

# Causes, Types and Management of Fracture of Dentate Region of Mandible

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## ABSTRACT

**Aim:** The mandible fracture ranks as the second most often occurring facial fracture. The advent of high-speed automobiles has led to a significant increase in the frequency of accidents in recent times. Mandibular fractures are observed as a notable occurrence of maxillofacial trauma in the region of Multan.

**Purpose:** To determine the Causes, types and management of fracture of dentate region of mandible fracture.

**Method:** The present research is an observational and descriptive investigation including a sample of 52 patients diagnosed with mandible fractures. The study was done at the Nishtar Institute of Dentistry in Multan, Pakistan, spanning from September 2021 to February 2023. Following the endorsement of the research by the Ethical Review Board of the hospital, patients were recruited using a non-probability sequential sampling method. This research included patients who had a history of trauma and were admitted to Nishtar Institute of Dentistry in Multan, Pakistan, as well as those from the surrounding districts of Multan. The assessment of mandibular fractures included doing extra-oral and intra-oral clinical evaluations, as well as obtaining panoramic and posterior-anterior radiographs of the mandible to establish a diagnosis. The data collected was then subjected to statistical analysis.

**Result:** Among the sample of 52 individuals diagnosed with mandibular fractures, the age group of 21-30 years had the greatest proportion, with a notable male preponderance. The leading causes of fractures were road traffic accidents and assault, with the parasymphysis being the most often affected anatomical region. The occurrence and aetiology of mandibular fracture are indicative of the prevailing trauma patterns in a given population and may serve as a valuable resource for informing the development of initiatives aimed at mitigating and managing such injuries.

**Conclusions:** Patients in the older age (51 years and over) exhibited a higher prevalence of fracture sites in comparison to patients in the younger age. This observation might perhaps be ascribed to the presence of a larger tooth-to-bone ratio. As a result, a decrease in bone density was seen among participants in the younger age category, whereas those in the older age category exhibited an elevation in bone frailty

**Keywords:** Dentate fracture, mandible, trauma

## INTRODUCTION

The name "mandible" in English is derived from the Latin root "mandere," meaning "to chew," and the suffix "-bula," denoting "instrument." This linguistic transformation results in the translation "mandibulae" from Latin to English. <sup>1</sup>The fusion of the left and right mandibular prominences, together with the mandibular symphysis that serves as their connecting structure, results in the formation of the mandible in the growing fetus<sup>2</sup>. The midline articulation, similar to other symphyses in the human body, is connected by fibrocartilage. Nevertheless, this integration occurs throughout the early stages of development<sup>3</sup>.

The symphyseal region has the highest degree of prominence and susceptibility to damage. Compression of the outer cortex and expansion of the inner cortex may lead to fracture when external pressures exceed the bone's ability to resist them. The lingual cortical plate contains a pair of genial tubercles, located in the midline and oriented in a supero-inferior direction. These tubercles serve as points of origin for the genioglossus and geniohyoid muscles. In cases of bilateral fracture occurring in the parasymphysis region, it is seen that the tongue experiences a loss of its anatomical attachment to the bone, resulting in a subsequent loss of control. Consequently, the tongue has a tendency to retract posteriorly. This is particularly true for patients who are unconscious, since the descent of the tongue might obstruct the passage of air, potentially leading to deadly consequences if appropriate measures are not taken to avoid it.<sup>4</sup>

The lower region of the facial structure comprises the mandible, which is the only mobile bone within the maxillofacial region. As a consequence of the mandible's symphysis being very prominent, it is particularly susceptible to injury in vehicle accidents and is also an attractive target in physical assaults<sup>5</sup>. Consequently, mandibular fractures are prevalent in the maxillofacial area. The social lives of those affected by this condition are also significantly influenced<sup>6</sup>.

The primary etiologies of fractures occurring in the ramus of the mandible include road traffic accidents, incidents involving slips

and falls, and cases of physical assault<sup>7</sup>. Occlusal abnormalities or the presence of an anterior open bite may be seen<sup>8</sup>.

The most prominent characteristic of the mandible is its symphysis, where the condyles articulate with the glenoid fossa of the temporal bone. This connection occurs at a specific location, known as point<sup>9</sup>. In cases of a fracture, there is a possibility of damage to the inferior alveolar neurovascular bundle, which traverses the bone. This trauma may lead to the formation of a hematoma and subsequent neurological impairment<sup>10</sup>. Additionally, the dentate region exhibits processes or projections that bear resemblance to teeth. Mandibular fractures often arise as a consequence of physical assaults and vehicular collisions. Some of the observed indications and symptoms include pain, swelling, changes in bite alignment, tingling sensation in the lower lip, accumulation of blood outside blood vessels, discoloration of the skin due to bleeding, teeth that are not firmly in place, and the ability to feel a crackling or grating sensation upon touch<sup>11</sup>. Based on their anatomical orientation, mandibular fractures may be classified into many distinct groups, as seen in Figure 1. These categories include symphysis/parasymphysis (30-50%), horizontal branch (21-36%), angle (15-26%), ramus (2-4%), condyle (20-26%), and coronoid process (1-2%)<sup>12</sup>.

The process of treatment for a fracture in the mandibular area that supports teeth will differ based on whether the patient has dentate or edentulous status<sup>13</sup>. The determination of the appropriate course of therapy is contingent upon the absence of teeth, since teeth play a crucial role in providing stability to fractures, whether via the use of osteosynthesis implantation or as an independent therapeutic method<sup>14</sup>. There are supplementary risks associated with a mandible lacking teeth, known as an edentulous mandible, when its height measures below 1 cm as determined by a panoramic radiograph or CT scan. This is due to the limited blood flow originating from the marrow (endosseous), necessitating the reliance of the healing bone on the blood supply provided by the periosteum encompassing the bone<sup>15</sup>. When a child in the mixed dentition stage has a fracture, it necessitates the implementation of many treatment approaches<sup>16</sup>.

Different types of body fractures may be classified as either open or closed. The distinction between these two factors is often obscured in cases of mandibular fractures, since fractures that involve the teeth inherently include the oral cavity. Open fractures are often seen in angle, body, and parasymphysis fractures, whereas closed fractures are more frequently seen in condylar, ramus, and coronoid process fractures<sup>17</sup>. There is a scarcity of scholarly material pertaining to fractures in the dentate region<sup>18</sup>. The objective of this research was to assess occurrences of fractures in the mandibular dentate region. The examination of mandibular fracture incidence and etiology might provide valuable insights for the development of preventive and therapeutic interventions, since it sheds light on patterns of community trauma.

**MATERIALS & METHODS**

**Study Design:** The present research is an observational and descriptive investigation including a sample of 52 patients with mandible fractures. The study was done at the Nishter Institute of Dentistry in Multan, Pakistan, spanning from September 2021 to February 2023. Following the endorsement of the research by the Ethical Review Board of the hospital, the patient records of all individuals who had surgical treatment for mandibular fractures were obtained from the computerized medical database of the aforementioned healthcare facility. The patients were recruited using a non-probability sequential sampling strategy. The research included individuals of all age groups and genders who had received surgical treatment for a solitary fracture in the dentate region of the mandible. The study comprised patients who had mandibular fractures that extended over the whole vertical dimension of the mandible. Patients who presented with infections during the first surgical procedure were excluded from the study. The research excluded individuals who presented with isolated injuries to soft tissue and hard tissue (namely, the teeth), individuals with previously treated instances of mandible fractures, and those with mandible fractures resulting from pathological conditions. A standardised form was used to document all relevant data, including patient information such as name, age, and gender, as well as details about the aetiology and location of the fracture, and the chosen treatment approach. The assessment of patients was conducted by a comprehensive evaluation that included a thorough review of pertinent medical history, as well as a comprehensive clinical examination and radiographic analysis. The assessment of mandibular fractures included doing extra-oral and intra-oral clinical evaluations, as well as using panoramic and posterior-anterior radiographs of the mandible. The patients had examination after their injuries, and the results of the first evaluation were documented. The confidentiality of patient records was maintained, and the data was input into SPSS version 26 for the purpose of analysing and determining the distribution of various variables in terms of percentages. The variables were shown in tabular format to illustrate their respective distribution in relation to frequency and percentage. A significance level of less than 0.05 was deemed statistically significant.

**RESULT**

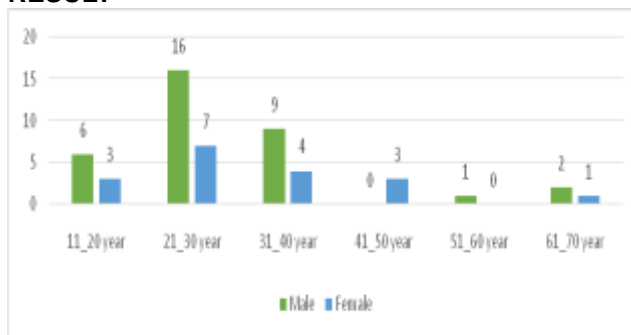


Figure 1: Age range of the patient at the time of injury (in years).

The study assessed dentate fractures across different age cohorts and observed that individuals between the ages of 21-30 exhibited the greatest incidence of dentate fractures. Conversely, those within the age range of 61-70 show the lowest likelihood of experiencing dentate fractures, maybe attributed to their higher levels of discipline.

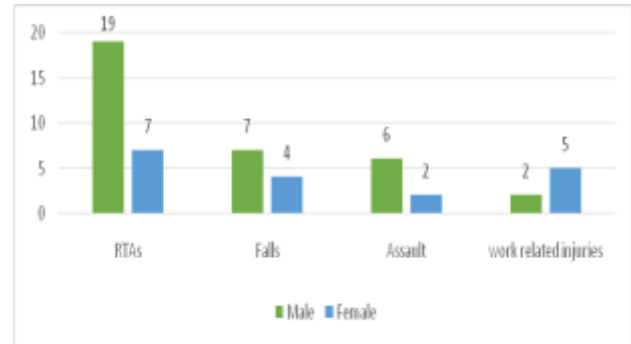


Figure 2: Distribution of causes of mandibular fractures

This research aimed to assess the aetiology of dentate fractures, revealing that the predominant cause of such fractures is road traffic accidents.

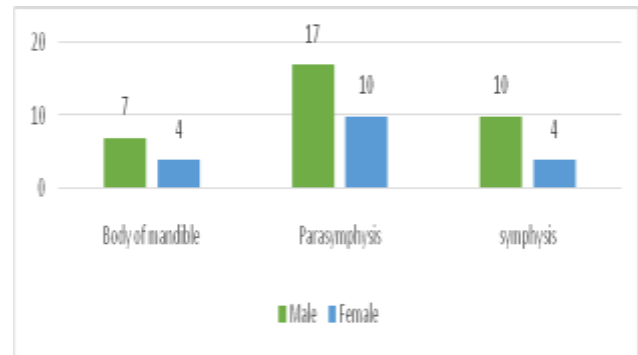


Figure 3: Distribution of areas involved in mandibular fracture

This research aimed to examine the distribution of fractures and determined that the parasymphysis region is the most often affected area, followed by the symphysis region.

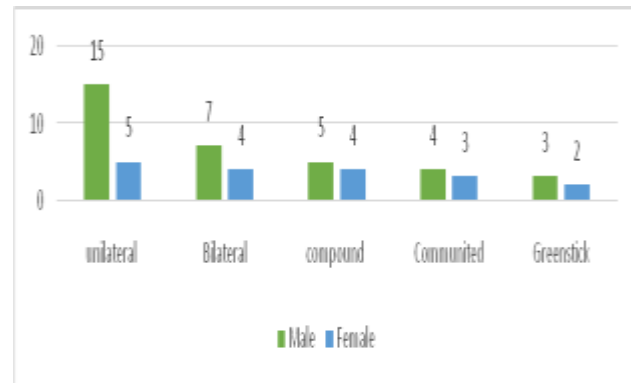


Figure 4: Distribution of types of mandibular fracture

The study assessed the prevalence of different kinds of fractures in the dentate area and found that unilateral fractures were the most often seen. Bilateral fractures rank as the second most often occurring kind of fracture.



Figure 5: Management options for mandibular fractures

A study demonstrated the existence of many management techniques used in the treatment of dentate fractures. The most prevalent treatment strategy seen was open reduction and internal fixation, followed by the utilisation of Intermaxillary fixation (IMF) as the second most often employed method.

## DISCUSSION

The prevalence of facial trauma has emerged as a social ailment that affects individuals universally, owing to the accelerated pace of contemporary lifestyles, the prevalence of high-speed transportation, and the escalating levels of aggression and intolerance within society<sup>19</sup>. Minor to severe deformities of the maxillofacial bone and functional loss may occur as a result of several variables, including alterations in face injury patterns, severity, and clinical characteristics<sup>20</sup>. Besides instances of violence and transportation accidents, it is noteworthy that sports-related incidents, falls, and firearm-related incidents may also lead to both direct and indirect trauma<sup>21</sup>. Occasionally, it may also manifest as a result of several other medical illnesses, including metabolic abnormalities, neoplasms, and cystic lesions<sup>22</sup>.

This research observed a positive correlation between age and the occurrence of dentate fractures, followed by a subsequent decline in prevalence at advanced stages of ageing. This phenomenon may perhaps be elucidated by the observation that children, who are under the age of six, get parental attention, which serves as a protective factor against the occurrence of severe injuries. Additionally, the higher flexibility of bones during this developmental stage contributes to a reduced likelihood of fractures. As individuals go through adolescence, their engagement in physical activities tends to increase. This trend continues into adulthood, when they often participate in contact sports, engage in reckless driving, and exhibit interpersonal aggression<sup>23</sup>.

The male population constitutes the majority, accounting for 54.0%, whilst the female population comprises a smaller proportion of 46.0%. A prior research effort identified road accidents and assault as the primary factors contributing to incidents, but the present inquiry did not observe any instances of such nature<sup>24</sup>. This research identifies road traffic accidents as the key etiological factor contributing to dentate fractures.

Among the 66 subjects included in the previous research, it was observed that 37 occurrences (56.1%) were unilaterally recorded, whereas 29 cases (43.94%) were reported as bilateral. Furthermore, it was shown that a majority of patients (62.12%) exhibited mandibular fractures as the only injury, but a minority (37.88%) presented with accompanying concomitant injuries, such as fractures in the mid-face region. The study evaluated the patient population with various kinds of fractures, revealing that unilateral fractures were the most prevalent type of fracture seen in the dentate region, with a frequency of 25 cases<sup>25</sup>. A bilateral fracture is the second most often occurring kind of fracture. The present investigation revealed that there were 5 cases (10%) of greenstick fractures, 20 cases (38%) of unilateral fractures, 11 cases (21%) of bilateral fractures, 9 cases (17%) of complex fractures, and 7 cases (14%) of comminuted fractures.

In the previous study, a total of 102 fracture sites were identified. Among these sites, the parasymphysis was the most often seen, accounting for 32 cases. This was followed by the body (5 cases), subcondyle (21 cases), angle (14 cases), symphysis (4 cases), comminuted (2 cases), ramus (1 case), condyle (1 case), coronoid (1 case), and dentoalveolar (1 case).<sup>26</sup> This research aimed to investigate the specific regions of fracture, revealing that the symphysis and para-symphysis regions exhibit the highest frequency of fractures. The bulk of these structures were composed of parasymphysis, accounting for 27 instances or 52%. Symphysis accounted for 14 instances or 27%, while the mandible body accounted for 11 instances or 21%. In the current investigation, the most often seen locations of mandibular fractures were found to be the parasymphysis, symphysis, and body. This suggests that the correlation between the place and degree of impact, rather than the etiological factor, is responsible for the occurrence of the fracture<sup>27</sup>. Patients in the higher age group (51 and above) had a greater number of fracture sites compared to patients in the lower age group, which may be attributed to the bigger tooth-to-bone ratio. Consequently, there was a decline in bone mass among individuals in the lower age group, whereas those in the higher age group saw an increase in bone fragility<sup>28</sup>.

## CONCLUSIONS

**The following conclusions have been drawn from the foregoing study:** Patients in the older age (51 years and over) exhibited a higher prevalence of fracture sites in comparison to patients in the younger age. This observation might perhaps be ascribed to the presence of a larger tooth-to-bone ratio. As a result, a decrease in bone density was seen among participants in the younger age category, whereas those in the older age category exhibited an elevation in bone fragility.

**Conflict of interest:** Nil

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