

# Mandibular Fractures at Veer Chandra Singh Garhwali Government Medical Science and Research Institute, Garhwal Region, Uttarakhand, India: A Retrospective Study

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## Abstract

**Background:** Mandibular fractures constitute a substantial proportion of cases of maxillofacial trauma. Demographic data related to mandibular fractures are difficult to evaluate because of many variables associated with the studies. The information is as diverse as the countries and the people who inhabit them. **Aim:** This is a retrospective study designed to determine the site distribution, associated fracture and causes of mandibular fractures in patients presenting to the trauma centre of Veer Chandra Singh Garhwali Government Medical Science and Research Institute, Uttarakhand, India. **Materials and Methods:** Records of 121 patients with confirmed mandibular fractures presenting over a three year period (i.e., 1<sup>st</sup> January 2008 to 31<sup>st</sup> December 2010). Data obtained from record included age, sex, site of fracture and causes. **Results:** There were 48/121 (39.6%) males and 73/121 (60.3%) females. The most predominant age group of fracture was found to be 21-30 (53/121-43.8%) followed by 11-20 (25/121-20.6%). In this study history of fall was the most common cause of mandibular fracture (66/121-54.5%), followed by road traffic accidents (45/121-37.1%), fights and assault (08/121-6.6%) and industrial accidents (02/121-1.6%). In our study most of the patients suffered from fracture in the parasymphysis (35/139-25.1%) and angle region (32/139-23.0%) followed by body (30/139-21.5%), condyle (21/139-15.1%), symphysis (19/139-13.7%), and ramus (02/121-1.4%) area. **Conclusion:** In this study mandibular fractures were more prevalent in females especially during the second and third decade of life. History of fall was the most predominant cause of mandibular fracture. The most frequently affected sites were parasymphysis and angle.

**Keywords:** Fall, Mandible fractures, Road traffic accident

## Introduction

Mandibular fractures constitute a substantial proportion of cases of maxillofacial trauma. They occur more frequently than any other fracture of the facial skeleton. It is the one serious facial injury that the average practicing dental surgeon may expect to encounter. Demographic data related to mandibular

fractures are difficult to evaluate and compare globally because of the many variables associated with studies. The information is as diverse as the countries and the people who inhabit them.<sup>[1]</sup> It has been reported that fractures of the mandible account for 36% to 59% of all the maxillofacial injuries.<sup>[2-4]</sup> The mandible is basically a tubular long bone which is bent in to a blunt V or U/horseshoe-shape. Even though it is a very strong bone, its prominent position on the face makes it particularly vulnerable to fracture. The fracture can occur at different parts of the bone; depending on the site of impact. Also because of the mandibles rounded shape, a traumatic injury may cause the fracture at more than one site.

The causes of mandibular fracture are chiefly road traffic accidents, interpersonal violence, falls, sporting injuries and industrial trauma. Despite the many variables associated with

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the etiology of mandibular fractures, vehicular accidents and assaults have been considered the major causes of mandibular fractures throughout the world. The literature showed that 43% of the mandibular fractures were caused by vehicular accidents, 34% were caused by assaults, 7% were work related, 7% occurred as a result of fall, 4% occurred in sporting accidents and the remainder had miscellaneous causes.<sup>[1]</sup>

Fractures occurring in the body, condyle and angle show a relatively similar incidence while ramus and coronoid fractures are rare.<sup>[5]</sup> In the cases evaluated for fracture location, the mean percentages were as follows: Body (29%), angle (25%), symphysis (17%), ramus (4%), and coronoid process (1%).<sup>[1]</sup>

Fridrich and associates showed that when fractures due to automobile accidents were considered, the condylar region was the most common site. When motorcycle accidents were considered, symphysis was most common affected and when assault was considered, angle demonstrated the highest incidence of fracture.<sup>[6]</sup> Ellis, *et al.*, have reported that 33% of mandibular fractures occur at the body, followed by condylar process (29%) and angle (23%).<sup>[4]</sup> Güven in another study has presented the following figures: Body (34%), angle (25%) and symphysis (20%).<sup>[7]</sup>

The purpose of this study was to describe the pattern of mandibular fractures at VCSGGMS and RI, age and sex of the patients related to etiology and distribution.

## Materials and Methods

This retrospective study was conducted involving patients with a history of mechanical injury to the facial region. All the patients with a confirmed mandibular fracture whether admitted to hospital and treated in operating room or seen and treated as outpatients were included in this study. A total of 121 patients were included in the study which were seen and treated in Veer Chandra Singh Garhwali Government Medical Science and Research Institute teaching hospital, which is located in the difficult hilly terrain of Uttarakhand, India. Sex, age, etiology and site of mandibular fracture were recorded and statistical analysis was completed. The mandibular fractures were classified according to the sites such as ramus, condyle, symphysis, body, parasymphysis and angle. The confirmed diagnosis of mandibular fractures was based on clinical examination correlated with relevant radiographic examination.

The radiographic views used for the diagnosis included postero anterior, left and right lateral oblique, panoramic and computed tomography. Simple descriptive statistics was employed.

## Results

A total of 121 patients with 140 injuries aged 5 to 78 years who presented with mandibular fractures during a 3 year period from 2008 to 2010 were included in the study. Most of the patients were female, 73/121 (60.3%) and 48/121 cases (39.7%) were

male [Table 1 and Figure 1]. The ratio of male to female is 1/1.52. Among males, the highest prevalence of fractures occurred in the age group 21-30 years followed by 11-20 years population. Similarly, amongst females more mandibular fractures occurred at the age of 21-30 years old. The elderly age group of 61-80 had the least mandibular fractures [Table 1].

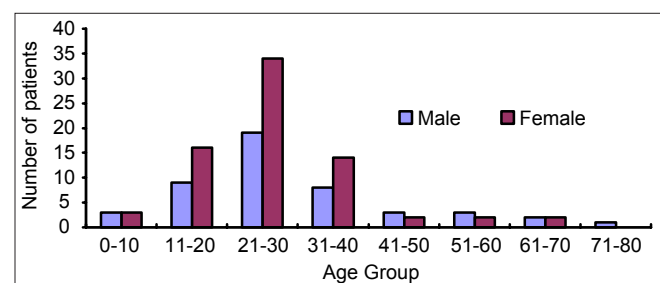
The mandibular fractures were predominantly caused by falls (66/121-54.5%). This was followed by road traffic accidents (45/121-37.1%), fight and assault (08/121-6.6%). The minimum incidence was of industrial accidents (02/121-1.6%). No cases were reported due to sports injury [Table 2 and Figure 2].

**Table 1: Age and sex distribution of patients**

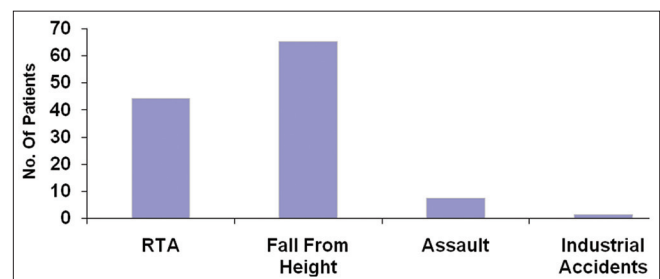
Age in years	Male, no	Female, no	Total no, (%)
0-10	03 (2.5)	03 (2.5)	6 (4.9)
11-20	09 (7.4)	16 (13.2)	25 (20.7)
21-30	19 (15.7)	34 (28.1)	53 (43.8)
31-40	08 (6.6)	14 (11.6)	22 (8.2)
41-50	03 (2.5)	02 (1.7)	5 (4.1)
51-60	03 (2.5)	02 (1.7)	5 (4.1)
61-70	02 (0.8)	02 (1.7)	4 (3.3)
71-80	01 (0.8)	00 (0.0)	1 (0.8)
Total	48 (39.6%)	73 (60.3%)	121

**Table 2: Causes of mandibular fracture**

Causes	N (%)
Road traffic accident	45 (37.2)
Falls	66 (54.5)
Fights and assault	08 (6.6)
Industrial accidents	02 (1.7)
Total	121



**Figure 1:** Garhwal region of Uttarakhand, India



**Figure 2:** Etiology of mandibular fractures

The site distribution of mandibular fractures is shown in Table 3. In our study most of the patients suffered from fracture in the parasymphysis (35/139-25.1%) and angle region (32/139-23.0%) followed by body (30/139-21.5%), condyle (21/139-15.1%), symphysis (19/139-13.7%), and ramus (02/121-1.4%) area. Table 3 also shows the distribution and combination of fractures. No case of coronoid fracture was reported.

Table 4 shows the relation of fracture site to cause of the mandibular fracture. When history of fall from height was considered symphysis, condyle and body were the most affected sites. On history taking it was found that most of the patients who had fall from height, fell on chin. This probably explains the high incidence of symphysis and condylar fractures in these patients. Parasymphysis and angle fractures were seen most commonly in road traffic accidents.

## Discussion

The mandible although considered the heaviest and the strongest facial bone, is more prone to fractures because it is an open arch, located in the lower portion of the face and atrophies with age. Additionally, the mechanism of hyperextension and hyperflexion of the head in traffic accidents makes it more vulnerable to fracture.<sup>[8]</sup> Oikarinen and Lindqvist studied 727 patients with multiple injuries sustained in traffic accidents; 11% of the patients had fractures of the facial bones. The most common facial fractures were in the mandible (61%), followed by the maxilla (46%), the zygoma (27%) and the nasal bones (19.5%).<sup>[9]</sup> In a study done amongst Nigerian intra-city road users the mandible (64.3%) recorded the highest incidence

of fractures.<sup>[10]</sup> The relative importance of various factors which affect the incidence of mandibular fractures is influenced by geography, social trends, road traffic legislation and seasons. In urban areas in more recent years particularly, interpersonal violence has accounted for an increasing proportion of mandibular fractures.<sup>[4]</sup>

Most patients in this study were females (60.3%) in the age group of 21-30 years. Umar and Abdullah reported a higher incidence in males with 11-20 being the predominant age group.<sup>[11]</sup> Few other studies also reported a higher incidence with male sex.<sup>[12,13]</sup>

However this ratio varies considerably from country to country.<sup>[14,15]</sup> Men are predominantly involved in mandibular fractures.<sup>[16,17]</sup> However, this present study shows a higher incidence of females ( $n = 73$ ) over males ( $n = 48$ ). This is in contrast to similar studies done in India as well. In a similar study done in Loni, Maharashtra in India, males formed 80.9% and females only 19.1% of the study population.<sup>[18]</sup> Similarly in a study done in Chennai, India, males formed 81% of the total population.<sup>[19]</sup>

Adekeye has reported that 74% of mandibular fractures are due to road traffic accidents.<sup>[20]</sup> Olson, *et al.*, reported that road traffic accidents were only responsible for 48% of the cases.<sup>[21]</sup> Subhashraj, *et al.*, reported RTA to be the major cause of mandibular fracture (73%) in a study done in a south Indian city. Similarly, Bither, *et al.*, founded RTA to be the most prevalent factor for mandible fracture (42.9%) in a study done in the rural population of Loni, Maharashtra, India followed by falls (25.9%). These differences may be attributed to the peculiar geographic features and social characteristics of dwellers in the study location. Although there are road safety regulations to reduce RTA, the maxillofacial injuries resulting from traffic accidents occur quite frequently.<sup>[22]</sup> Uniqueness of the present study is that RTA is responsible for less than half of mandibular fractures (37.1%), fall from height being the major cause of mandible fractures (54.5%) followed by fights and assault (6.6%) and industrial accidents (02/121-1.6%). RTA being the second major cause of mandible fractures is not similar to other previous studies.<sup>[11,18]</sup> However a significant finding in the present study was falls as a major cause of mandibular fractures in the Garhwal region of Uttarakhand. Out of 66 cases of fall leading to mandibular fractures 48 cases (42.8%) were fall from trees. A total of 41 female

**Table 3: Site distribution of mandibular fracture**

Site of fracture	No of patients (%)
Symphysis	15 (12.3)
Parasymphysis	28 (23.1)
Unilateral condyle	12 (9.9)
Angle	25 (20.7)
Ramus	02 (1.4)
Body	20 (16.5)
Symphysis and condyle	5 (4.1)
Parasymphysis and angle	7 (5.7)
Bilateral condyle	2 (1.4)
Bilateral body	5 (4.1)
Total	121 (99.9)

**Table 4: Relation of fracture type to cause**

Etiology of fracture	Symphysis no. (%)	Parasymphysis no. (%)	Condyle no. (%)	Angle no. (%)	Body no. (%)	Ramus no. (%)	Total no. (%)
RTA	02 (10.5)	20 (57.1)	04 (19.0)	23 (71.9)	04 (13.3)	02 (100)	55 (39.6)
Fall	16 (84.2)	11 (31.4)	15 (71.5)	06 (18.8)	22 (73.3)	-	70 (50.4)
Assault	01 (5.3)	03 (8.6)	02 (8.5)	02 (6.2)	02 (6.6)	-	10 (7.2)
Industrial	-	01 (2.9)	-	01 (3.1)	02 (6.6)	-	4 (2.9)
	19 (100)	35 (100)	21 (100)	32 (100)	30 (100)	02 (100)	139 (100.1)

RTA: Road traffic accident

patients (56.1%) suffered from mandibular fractures due to fall from trees. This is in contrast with other studies where fall from height is not a significant etiological factor for mandibular fractures.<sup>[4,10,11]</sup> In the present study it was found that most of the cases of fall were from height like fall from trees. The Garhwal region of Uttarakhand is a difficult hilly terrain with poor geographical and climatic conditions added with poor literacy and high unemployment. This causes men to leave home in search of work in cities, forcing women to take care of the house hold and do laborious work. It is in common practice for women in this region of Uttarakhand to climb trees for cutting wood both for domestic use as well as for commercial purpose. This also explains a higher incidence in women as compared to men in this region. However, in developed countries assaults were reported as the main cause for mandibular fractures.<sup>[4,23,24]</sup> In Sweden, alcohol or narcotic involvement in mandibular fracture has been reported to be as high as 56%, and most of the cases associated with violence (79%) are linked to alcohol abuse.<sup>[25]</sup> In Finland, 44% of mandibular fractures were associated with alcohol abuse.<sup>[26]</sup> The present study shows a very low incidence of mandibular fractures due to assault or violence i.e., 6.6%. It has been found in various studies that use of alcohol in men is a key factor in causing facial fractures. Combination of drinking and driving has always been considered to be lethal. Most of the cases of interpersonal violence in men have also been seen after alcohol consumption. In our study also 29 out of 48 males were under the influence of alcohol. In our study none of the females were found to be under the influence of alcohol when brought to the hospital.

In our study most of the patients suffered from fracture in the parasymphysis (25.1%) and angle region (23%) followed by body (21.5%), condyle (15.1%), symphysis (13.7%), and ramus (1.4%) area. The result was similar to Akosy, *et al.*<sup>[16]</sup> Elsewhere, the most common site of mandibular fractures was reported differently such as condyle of mandible, symphysis<sup>[16,27]</sup> and body.<sup>[28]</sup> The difference might be a reflection of the causative factor. In the present study when fractures due to road traffic accidents were considered, parasymphysis and angle were the most common sites. Assault also resulted in angle fractures. When history of fall was considered symphysis, condyle and body were the most affected.

Open reduction and internal fixation was carried out in 96/121 patients (79.3%) and closed reduction i.e., Intermaxillary fixation in 20/121 patients (16.5%) and cap splint fixation with circummandibular wiring was done for 5/121 patients (4.1%).

## Conclusion

The striking feature in the present study was that mandibular fractures were more prevalent in females in the Garhwal region of Uttarakhand. Fall from height form the major cause for mandibular fractures in this hill terrain followed by road traffic accident. The most frequently affected sites

are the parasymphysis and the angle region of the mandible. Socioeconomic reasons such as cattle breeding, poverty, men employed in cities, poor literacy and lack of essential things like cooking gas etc., could be the possible explanations in particular for this pattern of mandibular fractures in this part of the country. Health education channeled at prevention of mandibular fractures from falls should form a part of enlightenment campaign in the Garhwal region of Uttarakhand.

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