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Incidence of K-wire fixation of upper limb fractures for road traffic accidents in Bangladesh

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ABSTRACT

Background: Road traffic accidents (RTAs) are a significant public health issue globally, particularly in developing countries like Bangladesh. This study focuses on the epidemiological and clinical aspects of upper limb fractures resulting from RTAs, with an emphasis on the treatment modalities employed.
Methods: This retrospective observational study analyzed hospital records of 40 patients with upper limb fractures due to RTAs at Chakaria Unique Hospital, Cox's Bazar, Bangladesh, within the period of 1 year, from February 2023 to January 2024. The study included cases with comprehensive documentation of fractures resulting specifically from RTAs. Excluded were injuries not related to upper limb fractures and those not caused by RTAs. The focus was on patient demographics, the nature of the fractures, treatment methods (particularly K-wire fixation), and documented outcomes.
Results: The majority of the patients were young males, with the highest incidence in the 21-30 age group (40.00%). Two-wheeler vehicles were the leading cause of these injuries (57.50%). Treatment modalities varied, with open reduction and internal fixation (ORIF) combined with K-wire fixation being the most prevalent (35.00%). Other methods included ORIF alone and ORIF with plate-screw, each accounting for 25.00% of cases. Right-sided injuries were more common (57.50%) than left-sided (42.50%).
Conclusions: The study highlights the predominance of upper limb fractures in younger males due to two-wheeler accidents. The preference for combined ORIF and K-wire fixation in treatment reflects the complexity of these injuries. The findings call for enhanced road safety measures and further research into optimized treatment protocols for upper limb fractures in Bangladesh.

Keywords: RTAs, Upper limb fractures, K-wire fixation, Orthopedic trauma

INTRODUCTION

The global and regional impact of road traffic accidents (RTAs) is profound, positioning them as a critical public health concern. Worldwide, RTAs contribute significantly to injury-related deaths, with South Asia, particularly Bangladesh, experiencing a notable burden.[1] In this landscape, upper limb fractures due to RTAs are common, presenting unique challenges in treatment and rehabilitation. These fractures are a clinical priority given their frequency and potential complications, ranging from disability to socio-economic impacts on individuals and healthcare systems.[2] Globally, RTAs are a leading cause of morbidity and mortality, with a surge in developing countries like Bangladesh.[3] This situation is exacerbated

by the high incidence of upper limb fractures, particularly among vulnerable demographics such as children and working-age adults. Various types of fractures, such as supracondylar humeral fractures, are commonly reported, and the demographic trends indicate a broad spectrum of the population being affected.[4] Managing these fractures effectively is clinically important to avoid long-term disability. However, the treatment is fraught with challenges, including the necessity of precise diagnosis, timely intervention, and the selection of appropriate surgical techniques.[5] In this regard, Kirschner wire (K-wire) fixation has been identified as a significant treatment modality for these fractures, offering a balance between invasiveness and stability suitable for various fracture types.[6] K-wire fixation, while advantageous, is not devoid of complications. These include osteomyelitis, tendon rupture, nerve lesion, pin tract infection, and technical failures, especially when the procedure is performed by less experienced surgeons.[7] This underscores the necessity for careful surgical planning, execution, and post-operative care. In Bangladesh, the treatment of upper limb fractures due to RTAs, especially using K-wire fixation, presents both challenges and evolving practices. The healthcare system faces high injury burdens and resource limitations.[8] Further complicating this scenario is the lack of comprehensive data on treatment outcomes and recovery patterns specific to Bangladesh, critical for improving practices and patient care standards.[9] Notably, there's a gap in literature and practice concerning upper limb fracture management due to RTAs in Bangladesh, especially regarding the effectiveness and outcomes of K-wire fixation. Addressing this gap through targeted research could contribute significantly to global trauma care knowledge and aid in developing more effective, contextually relevant interventions and policies. This research aims to fill these gaps, particularly focusing on the efficacy and outcomes of K-wire fixation in treating upper limb fractures resulting from RTAs in Bangladesh.

METHODS

This retrospective observational study was conducted at the Department of Orthopedics, Chakaria Unique Hospital, Cox's Bazar, Bangladesh, focusing on patients who sustained upper limb fractures due to road traffic accidents. The study duration was one year, from February 2023 to January 2024. The study encompassed a comprehensive review of hospital records for 40 patients treated for such injuries. Inclusion criteria were strictly adhered to, encompassing only those patient records that documented upper limb fractures directly resulting from RTAa. This criterion ensured a focused analysis on the specific injury type relevant to the study's objectives. Records were evaluated for demographic information, specific details of the fractures, treatment methods employed with an emphasis on K-wire fixation techniques, and documented outcomes of these treatments including any complications or follow-up care. Exclusion criteria were rigorously applied to maintain the study's relevance and precision. Records documenting injuries from road traffic accidents that did not involve upper limb fractures were excluded. Additionally, cases of upper limb fractures arising from causes other than road traffic accidents were not considered. All collected data were organized and analyzed using statistical package for the social sciences (SPSS) V.25. This approach was critical to isolate the impact of road traffic accidents on upper limb fractures and the effectiveness of K-wire fixation in these specific cases. Ethical clearance for this study was obtained from the ethical review committee of the study hospital.

RESULTS

The participants' ages ranged from 15 to 48 years, with a predominant presence in the 21-30 age group, accounting for 40.00% of the cases (16 patients). The 11-20 age group comprised 27.50% (11 patients), followed by the 31-40 age group at 17.50% (7 patients), and the 41-50 age group at 15.00% (6 patients). This distribution suggests that the majority of upper limb fracture cases occurred in younger individuals, particularly those under 30 years of age (Table 1).

Table 1: Age distribution of the participants (n=40).

Age group (years)	Frequency	Percentage
11-20	11	27.50
21-30	16	40.00
31-40	7	17.50
41-50	6	15.00
Range	15-48 years	

Of the 40 patients, a significant majority were male, constituting 80.00% of the cases (32 patients), while females accounted for 20.00% (8 patients). This significant difference indicates a higher prevalence of upper limb fractures among males in road traffic accidents (Table 2).

Table 2: Gender distribution of the participants (n=40).

Gender	Frequency	Percentage
Male	32	80.00
Female	8	20.00

In terms of the side of injury, the right side was more frequently affected, with 57.50% of cases (23 patients) having right-sided upper limb injuries. The left side was involved in 42.50% of the cases (17 patients), indicating a slightly higher susceptibility of the right upper limb to injury in these accidents (Table 3).

Table 3: Side of injury among the participants (n=40).

Side	Frequency	Percentage
Right	23	57.50
Left	17	42.50

Analyzing the cause of injuries, 2-wheeler vehicles were the most common contributor, involved in 57.50% of the cases (23 patients). This was followed by accidents involving 3-wheeler vehicles, accounting for 30.00% (12 patients), and 4-wheeler vehicles, responsible for 12.50% of cases (5 patients). The high frequency of injuries associated with 2-wheeler vehicles underscores their significant role in road traffic accidents leading to upper limb fractures (Table 4).

Table 4: Cause of road traffic accidents among the participants (n=40).

Cause of injury	Frequency	Percentage
2-wheeler vehicles	23	57.50
3-wheeler vehicles	12	30.00
4-wheeler vehicles	5	12.50

Regarding treatment, open reduction and internal fixation (ORIF) with K-wire was the most common method, used in 35.00% of the cases (14 patients). This was followed by ORIF alone and ORIF with plate-screw, each accounting for 25.00% (10 patients respectively). K-wire fixation alone was utilized in 15.00% of cases (6 patients). These results highlight the varied surgical approaches employed, with a notable preference for combined ORIF and K-wire fixation in managing these fractures (Table 5).

Table 5: Type of fixation among the participants (n=40).

Type of fixation	Frequency	Percentage
ORIF	10	25.00
ORIF with K-wire	14	35.00
K-wire fixation	6	15.00
ORIF with plate-screw	10	25.00

DISCUSSION

In our study, we observed a distinct age distribution among patients with upper limb fractures resulting from road traffic accidents. The predominant age group was 21-30 years, accounting for 40.00% of the cases, closely followed by the 11-20 age group at 27.50%. This trend is supportive of the findings of Rennie et al where a similar age distribution was noted in pediatric fractures.[10] The young adult age group's higher incidence of upper limb fractures likely reflects their active engagement in risk-prone activities, including driving and riding two-wheelers, as suggested by the findings of Haris et al.[11] The male predominance in our study (80.00%) aligns with global trends in road traffic injuries, as reflected in the study by Shaheen et al which also noted a higher prevalence of fractures among males.[12] This gender disparity can be attributed to the generally higher exposure of males to road traffic activities and their involvement in high-risk behaviors. Analyzing the cause of injuries, our study highlighted two-wheelers as the most common contributor, involved in 57.50% of the cases. This finding resonates with the observations made by Wraighte et al where two-wheelers were identified as significant contributors to road traffic accidents.[13] The high frequency of injuries associated with two-wheelers underscores the importance of targeted interventions to improve safety measures and awareness among two-wheeler users. In terms of treatment modalities, ORIF with K-wire was the most commonly employed method in our study (35.00%). This preference for a combined surgical approach is supported by the study of Khaled and Mohamed, which demonstrated the effectiveness of mini-plates and percutaneous K-wire fixation for unstable metacarpal fractures.[14] The use of K-wire fixation, whether standalone or in combination with ORIF, indicates a strategic choice for stable fixation and quick rehabilitation. This is in line with the findings of Grewal et al who explored different fixation methods for distal radius fractures.[15] Our study's findings on the side of injury revealed a higher incidence of right-sided injuries (57.50%), a pattern that is consistent with the global prevalence of right-handedness. This observation is corroborated by the research of Hume and Wiss, who reported a similar pattern in olecranon fractures.[16] The dominance of the right hand in the general population could explain the higher susceptibility of the right upper limb to injuries during accidents. In summary, the current study's findings contribute significant insights into the demographics, causes, and treatment of upper limb fractures due to road traffic accidents in Bangladesh. The high incidence of such injuries in young males, especially due to two-wheeler vehicles, and the varied but strategic approaches to surgical treatment are in line with broader trends noted in the literature. These insights are crucial for informing public health strategies and medical practices, particularly in the context of developing countries like Bangladesh.

Limitations

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

CONCLUSION

This study provides a comprehensive overview of the patterns and treatment modalities of upper limb fractures resulting from road traffic accidents in Bangladesh. The findings reveal a significant predominance of younger males, particularly in the 21-30 age group, as the most affected demographic. Two-wheeler vehicles emerged as the primary cause of these injuries, accounting for a majority of the cases. In terms of treatment, ORIF combined with K-wire fixation was the most commonly employed method, highlighting a preference for approaches that ensure stability and facilitate rehabilitation. The study underscores the urgent need for targeted road safety interventions and further research to develop optimized treatment protocols for upper limb fractures resulting from RTAs.

Recommendations

Based on the study's findings, the following recommendations can be made.

Enhanced road safety measures

There should be an increased focus on road safety education and enforcement, especially for two-wheeler users. This includes promoting the use of protective gear and adherence to traffic rules.

Targeted public health campaigns

Public health initiatives should aim at educating young adults, particularly males, about the risks associated with road traffic accidents and the importance of safe driving practices.

Further research

Additional studies are needed to explore the long-term outcomes of different surgical treatments for upper limb fractures, especially in the context of developing countries like Bangladesh.

Improving emergency response

Strengthening the emergency medical response system to ensure timely and effective treatment of road traffic accident victims can significantly improve outcomes.

Training and resources for healthcare providers

Enhancing the skills and resources available to healthcare providers in effectively managing upper limb fractures, including the use of combined ORIF and K-wire fixation techniques, is crucial.

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REFERENCES

1. Kundu S, Al Banna MH, Sayeed A. Road traffic accidents in Bangladesh: A top public health issue? Popul Med. 2020;2:5.
2. Ul Baset MK, Rahman A, Alonge O, Agrawal P, Wadhwaniya S, Rahman F. Pattern of Road Traffic Injuries in Rural Bangladesh: Burden Estimates and Risk Factors. Int J Env Res Public Health. 2017;14(11):1354.
3. Chowdhury SM, Baset K ul, Uddin KB, Rahman AF. PW 2064 Epidemiology of road traffic injuries among urban population in bangladesh: finding from a nationwide survey. Injury Prev. 2018;24(2):A186.
4. Ahmad M, Rahman FN, Rahman MZ, Biswas P. Road traffic injury among pedestrians: an emerging research focus in Bangladesh. KYAMC J. 2018;9(1):11-5.
5. Stahl S, Schwartz O. Complications of K-wire fixation of fractures and dislocations in the hand and wrist. Arch Orth Traum Surg. 2001;121(9):527-30.
6. Awasthi A, Jadhav S, Taywade S, Salwan A, Khan K, Awasthi AA, et al. Outcome Analysis of Distal End Radius Fractures Managed With Antegrade Intramedullary K-wire Fixation. Cureus. 2022;14(10).
7. Ahmad S, Gupta T, Ansari S, Jain A, Barik S, Singh V. Intramedullary Crossed K-wire Fixation for the Hand Fractures is a Useful Treatment Modality: A Prospective Observational Study. Strategies Trauma Limb Reconstr. 2022;17(2):74-80.
8. Islam MN, Islam MS, Hasan SA. Study on the Management of Open Tibia-fibula Fracture in Rehabilitation Institute and Hospital for the Disabled (RIHD), Dhaka, Bangladesh. TAJ: J Teachers Assoc. 2002;15(2):84-6.
9. Roy S, Hawlader MDH, Nabi MH, Chakraborty PA, Zaman S, Alam MM. Patterns of injuries and injury severity among hospitalized road traffic injury (RTI) patients in Bangladesh. Heliyon. 2021;7(3).
10. Rennie L, Court-Brown CM, Mok JYQ, Beattie TF. The epidemiology of fractures in children. Injury. 2007;38(8):913-22.
11. Haris A, Zulfiqar T, Ali A. Frequency Of Upper Extremity Fractures In Patients With Road Traffic Accidents And Its Association With Age. Med Sci J Adv Res. 2022;3(3):143-8.
12. Shaheen ME, Badr AA, Al-Khudairy N, Khan FA, Mosalem A, Sabet N. Patterns of accidental fractures and dislocations in Saudi Arabia. Injury. 1990;21(6):347-50.
13. Wraighte PJ, Manning PA, Wallace WA, Hynd D. Upper Extremity Injuries in Road Traffic Accidents. Shoulder Elbow. 2011;3(3):184-7.
14. Khaled NA, Mohamed EM. Unstable Metacarpal Fractures: A comparative study between Mini-plates and percutaneus K-wire fixation at Emergency Hospital, Mansoura University, Egypt. OROAJ. 2018;13(2):1-5.
15. Grewal R, Perey B, Wilmink M, Stothers K. A Randomized Prospective Study on the Treatment of Intra-Articular Distal Radius Fractures: Open Reduction and Internal Fixation With Dorsal Plating Versus Mini Open Reduction, Percutaneous Fixation, and External Fixation. J Hand Surg. 2005;30(4):764-72.
16. Hume MC, Wiss DA. A Clinical and Radiographic Comparison of Tension Band Wiring and Plate Fixation. Clin Orthop Relat Res. 1992;285:229.

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