Road Traffic Accidents in West Champaran

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Abstract:

Background: Road traffic accidents (RTAs) are a major public health problem in India and are associated with significant morbidity and disability due to fractures. Young adults and two-wheeler users are particularly vulnerable to traumatic injuries.

Aim: To study the epidemiological profile, fracture pattern, and management modalities of fractures secondary to RTAs in West Champaran.

Methodology: This hospital-based descriptive observational study was conducted in the Department of Orthopaedics at Government Medical College & Hospital Bettiah over a period of 8 months. A total of 80 patients with RTA-related fractures were included. Data regarding demographic profile, type of vehicle, fracture pattern, and treatment modalities were collected and analyzed using IBM SPSS Statistics 27.0.

Results: The majority of patients belonged to the 21–30 years age group (30%), and males constituted 72.5% of cases. Two-wheelers were involved in 47.5% of accidents. Lower limb fractures were the most common injury pattern (45%), followed by upper limb fractures (30%). Conservative management was used in 35% of patients, while 30% underwent surgical fixation.

Conclusion: Young male two-wheeler users were the most affected group. Strengthening road safety measures, public awareness, and trauma care services is essential to reduce RTA-related fractures.

Keywords: Road traffic accidents, fractures, epidemiology, two-wheelers, trauma, orthopedic injuries, West Champaran.

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Introduction

Road traffic accidents (RTAs) have emerged as a significant global public health problem, particularly in low- and middle-income countries like India [1]. The World Health Organization estimates that RTAs are one of the top causes of death in the 5-29 age group. The alarming rise in road traffic injuries and deaths in India is attributed to rapid urbanization, rising motorization, and inadequate enforcement of traffic laws. Bihar is one of the densely populated states with increasing number of vehicles and mixed traffic conditions, and experiences a significant number of RTAs annually. Tertiary care hospitals' emergency departments are frequently the first point of contact for RTA victims and can provide valuable information on the epidemiological profile, risk factors, and injury outcomes. These patterns must be understood to design specific interventions for prevention, early care and effective rehabilitation. Although the incidence is increasing, there is a relative lack of detailed, hospital-based epidemiological data from this region, especially from North Bihar. One of the most frequent and severe outcomes of road traffic accidents is fractures [2]. They cause acute morbidity and disability, and also have long-term socioeconomic and psychological consequences for individuals and families. Depending on the mechanism and severity of the injury, fractures resulting from RTAs are often in the lower limbs, upper limbs, pelvis, spine and craniofacial bones. Young adults, particularly males in the productive age group, are more vulnerable because of their increased outdoor activity, occupational exposure, risk-taking behavior, and increased use of two-wheelers [3]. The rising number of fractures due to RTAs has emerged as a significant problem in the field of orthopedic and trauma care in India. The

epidemiology of fractures due to road traffic accidents is different in different geographical regions, depending on the road infrastructure, traffic density, socioeconomic factors and public awareness of road safety measures [4]. The lack of good roads, street lighting, over-speeding, non-use of helmets and seat belts, drunk driving, and traffic rule violations are major factors in accidents and serious injuries in developing areas. The presence of motor vehicles, bicycles, pedestrians, animal-drawn carts and overloaded transport vehicles on the same roads in Bihar further compounds the risk of collisions and traumatic injuries. Furthermore, the transportation of victims is frequently delayed and pre-hospital trauma care facilities are not available, which can exacerbate the effects of fracture-related injuries.

Epidemiological studies conducted in hospitals are important to understand the burden and nature of RTA-related fractures. These studies can be useful in determining the age group, gender distribution, fracture type, fracture site, mechanism of injury, time of injury, and risk factors associated with fractures [5]. The results of these findings are useful for healthcare administrators, policymakers, and public health officials in planning trauma services, enhancing emergency care systems, and developing preventive strategies. Moreover, epidemiological data can help in resource allocation, infrastructure development, and the creation of road safety policies that are specific to local needs.

In recent years, there has been significant increase in the number of vehicles and road connectivity in West Champaran, which is in the north-west of Bihar. But the area still has issues with road safety, traffic control, and access to health care [6]. The district is also home to several national highways and local roads that are heavily trafficked, which can lead to accidents and congestion. This area has a high volume of tertiary care hospitals, which are receiving a significant number of trauma cases, including those with fractures due to RTAs. However, detailed epidemiological data on the incidence and distribution of fractures in RTA victims in this region is still scarce.

Fracture patterns in road traffic accidents are influenced by several factors such as type of vehicle involved, speed of impact, use of protective measures, and position of the victim during the accident [7]. Limb fractures are especially common in two-wheelers because of direct impact in crashes. Lack of protection also increases the risk of serious injury to pedestrians and cyclists. Often, there are several fractures and soft tissue injuries that make treatment more difficult and increase the length of hospital stay. Such injuries frequently necessitate surgical repair, rehabilitation, and long-term monitoring, adding to the economic strain on healthcare systems and impacted families.

The burden of RTA-related fractures is significant in terms of social and economic consequences. Victims are often in the prime of their working lives and long-term disability can result in lost income, diminished quality of life and reliance on caregivers. Financial constraints and lack of access to specialized trauma care further complicate recovery and rehabilitation in rural and semi-urban areas like West Champaran. Hence, knowledge of the epidemiological features of fractures following RTAs is crucial for the development of effective preventive and management strategies.

Epidemiological evaluation of RTA-related fractures also has implications for public health planning. Knowing when accidents are most likely to occur, who is most likely to be injured, and what are the most common injury mechanisms can help inform awareness campaigns, more stringent enforcement of traffic laws, and the promotion of safety measures like wearing helmets and seatbelts. It can also inform the development of better emergency medical response systems and trauma care facilities in areas that lack them.

Given the increasing number of road traffic accidents and the associated orthopedic injuries, there is a need for detailed hospital-based studies that concentrate on fracture patterns and epidemiological determinants in specific geographic areas. The present study entitled "A Hospital Based Epidemiological Study of Fractures Secondary to Road Traffic Accidents in West Champaran" has been conducted to assess the demographic profile, pattern of fractures, associated factors and clinical characteristics of patients attending the hospital with RTA related fractures in a tertiary care hospital in West Champaran. The results of this study will help inform the local burden of trauma and help inform the region's road safety, trauma management, and healthcare planning.

Methodology

Study Design: The present study was designed as a hospital-based descriptive observational study aimed at documenting the epidemiological profile, pattern, severity, and management of fractures secondary to road traffic accidents (RTAs) presenting to the emergency outpatient department (OPD). The study focused on analyzing the distribution of fracture types, demographic characteristics, mechanism of injury, and treatment modalities among patients attending the tertiary care hospital.

Study Area: The study was conducted in the Department of Orthopaedics, Government Medical College & Hospital, Bettiah, West Champaran, and Bihar, India.

Study Duration: The duration of the study was 8 months.

Study Participants

Inclusion Criteria

- Patients of all age groups and both sexes presenting with fractures due to road traffic accidents.
- Patients admitted or treated in the Emergency OPD and Orthopaedic Department of the hospital.
- Patients who provided informed consent to participate in the study.
- Patients diagnosed clinically and radiologically with fractures associated with RTAs.
- Patients presenting within the study duration.

Exclusion Criteria

- Patients with fractures caused by falls, assaults, sports injuries, or other non-RTA causes.
- Patients who were dead on arrival.
- Patients unwilling to participate in the study.
- Patients with incomplete medical records or insufficient clinical details.
- Patients referred to another institution before complete evaluation and management.

Sample Size: A total of 80 patients with fractures secondary to road traffic accidents were included in the study. The sample size comprised all eligible participants presenting during the study period who fulfilled the inclusion criteria".

Procedure: The study was initiated in the Department of Orthopaedics and Emergency OPD of the hospital. All patients presenting with fractures following road traffic accidents during the study period were screened for eligibility. Patients fulfilling the inclusion criteria were enrolled after obtaining informed consent from the patient or their attendants. A pre-designed semi-structured proforma was used for data collection. Information regarding socio-demographic characteristics such as age, sex, residence, and occupation was recorded. Detailed history related to the road traffic accident including type of vehicle involved, mechanism of injury, place and time of accident, use of safety measures such as helmets or seat belts, and mode of transportation to the hospital was obtained. Clinical examination findings and radiological investigations were reviewed to identify the type, site, and severity of fractures. Details regarding associated injuries, management procedures, duration of hospital stay, and immediate clinical outcomes were also documented. Fractures were categorized according to anatomical site and type of injury. Management modalities such as conservative treatment, plaster immobilization, traction, and surgical interventions including internal fixation were recorded. Patients were followed during their hospital stay to assess immediate treatment outcomes and complications whenever applicable. All collected information was entered systematically into a master chart using Microsoft Excel to ensure proper organization and accuracy of data. Confidentiality of patient information was strictly maintained throughout the study. Participation in the study was voluntary, and all ethical principles related to biomedical research involving human subjects were followed.

Statistical Analysis: The collected data were compiled, coded, and entered into Microsoft Excel and subsequently analyzed using IBM SPSS Statistics 27.0. Descriptive statistical methods such as frequency, percentage, mean, and standard deviation were used for analysis and presentation of data. The findings were represented in the form of tables, charts, and graphs wherever necessary. Appropriate statistical interpretation was carried out to assess the epidemiological distribution and management patterns of fractures secondary to road traffic accidents.

Result

Table 1 shows the distribution of study participants according to age group among the total sample size of 80 patients. The highest number of patients belonged to the 21–30 years age group, comprising 24 patients (30%), followed by the 31–40 years age group with 18 patients (22.5%). Patients aged 41–50 years accounted for 14 cases (17.5%), while those below 20 years constituted 10 patients (12.5%). The 51–60 years age group included 8 patients (10%), and the lowest proportion was observed in participants aged above 60 years, with 6 patients (7.5%). Overall, the findings indicate that the majority of study participants were young adults, particularly those between 21 and 40 years of age.

Table 1: Distribution of Study Participants According to Age Group

Age Group (Years)	Number of Patients (n=80)	Percentage (%)
<20	10	12.5
21–30	24	30
31–40	18	22.5
41–50	14	17.5
51–60	8	10
>60	6	7.5
Total	**80**	**100**

Table 2 shows the distribution of study participants according to gender among the total sample size of 80 patients.

Out of the 80 participants, 58 patients (72.5%) were male, while 22 patients (27.5%) were female. The findings indicate that the majority of the study participants were males, accounting for nearly three-fourths of the total study population, whereas females constituted slightly more than one-fourth of the participants.

This gender distribution suggests a higher representation of male patients in the present study.

Table 2: Distribution of Study Participants According to Gender

Gender	Number of Patients (n=80)	Percentage (%)
Male	58	72.5
Female	22	27.5
Total	**80**	**100**

Table 3 shows the distribution of patients according to the type of vehicle involved in road traffic accidents among the total study population of 80 patients. The majority of accidents were associated with two-wheelers, accounting for 38 patients (47.5%), indicating that motorcyclists and scooter riders were the most commonly affected group. Four-wheelers were involved in 16 cases (20%), while auto-rickshaws contributed to 8 cases (10%). Heavy vehicles were responsible for 7 cases (8.75%), and bicycle-related accidents accounted for 6 cases (7.5%). Pedestrian injuries constituted the lowest proportion, with 5 patients (6.25%). The findings suggest that two-wheeler accidents were the predominant cause of road traffic accident-related injuries in the study population, possibly due to increased usage, lack of protective measures, and greater exposure to road hazards.

Table 3: Distribution of Patients According to Type of Vehicle Involved in Road Traffic Accident

Type of Vehicle	Number of Patients (n=80)	Percentage (%)
Two-wheeler	38	47.5
Four-wheeler	16	20
Bicycle	6	7.5
Auto-rickshaw	8	10
Heavy vehicle	7	8.75
Pedestrian injury	5	6.25
Total	**80**	**100**

Table 4 shows the distribution of patients according to the site of fracture among the total study population of 80 patients. The majority of patients sustained lower limb fractures, accounting for 36 cases (45%), indicating that lower extremity injuries were the most common type of fracture following road traffic accidents. Upper limb fractures were the second most common, observed in 24 patients (30%). Pelvic fractures were reported in 7 patients (8.75%), while spinal fractures were seen in 5 patients (6.25%). Skull or facial fractures and multiple fractures were each observed in 4 patients (5%). The findings suggest that fractures involving the limbs, particularly the lower limbs, constituted the predominant injury pattern among the study participants, whereas pelvic, spinal, craniofacial, and multiple fractures were comparatively less frequent.

Table 4: Distribution of Patients According to Site of Fracture

Site of Fracture	Number of Patients (n=80)	Percentage (%)
Lower limb fractures	36	45
Upper limb fractures	24	30
Pelvic fractures	7	8.75
Spinal fractures	5	6.25
Skull/Facial fractures	4	5
Multiple fractures	4	5
Total	**80**	**100**

Table 5 shows the distribution of patients according to management modality among the total study population of 80 patients.

Out of the total patients, 28 patients (35%) were managed conservatively, indicating that non-operative treatment was commonly adopted in selected cases. Among the conservative methods, plaster immobilization was used in 18 patients (22.5%), making it the most frequently applied conservative approach, while traction was used in 6 patients (7.5%). Surgical fixation was performed in 24 patients (30%), reflecting the considerable use

of operative intervention for fracture stabilization and better functional recovery. External fixation was utilized in 4 patients (5%), representing the least commonly used management modality, possibly reserved for specific fracture patterns or emergency conditions. Overall, the findings indicate that both conservative and surgical approaches were utilized for patient management, with conservative management being slightly more common in the present study.

Table 5: Distribution of Patients According to Management Modality

Management Modality	Number of Patients (n=80)	Percentage (%)
Conservative management	28	35
Plaster immobilization	18	22.5
Traction	6	7.5
Surgical fixation	24	30
External fixation	4	5
Total	**80**	**100**

Discussion

The results from this hospital based epidemiological work in West Champaran showed that road traffic accident related fractures were mostly seen in young adults, particularly the 21–30 years group, and then came the 31–40 years group. In this same study about 30% of the patients came from the 21–30 years bracket, whereas 22.5% fell under the 31–40 years category, so it seems the economically active population is still quite prone to road traffic injuries. A similar pattern was described by Singh R et al. (2014) [8], they reported that most trauma victims were from the productive age range of 20–40 years, which likely points to higher exposure from commuting, job travel ,and careless driving routines. Comparable results were also mentioned by Kashid M et al. (2020) [9], where young adults made up the biggest share of trauma victims who were admitted to tertiary hospitals across India. Still, the present findings do not fully match the work by Andrews CN et al. (1999) [10], who noted a somewhat broader age spread among road traffic accident victims in Kampala, and that difference may be linked to location specific transportation habits and variations in occupational exposure.

Male predominance showed up again as a key point in the present study, where males made up almost three-fourths of all cases. This result feels quite in line with the work of Jain M et al. (2020) [11], they stated that roughly 76% of trauma patients were males. Likewise Kumar S et al. (2020) [12], also pointed to greater male involvement in road traffic accidents, and linked it to increased time outdoors, occupational exposure, and a more pronounced risk-taking style in men. The comparatively higher occurrence among males in our study can also be connected with the frequent use of two wheelers, over-speeding habits, and a weak compliance with traffic safety rules. On the other hand, females were present in a much smaller fraction of the cases, which may indicate lesser everyday exposure to vehicular traffic and a relatively smaller engagement in high-risk driving behaviors. The current study further showed that two-wheelers were responsible for the biggest share of road traffic accident related fractures, about half of the total cases, more or less. This kind of result seems to match what Sasmal PK et al. (2020) [13] described, where two-wheeler riders were recognized as the most vulnerable group among road traffic accident victims in eastern India. Similarly, Boniface R et al. (2016) [14] noted that motorcycle related accidents made up a prominent portion of trauma cases in Tanzania, largely because more people depend on motorcycles for transport. In the present setting, the high involvement of two-wheelers might be traced to their affordability, the relative ease of movement, poor helmet practices, and basically minimal bodily protection when collisions happen. Four-wheelers formed the second most common group in this study, while pedestrians, bicycles, and heavy vehicles appeared comparatively less often. This distribution is not exactly the same as what Bonnet E et al. (2018) [15] reported, because in their work pedestrian injuries were higher, possibly linked with weak pedestrian safety infrastructure and the busy crowded urban surroundings.

Regarding fracture patterns, lower limb fractures were found to be the most common type of injury in the present study. Similar results have been described by Singh R et al. (2014), where lower extremity injuries were highly prevalent among road traffic accident victims, mostly because of direct impact during collisions.

The high frequency of lower limb fractures here might be linked to the way the legs are exposed during motorcycle crashes and to the strong impact forces that are sustained during falls or sudden collisions. Upper limb fractures made up the second most frequent fracture pattern, which could be explained by protective reflex actions during accidents, you know like trying to brace. The current findings are somewhat comparable with the study by Chelly H et al. (2019) [16] , in which head injuries were more frequent among severe trauma cases admitted to intensive care units. However, in

contrast with their report, skull and facial fractures were comparatively less common in our investigation, and this difference may point to variations in accident severity, differences in protective equipment use, how patients were referred, and even the inclusion criteria.

In the present study, the management pattern we saw showed that both conservative and surgical modalities were pretty often chosen for fracture care, you know. Conservative management made up 35% of the cases, whereas surgical fixation was needed in around 30% of patients, which suggests that non-operative treatment still has a meaningful place, especially for selected stable fractures. Something similar was mentioned by Nayeem N et al. (1992) [17], in which they described that a sizeable portion of road traffic accident injuries could be handled without surgery, depending on how stable the fracture was and how severe the injury turned out to be. At the same time, the rise in surgical fixation in our study can probably be linked to newer improvements in orthopedic trauma care, better surgical facilities, and a stronger current focus on early mobilization plus functional regain. External fixation, meanwhile, was the least commonly used option, and it was most likely kept for unstable or open fractures where emergency stabilization is required. Very comparable results have also been noted by Kashid M et al. (2020), who reported a trend toward greater use of operative interventions among trauma patients treated at tertiary care centers.

Overall, the results in this current study are mostly in line with national and worldwide reports about the epidemiological profile of fractures linked to road traffic accidents. In particular, young males riding two wheeled vehicles seemed to be the most at risk group, and fractures of the lower limb were the main type of injury. The fact that our findings closely match earlier work further supports the idea of a growing burden from road traffic injuries in developing areas. At the same time, small differences in fracture patterns and how injuries were distributed could stem from variations in where the study was carried out , how traffic actually functions there, the quality of road infrastructure, the level of access to healthcare, and even how well people follow traffic safety expectations. This study points to an urgent requirement for more strict enforcement of road safety laws, better uptake of helmets and other protective gear, stronger public education campaigns, enhanced road infrastructure, and more capable trauma care services, all so morbidity and mortality from road traffic accident related fractures can be reduced.

Conclusion

The present hospital-based epidemiological study highlights that fractures secondary to road traffic accidents constitute a major public health concern in West Champaran. The study revealed that young adult males, particularly those in the 21–40 years age group, were the most commonly affected population. Two-wheelers were identified as the leading cause of accidents, while lower limb fractures represented the most frequent injury pattern. Both conservative and surgical treatment modalities were commonly employed depending on the severity and type of fracture. The findings emphasize the growing burden of trauma on healthcare services and the socioeconomic impact on the productive age group. Strengthening road safety measures, improving public awareness regarding helmet and seat belt use, enforcing traffic regulations, and enhancing emergency trauma care facilities are essential steps to reduce the incidence, morbidity, and long-term consequences of RTA-related fractures in the region.

References

1. Dindi K, Bachani D, Singhal M, Singh AR. Road traffic injuries: Epidemiology, challenges and initiatives in India. National Medical Journal of India. 2019 Mar 1;32(2).
2. Seyoum G. Common types and pattern of bone fractures among road traffic injury victims seen In Addis Ababa piblic hospitals. Ethiopian Medical Journal. 2019 Jan 1.
3. Freeman J, Scott-Parker B, Wong I, Haworth N. Vulnerable road user groups: a review of younger drivers, motorcyclists and older drivers. Vulnerable Groups & Inclusion. 2012 Jan 1;3(1):14889.
4. Yan Y, Zhu Y, Lian X, Lv H, Hou Z, Zhang Y, Chen W, Liu G. A comparative epidemiologic study of fractures among people in rural and urban areas. Injury. 2020 Aug 1;51(8):1784-90.
5. Rewers A, Hedegaard H, Lezotte D, Meng K, Battan FK, Emery K, Hamman RF. Childhood femur fractures, associated injuries, and socio-demographic risk factors: a population-based study. Pediatrics. 2005 May 1;115(5):e543-52.
6. Bliss T, Breen J. Meeting the management challenges of the Decade of Action for Road Safety. IATSS research. 2012 Mar 1;35(2):48-55.
7. Weninger P, Hertz H. Factors influencing the injury pattern and injury severity after high speed motor vehicle accident—a retrospective study. Resuscitation. 2007 Oct 1;75(1):35-41.
8. Singh R, Singh HK, Gupta SC, Kumar Y. Pat tern, severity and circumtances of injuries sus tained in road traffic accidents: a tertiary care hospital-based study. Indian J Community Med. 2014 Jan;39(1):30-4. doi: 10.4103/0970

0218.126353. PMID: 24696537; PMCID: PMC3968579.
9. Kashid M, Rai SK, Nath SK, Gupta TP, Shaki O, Mahender P, Varma R. Epidemiology and outcome of trauma victims admitted in trauma centers of tertiary care hospitals - A multicentric study in India. Int J Crit Illn Inj Sci. 2020 Jan Mar;10(1):9-15
10. Andrews CN, Kobusingye OC, Lett R. Road traffic accident injuries in Kampala. East Afr Med J. 1999 Apr;76(4):189-94. PMID: 10442099.
11. Jain M, Radhakrishnan RV, Mohanty CR, Be hera S, Singh AK, Sahoo SS, Guru S, Barik S. Clinicoepidemiological profile of trauma pa tients admitting to the emergency department of a tertiary care hospital in eastern India. J Family Med Prim Care. 2020 Sep 30;9(9): 4974-4979. doi: 10.4103/jfmpc.jfmpc_621_20. PMID: 33209831; PMCID: PMC7652149.
12. Kumar S, Mahima, Srivastava DK, Kharya P, Sachan N, Kiran K. Analysis of risk factors con tributing 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.
13. Sasmal PK, Mohanty CR, Jain M, Radhakrish nan RV, Sahoo S, Krishna VS, Doki SK, Dun gala RVMK. The effect of 'THE MOTOR VE HICLES (AMENDMENT) ACT, 2019' on the clinico-epidemiological profile of road traffic accident patients presenting to a tertiary care trauma centre in Bhubaneswar. J Family Med Prim Care. 2020 Jul 30;9(7):3682-3687. doi: 10.4103/jfmpc.jfmpc_293_20. PMID: 33102351; PMCID: PMC7567252
14. Boniface R, Museru L, Kiloloma O, Munthali V. Factors associated with road traffic injuries in Tanzania. Pan Afr Med J. 2016 Feb 19; 23:46. doi: 10.11604/pamj.2016.23.46.7487. PMID: 27217872;
15. Bonnet E, Fillol A, Nikiema A, Lechat L, Tall M, Da SC, Ridde V. Évaluation des inégalités sociales de santé des traumatisés de la route à Ouagadougou au Burkina Faso [Evaluation of social inequalites in health of road accident vic tims in Ouagadougou, Burkina Faso]. Sante Publique. 2018 May-Jun;30(1 Suppl):131-137. French. doi: 10.3917/spub.184.0131. PMID: 30547479.
16. Chelly H, Bahloul M, Ammar R, Dhouib A, Mahfoudh KB, Boudawara MZ, Chakroun O, Chabchoub I, Chaari A, Bouaziz M. Clinical characteristics and prognosis of traumatic head injury following road traffic accidents admitted in ICU "analysis of 694 cases". Eur J Trauma Emerg Surg. 2019 Apr;45(2):245-253. doi: 10.1007/s00068-017-0885-4. Epub 2017 Dec 12. PMID: 29234838
17. Nayeem N, Barltrop AH, Kotecha MB. Care of road traffic accident victims in a district general hospital. Ann R Coll Surg Engl. 1992 May;74(3):212-7. PMID: 1616265; PMCID: PMC2497574.