

# Incidence and Patterns of Mandibular Fractures: A Retrospective Institutional Study

**Running title:** Incidence and patterns of mandibular fractures

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## **Abstract**

The aim of this study was to assess patterns of mandibular fractures and its relationship with etiology. This descriptive, cross-sectional study analyzed all patients aged above 8 years who had been clinically or radiographically diagnosed with mandibular fractures from June, 2019 to March, 2020. Patients with pathological fractures or blast injuries were excluded. Data were analyzed using IBM SPSS Statistics for Windows, Version 20.0 (IBM Corp., Armonk, NY) and results obtained. Among 46 patients involved in mandibular fractures 41 were men (89.1%) and 5 were women (10.9%), and the majority of trauma patients (34.8%) were aged 21-30 years. The most frequent cause of mandibular fracture was road traffic accidents (RTA) mostly due to drunken driving (RTAs; 59.4%), followed by falls (18.8%). In patients with unilateral fractures, the most frequent site was the angle (23.9%), followed by the parasymphysis (15.2%). In patients with bilateral fractures, the most common sites were the dentoalveolar area (13%). All these results were statistically significant.  $p < 0.05$ . On comparing the association between type of mandibular fractures and the other associated fractures, the results were statistically not significant.  $p > 0.05$ . More mandibular fractures were present in men than in women mostly among the young adults. The most common etiological factor for mandibular fractures was road traffic accidents due to drunken driving, followed by falls. The most frequently fractured site was the angle of mandible followed by parasymphysis. The incidence of RTAs and resultant fractures may be reduced by strict prohibition of drunken driving, mandatory wearing of helmets, maintaining speed limits, and obeying proper traffic rules.

**Keywords:** mandibular fractures, maxillary fractures, road traffic accident, etiology, facial trauma.

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## INTRODUCTION

The facial area is one of the most common sites of injury. The mandible is fractured more frequently than any other facial bone, because it is exposed and protruding (Oberdan and Finn 2007; Bereket et al. 2015; Al-Moraissi and Ellis 2015). In addition to functional loss, a mandibular fracture can result in mild to moderate impairment or defect (Adhikari, Karmacharya, and Malla 2012).

Mandibular fractures are the most frequent type of fracture in the maxillofacial region. Mandibular fractures may occur alone or together with other facial bone fractures. The predicted ratio of mandible to zygomatic to maxillary bone fractures in patients experiencing maxillofacial injury is 9:4:1 (Khan et al. 2019).

The mandible is particularly prone to maxillofacial trauma because of its unique shape, mobility, and prominence in the facial skeleton. It is the second most common facial bone experiencing traumatic injuries, accounting for 15.5%-59% of all facial fractures (Ellis, Moos, and el-Attar 1985). Patients with a broken lower jaw experience pain, difficulty chewing and talking, and esthetic disfigurement (Zix et al. 2011; Sweta, Abhinav, and Ramesh 2019; Rao and Santhosh Kumar 2018; Patturaja and Pradeep 2016; S. Kumar 2017; Santhosh Kumar 2017; Jesudasan, Abdul Wahab, and Muthu Sekhar 2015). These injuries are often accompanied by psychological effects, along with significant financial costs (Vijayakumar Jain et al. 2019; Bhattacharya 2012).

The epidemiology of mandible fractures varies over time and in different countries (Patil et al. 2017; Packiri, Gurunathan, and Selvarasu 2017). The etiology of these fractures is multifactorial, with the type and frequency of fracture dependent on

socioeconomic status, culture, technology, demography, and economic factors (Christabel et al. 2016).

No recent comprehensive study has assessed the significance of mandibular fracture in South Asian countries. Therefore, this study analyzed patterns of mandibular fractures and associated fractures in patients evaluated at departments of maxillofacial surgery at Saveetha Dental College & Hospitals. Determining the frequency of mandibular fractures and their patterns of occurrence can enhance early diagnosis and treatment, thereby reducing morbidity and mortality associated with these fractures.

## MATERIALS AND METHODS

The present retrospective study was carried out at the department of oral and maxillofacial surgery of Saveetha Dental College and Hospital, Chennai. Patients aged above 8 years presenting with mandibular fractures, and treated in our institution from June 2019 to March 2020, were included in our study. The study was initiated after approval from the institutional review board. (SDC/SIHEC/2020/DIASDATA/0619-0320). Patients with pathological fractures were excluded from our study.

Patients were examined clinically and radiographically in the outpatient departments of Oral and Maxillofacial Surgery, and a detailed history was taken. Both intraoral and extraoral clinical photographs, X-rays (orthopantomogram) were properly analyzed and the parameters regarding fractures were recorded.

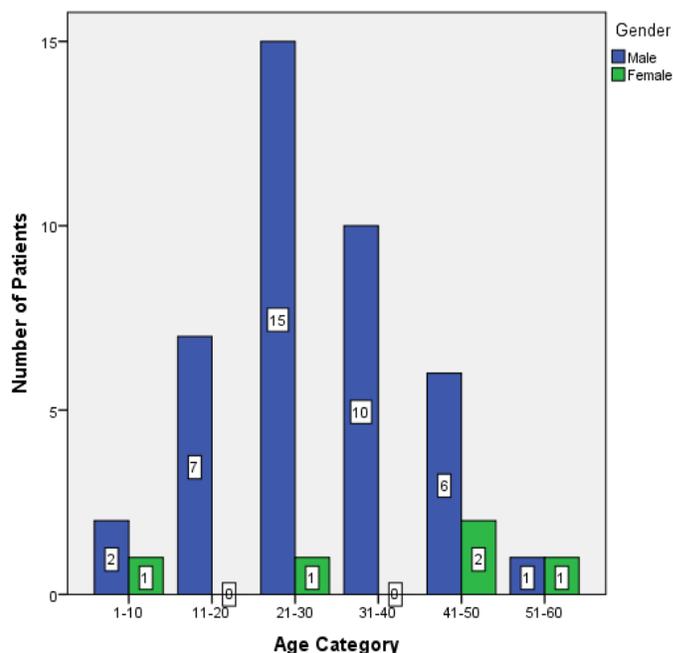
The study protocol was approved by the Ethical Committee and all included patients provided written informed consent. Patient information, including, name, age, and gender were recorded on pre-designed forms. Other parameters recorded were Type of

fracture, other associated fractures, type of reduction done, sides involved and presence of mandibular third molars based on radiographic and clinical details.

Data were analyzed using IBM SPSS Statistics for Windows, Version 20.0 (IBM Corp., Armonk, NY). Descriptive statistics were done. Continuous variables were reported as mean and standard deviation and categorical variables as frequency and percentage. Patients were stratified by age, gender, and site of mandibular fracture to determine the etiology, incidence and patterns of mandibular fractures. Tests of association between categorical variables were done using chi square test and results obtained. The level of statistical significance was set at  $P < 0.05$ .

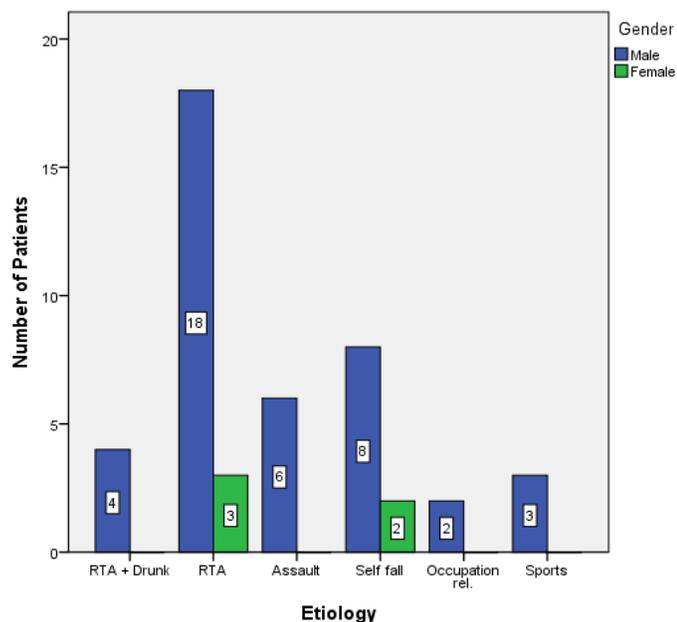
## RESULTS AND DISCUSSION

In our study, among 46 patients involved in mandibular fractures 41 were men (89.1%) and 5 were women (10.9%), with a male-to-female ratio of 9:1, thus showing a predominance of males in the study population. The majority of trauma patients (34.8%) were aged 21-30 years, 15.2% aged 11-20 years, 21.7% aged 31-40 years and 17.4% aged 41-50 years, indicating that young adults are mostly affected by mandibular fractures followed by middle aged adults. The results were statistically significant. ( $p < 0.05$ ). (Figure 1).



**Figure 1:** Bar chart depicting association between the age and gender distribution of the trauma patients. X-axis represents the age category and y axis denotes the number of trauma patients in each gender. Pearson's chi square test was done;  $p < 0.05$  and the results were statistically significant. Thus, male patients and most of the patients in the age category of 21-30 years had mandibular fractures.

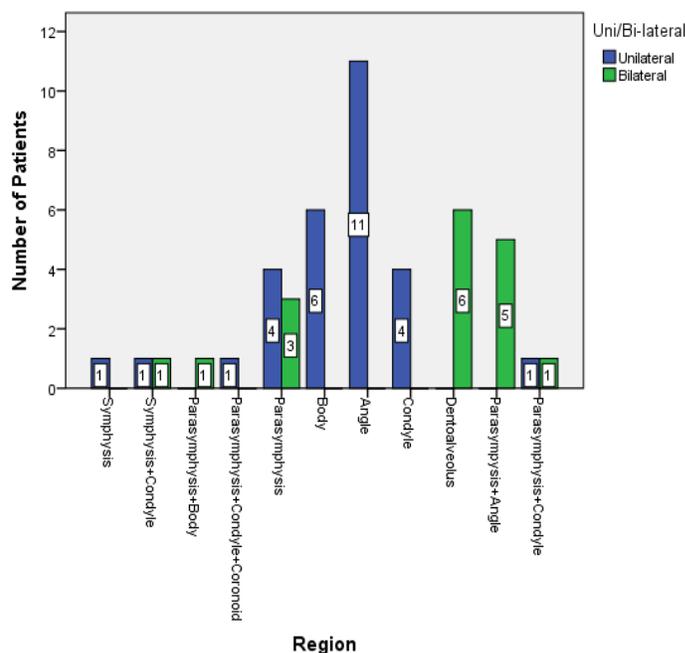
The most frequent cause of mandibular fracture was road traffic accidents (RTA) mostly due to drunken driving (RTAs; 59.4%), followed by falls (18.8%) and males were mostly affected in both the groups. Fractures due to sports and interpersonal violence were more frequent in men. The results were statistically significant. ( $p < 0.001$ ). (Figure 2).



**Figure 2:** Bar chart depicting the association between gender of trauma patients and etiology of mandibular fractures. X axis denotes the various etiologies for mandibular fractures and Y axis denotes the number of trauma patients in males and females. Pearson's chi square test was done;  $p < 0.001$  and the results were statistically significant. Thus, the most frequent cause of mandibular fracture was road traffic accidents and males were mostly affected.

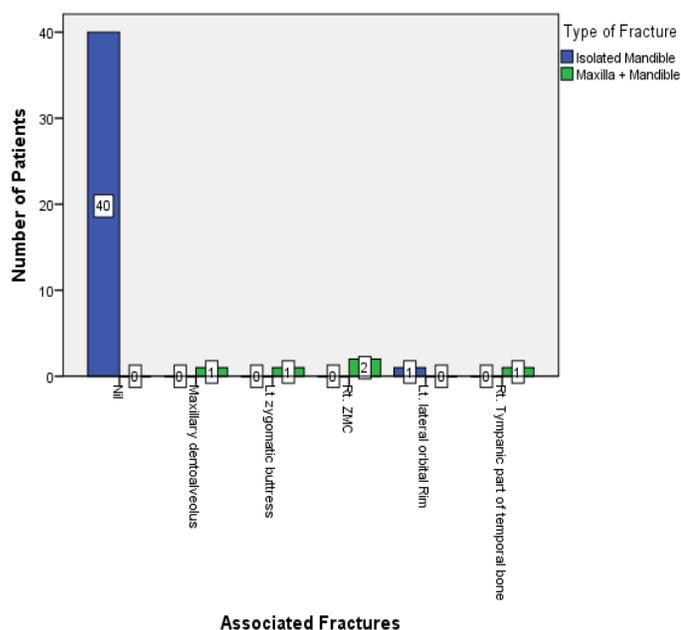
In patients with unilateral fractures, the most frequent site was the angle (23.9%), followed by the parasymphysis (15.2%). It can also be observed that the presence of a lower third molar is the leading cause of angle fractures. Other sites included the condyle (8.7%), body (13%), symphysis (2.2%). In patients with bilateral fractures, the most common sites were the dentoalveolar area (13%) and parasymphysis and angle (11.6%), followed by the symphysis and condyle (4.3%), parasymphysis and condyle (4.3%), parasymphysis and body (2.2%) and a combination of parasymphysis, body & coronoid (2.2%). The results were statistically significant.

( $p < 0.05$ ). (Figure 3).



**Figure 3:** Bar chart depicting the association between anatomic site of mandibular fractures and side of face affected. X axis denotes anatomic site of the mandibular fracture and Y axis denotes the number of trauma patients based on the sides affected. Pearson's chi square test was done;  $p < 0.001$  and the results were statistically significant. Thus angle region of mandible is the commonly affected site in unilateral mandibular fractures and dentoalveolar fracture commonly occurs in patients with bilateral mandibular fractures.

On comparing the association between type of mandibular fractures and the other associated fractures, the results were statistically not significant.  $p > 0.05$ . Thus the associated fractures did not occur at any specific region of the facial skeleton. (Figure 4).



**Figure 4:** Bar chart depicting association between type of mandibular fractures and the other associated fractures. X axis denotes associated fractures (in other sites) and Y axis denotes the number of trauma patients having mandible and maxilla fractures. Pearson’s chi square test was done;  $p > 0.05$  and the results were statistically not significant. Thus the associated fractures did not occur at any specific region of the facial skeleton.

Epidemiological surveys have shown that the causes, incidence, and patterns of mandibular fracture vary by geographical region, socioeconomic condition, cultural characteristic, and era. In the present study, 50% of patients with mandibular fracture were aged 11-30 years, consistent with the results of previous studies, but differs from that in a South Indian population (Almasri et al. 2015; Karyouti 1987); (Abhinav et al. 2019; Ogundare, Bonnicksen, and Bayley 2003). Moreover, mandibular fracture was more common in men than in women, with a 9:1 ratio, consistent with previous findings (Subhashraj, Ramkumar, and Ravindran 2008; Sakr, Farag, and Zeitoun 2006; Thorén et al. 1992). People are more active during the second and third decades of life than

during other decades, making them more vulnerable to trauma. Moreover, men participate in more outdoor activities than women.

Previous epidemiological studies have shown that RTA and falls are important causes of mandibular fracture in developing countries (Dongas and Hall 2002). In developed countries, however, the leading causes of mandibular fracture are physical assault and interpersonal violence (Santhosh Kumar and Rahman 2017; Down, Boot, and Gorman 1995). Helmet legislation markedly reduced the incidence of mandibular fracture due to RTA in developed countries, although the incidence was increased by the abuse of alcohol and the use of illicit drugs (Iqbal et al. 2020). The high number of mandibular fractures attributed to RTA in South India is likely due to the lack of strict helmet laws, speeding and overloading of vehicles, underage driving, and poor conditions of roads and vehicles. The high incidence of mandibular fractures due to assault was likely due to tribal quarrels and mode of life in South India.

In our study, the most common site of mandibular fracture was the angle (23.9%), followed by the parasymphysis (15.2%). Other sites included the condyle (8.7%), body (13%), symphysis (2.2%). The causes and anatomic sites of mandibular fracture may correlate. For example, the majority of angle fractures were caused by RTA and also due to the presence of impacted third molars. The most common bilateral fracture was dentoalveolar; whereas, the most common combination was parasymphysis and angle fracture. Similar findings were reported by a study in India (Abhinav et al. 2019).

An awareness campaign to educate the public, especially young drivers, about the importance of helmets and protective measures in motor vehicles should be started. Education of parents about the

consequences of falls in children may reduce the incidence of injury in pediatric populations (Marimuthu et al. 2018; V. Kumar, Patil, and Munoli 2015; Santhosh Kumar and Sneha 2016).

## CONCLUSION

More mandibular fractures were present in men than in women mostly in the young adults. The most common etiological factor for mandibular fractures was Road traffic accidents due to drunken driving, followed by falls. The most frequently fractured site was the angle of mandible followed by parasymphysis. The incidence of Road traffic accidents and resultant fractures may be reduced by strict prohibition of drunken driving, mandatory wearing of helmets, maintaining speed limits, and obeying proper traffic rules.

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