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PATTERN OF MANDIBULAR FRACTURES IN ROAD TRAFFIC ACCIDENT PATIENTS PRESENTING TO A TERTIARY CARE HOSPITAL

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RTA; mandibular fractures; condylar fractures; parasymphysis; ORIF; motorcycle accidents

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Abstract

Background:
Road traffic accident (RTA)-induced mandibular fractures have been reported to be amongst the commonest facial trauma in the underdeveloped countries like Pakistan. There is not much literature related to its pattern and management.

Objective:
To determine the pattern of mandibular fractures associated with RTA in the study population.

Material & Methods:
This descriptive, cross-sectional study was carried out at the Department of Oral & Maxillofacial Surgery, Mardan Medical Complex Hospital during the period of February-August 2024. The number of 158 patients suffering from RTA induced mandibular fractures were selected using non-probability convenience sampling technique. Demographic data, type and site of fractures, mode of occurrence, treatment and outcomes were analyzed statistically using IBM SPSS Statistics software version 24. The predictor of patterns of mandibular fractures were analyzed using logistic regression analysis.

Results:
The average age of the patient was 24.5 ± 12.3 years. There was a predominance of male gender (89.8%) in the study sample. Most frequent sites of mandibular fractures were parasymphysis (40%) and condyle area (25%). Motorcycle accidents constituted 70% cases. Out of total patients, open reduction and internal fixation (ORIF) was performed in 80% while 20% received conservative treatment. Intraoperative and post-operative complications were found in 20% patients. Significant association of mandibular condyle fractures was noted with age <20 (OR = 2.5, 95% CI: 1.4-4.3, $p<0.01$).

Conclusion:
Mandibular fractures due to RTA mainly occur in males younger than 20 years and mostly due to motorcycle accidents. Parasymphysis and condyle region constitute the most commonly injured areas. Implementation of strict security measures on roads and timely surgical interventions may help to minimize morbidity rate.

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INTRODUCTION

Road traffic accidents (RTAs) represent a major global public health challenge, contributing substantially to both morbidity and mortality, particularly in low- and middle-income countries. [1] According to global estimates, a large number of individuals sustain injuries each year as a result of RTAs, with a considerable proportion involving maxillofacial trauma. [2,3] In countries such as Pakistan, the burden of these injuries is further exacerbated by rapid urbanization, increased motorization, and inadequate enforcement of traffic safety regulations. [4]

Mandibular fractures are among the most common maxillofacial injuries associated with RTAs. [5] The mandible, being the largest and strongest bone of the facial skeleton, is particularly vulnerable due to its prominent anatomical position. [6] Fractures of the mandible can significantly compromise essential functions such as mastication, speech, and occlusion, while also affecting facial aesthetics and overall quality of life. [7]

The etiology and patterns of mandibular fractures vary across different regions and populations. [8]In developed countries, interpersonal violence and falls are frequently reported causes, whereas in developing countries, RTAs remain the predominant cause. [9] Several regional studies have consistently shown that young males are disproportionately affected, likely due to increased exposure to road traffic and engagement in high-risk behaviors, including motorcycle riding without adequate protective measures. [10]

The distribution of fracture sites is influenced by the mechanism and severity of injury. [11] Previous studies have identified the parasymphysis, condylar region, and angle of the mandible as the most commonly involved sites in RTA-related mandibular fractures. Understanding these patterns is essential for optimizing clinical management and developing effective preventive strategies. [12]

Management of mandibular fractures includes both surgical and conservative approaches, depending on the nature and severity of the injury. [13]Open reduction and internal fixation (ORIF) is commonly employed for displaced fractures, as it provides stable fixation and facilitates early functional recovery. In contrast, conservative methods such as closed reduction and maxillomandibular fixation (MMF) may be appropriate in selected cases. [14]

Despite the substantial burden of mandibular fractures associated with RTAs in Pakistan, there remains a paucity of region-specific data, particularly in Khyber Pakhtunkhwa. Such information is crucial for guiding clinical decision-making and informing public health interventions. [15]

Therefore, the present study was conducted to evaluate the patterns of mandibular fractures in patients presenting with RTAs at a tertiary care hospital. Furthermore, the study aimed to assess demographic characteristics, fracture distribution, treatment modalities, and clinical outcomes, as well as to identify predictors of specific fracture patterns.

Materials and Methods

The present retrospective cross-sectional study was carried out at the Department of Oral and Maxillofacial Surgery, Mardan Medical Complex, Mardan, Pakistan. It consisted of a total of six months of duration; from February 2024 to August 2024. The sample size was determined utilizing the EPI sample size calculator based on a 95% confidence level, 6% margin of error, and an expected rate of 18%, with a total of 158 patients. Convenience sampling method was used in this study for sampling technique.

Patients of both genders between the ages of 8–70 years having isolated fractures of the mandible were included in the study. Patients having associated facial fractures, pathological fractures of the mandible, tumors, and/or maxillofacial trauma other than mandibular fractures along with comorbid conditions affecting mandibles were excluded from the study.

Eligible patients who attended the Oral and Maxillofacial Surgery unit according to inclusion and exclusion criteria were selected for the study. Ethical approval for this research study was granted by the Ethics Review Board of Bacha Khan College of Dentistry; Approval Number 90 issued on December 24, 2023. Informed consent was

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taken after explaining the study to the participants. Confidentiality of the patients was kept throughout the procedure. History and clinical examinations were performed along with investigations. The diagnosis of mandibular fractures was made through computed tomography (CT scan). Data were collected through a pretested questionnaire.

Data analysis was done utilizing IBM SPSS statistics version 24. Descriptive statistics were computed for all of the variables. Numerical data were reported as mean ± SD and/or median, while categorical data were presented as percentage frequencies. Normal distribution was assessed using Shapiro-Wilk test. If the data were normally distributed then mean ± SD was reported; otherwise, median with interquartile range was presented. Associations among categorical variables were assessed through chi-square or Fischer's exact test as per suitability. Logistic regression analysis was performed to evaluate predictors of pattern of fractures. P-value ≤0.05 was considered statistically significant.

Results

In this study, a total of 158 patients with mandibular fractures resulting from road traffic accidents (RTAs) were included. The findings present an overview of the demographic characteristics, fracture patterns, and treatment outcomes.

The mean age of the patients was 24.5 ± 12.3 years, with a male-to-female ratio of 8:2. The majority of patients (70%) were within the age group of 15–35 years. The most commonly reported occupations were daily wage laborers (40%), followed by students (30%) and drivers (20%).

Table 1: Demographic Characteristics of Patients (n = 158)

Demographic Variable	Category	Number of Patients	Percentage
Age (Years)	0–10	20	12.7%
	11–20	50	31.6%
	21–30	60	38.0%
	31–40	20	12.7%
	>40	8	5.0%
Gender	Male	142	89.8%
	Female	16	10.2%
Occupation	Daily Wage Laborer	63	40.0%
	Student	47	30.0%
	Driver	32	20.0%
	Other	16	10.0%

The most common fracture locations included the parasymphysis area, which comprised 40% of fractures, followed by condylar area at 25%, angle of mandible at 20%, and symphysis at 10%. Compound fractures occurred in 65% of patients, while simple fractures occurred in 35%. Bilateral fractures were recorded in 20% of patients, and usually involved the condylar and parasymphysis

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areas. Other associated fractures included zygomatic fractures, which were present in 15% of patients.

Table 2: Distribution of Fracture Sites and Types (n = 158)

Fracture Site	Number of Patients	Percentage	Fracture Type	Number of Patients	Percentage
Parasymphysis	63	40.0%	Compound Fracture (#)	103	65.0%
Condylar Region	40	25.0%	Simple Fracture (#)	55	35.0%
Angle of Mandible	32	20.0%	Bilateral Fracture (#)	32	20.0%
Symphysis	16	10.0%	Associated Injuries	24	15.0%
Ramus	7	5.0%			

Fractures occurred due to RTAs. Motor cycle injuries were the most common (70% of all cases), followed by car accidents (20%). The rest of the cases included pedestrian injuries (10%).

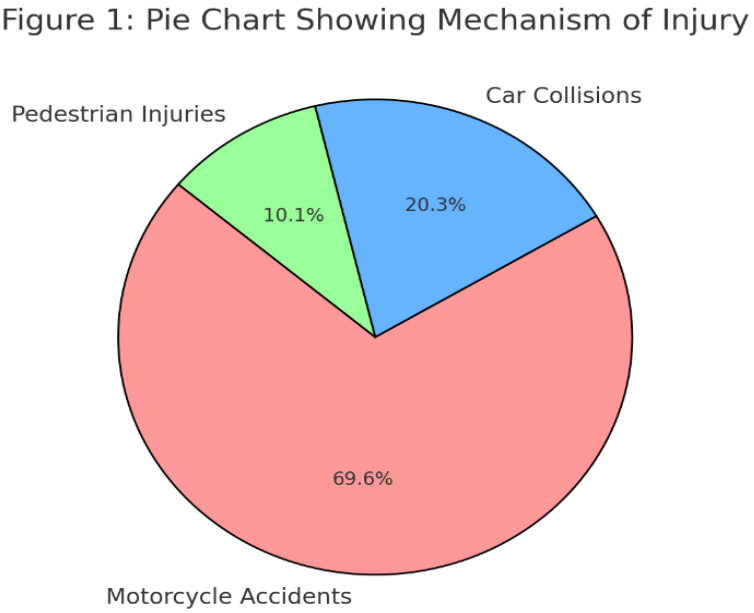

Figure 1: Pie Chart Showing Mechanism of Injury

For 80% of patients, surgical treatment (ORIF) was necessary, whereas for the other 20%, conservative treatment in the form of closed reduction or maxillo-mandibular fixation (MMF) was sufficient. The average period of hospital stay was 6.8 ± 2.9 days. Post-operative problems like

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infections and malocclusions occurred among 20% of patients, being at 12% and 8%, respectively. Follow up results showed 90% success rate after 6 months

Figure 2: Bar Graph Comparing Surgical vs. Conservative Management

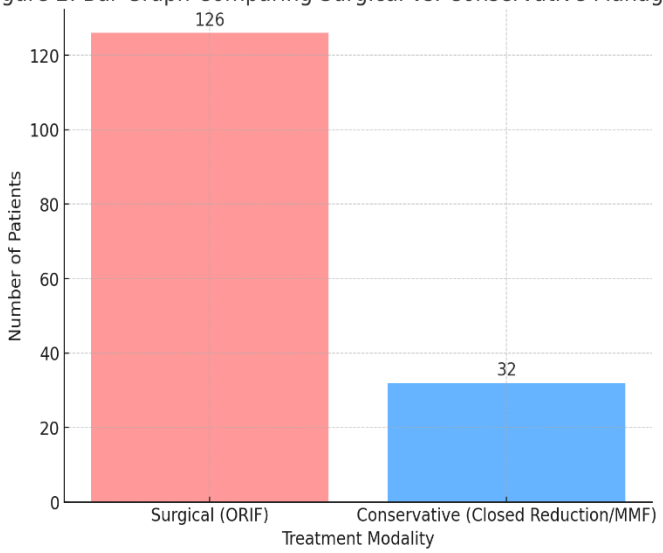

Figure 2: Bar Graph Comparing Surgical vs. Conservative Management

Statistical analysis showed a significant association between the type of mandibular fractures and the mechanism of injury ($p < 0.05$). Compound fractures were most commonly associated with motorcycle accidents. Furthermore, logistic regression analysis indicated that age ≤20 years was a significant predictor of condylar fractures (OR = 2.5, 95% CI: 1.4–4.3, $p < 0.01$).

Discussion

The current study aimed to explore the patterns of mandibular fractures seen in patients with road traffic accidents (RTAs). The results obtained are in line with the literature on the subject and offer important information regarding the distribution of cases, patterns, causes of injuries, and outcomes of management.

The most common group included young male individuals (89.8%) in the age range of 15–35 years (mean age: 24.5 ± 12.3 years). Such finding corresponds with literature stating that the frequency of mandibular fractures among younger age groups can be attributed to greater exposure to road accidents and involvement in risky behavior such as motorbike riding.16 Moreover, a high number of daily wage workers (40%) and students (30%) is indicative of the greater vulnerability of the latter due to higher levels of physical activity and reduced adherence to precautionary measures. [16,11]

With respect to fracture distribution, the parasymphysis was identified as the most commonly affected site (40%), followed by the condylar region (25%) and the angle of the mandible (20%). These findings are consistent with previous studies that have reported the parasymphysis and condylar regions as the most frequently involved sites in RTA-related mandibular fractures. [5] When discussing the distribution of fractures, it should be mentioned that the most affected area is the parasymphysis (40%), followed by the condyle (25%) and angle of the mandible (20%). These data correspond with the results of earlier research showing that the sites most frequently injured in mandibular fractures associated with RTAs include the parasympsis and condyle. 5 Parasymphysis fractures may occur because of direct trauma to the anatomically vulnerable area, while condylar fractures are caused by indirect forces transferred from a blow to the chin. In turn, the prevalence of compound fractures (65%) is related to the severity of injuries

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sustained during high-velocity accidents, such as those involving motorbikes. [17]

It was found that motorcycle accidents accounted for 70% of mandibular fractures. This finding is also supported by similar reports from various other parts of Pakistan and other developing nations where motorcycles are extensively used, yet the adherence to safety protocols, particularly wearing helmets, remains poor. The prevalence of mandibular fractures due to other modes of injury like car accidents (20%) and walking (10%) may be relatively lower; however, they still constitute a considerable part of all mandibular injuries.[8]

Regarding management, most of the patients (80%) were subjected to surgery in the form of ORIF, owing to the fact that RTAs result in more complicated and dislocated fractures. This conforms to the observations made in earlier studies, where ORIF is recognized as an ideal treatment approach for dislocated mandible fractures.[13]Conservative approaches, such as closed reduction and maxillomandibular fixation, were applied in 20% of patients, with no dislocation of fracture. The incidence of postoperative complications of 20% in the form of infection (12%) and malocclusion (8%) is fairly consistent with those from other studies [18]

Some of the strengths of this research include sufficient sample size (n=158) and thorough evaluation of clinical and outcome factors. However, there are some limitations that need to be pointed out. For instance, the retrospective study design could lead to selection and information biases. Furthermore, the single-center research could reduce the applicability of the results.

Conclusion

Road traffic accident-induced injuries leading to fractures in the jaw bone occur primarily in young adult males, and motorcycle accidents are the most frequent causes. Jaw fractures of the parasymphysis and condylar areas were more commonly seen in the patients. The treatment was surgical, involving open reduction and internal fixation; these procedures yielded favorable results, though there was a fair incidence of complications.

CONFLICT OF INTEREST:

The authors declare no conflict of interest.

FUNDING:

This research received no external funding.

Authors' Contributions

Sahar Saeed: Conceptualization, literature review, and data collection.

Ahmad Khan: Methodology development, data collection, and statistical analysis.

Junaid Ahmad: Patient recruitment, clinical assessment, and data validation.

Muneesh Kumar: Literature review and manuscript drafting.

Zohaib Nasar Khan: Data interpretation and manuscript revision.

Suneela Inayat: Supervision and final manuscript editing.

All authors have read and approved the final version of the manuscript.

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