

## Prevalence of mandibular fracture in patients visiting a tertiary dental care hospital in North India

### ABSTRACT

**Background:** Injuries of the maxillofacial complex represent one of the most important health problems worldwide. At present, in developing India, due to poor traffic sense, maxillofacial trauma and fractures are most epidemiologic diseases. Mandible is the largest and strongest facial bone and it is the second most commonly fractured bone. Mandibular fractures can involve only one site or can often involve multiple anatomic sites simultaneously.

**Aims:** The present study is aimed to know the age- and sex-related prevalence of parasymphyseal fracture, fracture of angle, condylar fracture, symphyseal fracture, and coronoid fracture of mandible in North Indian population. It also evaluates the correlation of prevalence of parasymphyseal fracture, angle of mandible, condylar fracture of mandible, symphyseal fracture of mandible, and coronoid fracture of mandible.

**Materials and Methods:** All patients fulfilling the selection criteria and having mandible fracture were selected for the study. The data about mandibular fracture was collected by means of a structured questionnaire including age, sex, and anatomic site of fracture. Qualitative variables were compared using Chi-square test/Fisher's exact test as appropriate.

**Results:** The study population consists of 1015 individuals aged between 7 and 68 years with the mean age of  $33.49 \pm 11.79$  years. The most common anatomic site for mandibular fracture was parasymphyseal region (40.3%) followed by angle (28.8%), condyle (27.6%), and symphysis (12.5%) of mandible. The coronoid process of mandible (44, 4.3%) was least involved in mandibular fracture. Males (30.8%) are more predilected for condylar fracture than females (15.7%). The mandibular symphyseal fracture is more common in male (14.9%) than female (3.7%).

**Conclusion:** Mandibular fractures occur in people of all ages and races, in a wide range of social settings. Their causes often reflect shifts in trauma patterns over time. The present assessments of mandibular fracture will be valuable to government agencies and health-care professionals involved in planning future programs of prevention and treatment.

**Keywords:** Mandibular fracture, maxillofacial injuries, trauma

### INTRODUCTION

The strenuous pace of modern life with high speed travel as well as an increasingly violent and dictatorial society has made facial trauma, a form of social disease from which no one is immune. There are changes in patterns of facial injuries, extent, clinical features, and so forth resulting in mild-to-massive disfigurement of maxillofacial skeleton along with functional loss. Besides road traffic accident (RTA) and violence, direct/indirect trauma may also occur due to sports activities, falls, and firearms. Occasionally, it may also be secondary to certain disease entities such as cystic lesion, neoplasms, and metabolic diseases.<sup>[1]</sup> The fracture is defined as "breach in the continuity of bone."<sup>[2]</sup> Facial area is one of

the most frequently injured areas of the body, accounting for 23%–97% of all facial fractures.<sup>[3]</sup>

The mandible is a unique bone having a complex role in esthetics of the face and functional occlusion. Because of the

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prominent position of the lower jaw, mandibular fractures are the most common fractures of the facial skeleton. It has been reported that fractures of the mandible account for 36%–59% of all maxillofacial fractures.<sup>[4]</sup> Despite the fact that it is the largest and strongest facial bone, it is the tenth most often injured bone in the body<sup>[5]</sup> and second to nasal bone fractures,<sup>[6]</sup> and it is fractured two or three times more often than other facial bones.<sup>[7]</sup> Ill-treated or wrongly treated mandibular fractures culminating to significant functional and esthetic emanation including facial asymmetry, malocclusion, temporomandibular joint disorders (TMJDs), and osteomyelitis. The age distribution of individuals sustaining craniomaxillofacial injuries differs from one country to another. Conventionally, there has been a high male-to-female ratio among craniomaxillofacial injury victims, ranging from 10:1–6.6:1. However, the recent literature shows a trend toward a more equal male-to-female ratio.<sup>[5]</sup>

Despite many reports about the incidence, diagnosis, and treatment of mandibular fracture, there is limited knowledge about the specific type or pattern of mandibular fractures in Indian and subcontinental countries.

King George's Medical University is a large teaching hospital in Lucknow, which serves a densely populated area of great cultural and ethnic diversity. Many people are of low socioeconomic status. Although previous authors have described the general trends in maxillofacial trauma,<sup>[8]</sup> but there is scarcity in the studies investigating the pattern of mandibular fractures in North-Central India. We aimed to evaluate the epidemiology of mandibular fractures in patients who presented to our center over a 10-year period. Understanding the patterns of injury and their causes is essential for the primary prevention of trauma and also for the efficient allocation of health-care resources.

## MATERIALS AND METHODS

The present study is a retrospective study that included all cases of mandibular fractures that were clinically and radiographically diagnosed at our institution from January 2017 to December 2017. The study population consists of individuals from 7 to 68 years of age, with either sex being included. The study individuals having developmental disorders, pathology, and tumors of mandible were excluded from the study. The data about mandibular fracture were collected by means of structured questionnaire including age, sex, and anatomic site of fracture.

### Statistical analysis

Categorical variables were presented in number and percentage (%). Qualitative variables were compared using

Chi-square test/Fisher's exact test as appropriate.  $P < 0.05$  was considered statistically significant. The data were entered into MS EXCEL spreadsheet and analysis was done using SPSS Statistics 21.0 – Released on August 2012 Latest version, owned by IBM.

## RESULTS

The study population consists of 1015 individuals aged between 7 and 68 years with the mean age of  $33.49 \pm 11.79$  years [Table 1]. Majority of the patients were between 18 and 35 years of age [Table 2]. Males (78.6%) have predominated the study population than females (21.4%) [Table 3]. The most common anatomic site for mandibular fracture was parasymphyseal region (40.3%) [Table 4] followed by angle (28.8%) [Table 5], condyle (27.6%) [Table 6], and symphysis (12.5%) [Table 7] of mandible. The coronoid process of mandible (44, 4.3%) was least involved in mandibular fracture [Table 8]. Males (42.4%) suffered more parasymphyseal injury than females (32.7%) [Table 9].

**Table 1: Total no. of individuals**

	<i>n</i>	Minimum	Maximum	Mean $\pm$ SD
Age	1014	7	68	33.49 $\pm$ 11.790

SD: Standard deviation

**Table 2: Age intervals and frequencies**

Age intervals (years)	Frequency (%)
Below 18	105 (10.3)
18-35	481 (47.4)
36-50	337 (33.2)
51-60	82 (8.1)
>60	10 (1.0)
Total	1015 (100.0)

**Table 3: Gender predisposition and their frequency**

Gender	Frequency (%)
Male	798 (78.6)
Female	217 (21.4)
Total	1015 (100.0)

**Table 4: Frequency of parasymphyseal fracture**

Parasymphyseal fracture	Frequency (%)
Yes	409 (40.3)
No	606 (59.7)
Total	1015 (100.0)

**Table 5: Frequency of angle fracture**

Angle fracture	Frequency (%)
Yes	292 (28.8)
No	723 (71.2)
Total	1015 (100.0)

The mandibular angle fracture is more common in females (47.9%) than males (23.6%). This association is statistically significant ( $P < 0.001$ ) [Table 10]. The correlation between condylar fracture and gender showed that males (30.8%) are more predilected for condylar fracture than females (15.7%) and this correlation was statistically significant ( $P < 0.001$ ) [Table 11]. The mandibular symphyseal fracture is more common in males (14.9%) than females (3.7%). It was statistically significant ( $P \leq 0.001$ ) [Table 12]. The correlation between gender and coronoid fracture showed that it is more common in females (4.6%) than males (4.3%) and this correlation was statistically nonsignificant ( $P < 0.824$ ).

**Table 6: Frequency of condylar fracture**

Condylar fracture	Frequency (%)
Yes	280 (27.6)
No	735 (72.4)
Total	1015 (100.0)

**Table 7: Frequency of symphyseal fracture**

Symphyseal fracture	Frequency (%)
Yes	127 (12.5)
No	888 (87.5)
Total	1015 (100.0)

**Table 8: Frequency of coronoid fractures**

Coronoid fracture	Frequency (%)
Yes	44 (4.3)
No	971 (95.7)
Total	1015 (100.0)

**Table 9: Association of gender and parasymphiseal fractures**

Parasymphiseal fracture	Gender		Total (%)
	Male (%)	Female (%)	
Yes	338 (42.4)	71 (32.7)	409 (40.3)
No	460 (57.6)	146 (67.3)	606 (59.7)
Total	798 (100.0)	217 (100.0)	1015 (100.0)

**Table 10: Association of gender and angle fractures**

Angle fracture	Gender		Total (%)
	Male (%)	Female (%)	
Yes	188 (23.6)	104 (47.9)	292 (28.8)
No	610 (76.4)	113 (52.1)	723 (71.2)
Total	798 (100.0)	217 (100.0)	1015 (100.0)

**Table 11: Association of gender and condylar fractures**

Condylar fracture	Gender		Total
	Male (%)	Female (%)	
Yes	246 (30.8)	34 (15.7)	280 (27.6)
No	552 (69.2)	183 (84.3)	735 (72.4)
Total	798 (100.0)	217 (100.0)	1015 (100.0)

The correlation between gender and coronoid fracture showed that it is more common in females (4.6%) than males (4.3%) and this correlation was statistically nonsignificant ( $P < 0.824$ ) [Table 13]. The parasymphiseal fracture is studied in the age groups by Fischer's test, and it was concluded that it was most common in 18–35 years followed by 36–50 years of age; however, minimum cases were reported in >60 years of age group and it was statistically significant ( $P$  value = 0.014) [Table 14]. The mandibular angle fracture was most common in 18–35 years followed by 36–50 years of age, and minimum cases were found in >60 years of age group and it was statistically significant ( $P \leq 0.001$ ) [Table 15]. The condylar fracture was most common in 51–60 years of age followed by 36–50 years; however, minimum cases were reported in >60 years of age group and it was statistically significant ( $P \leq 0.001$ ) [Table 16]. Symphyseal fracture is most common in <18 years of age group followed by 36–50 years; however, minimum cases were found in >60 years of age group and it was statistically significant ( $P = 0.010$ ) [Table 17]. The coronoid fracture was most common in 18–35 years of age group followed by 36–50 years; however, minimum cases were seen in <18 years of age group and it was statistically significant ( $P \leq 0.001$ ) [Table 18].

## DISCUSSION

Maxillofacial injuries have advanced to engender the debate among researchers all over the world due to the fact that it affects victim's functional and cosmetic deformities. And also, the etiological factors and pattern of maxillofacial injuries have been observed that it varies from one geographical area to another depending on the socioeconomic status, geographic condition, and cultural characteristics.<sup>[4,9,10]</sup> As it is proved that mandible is the only facial bone that has mobility and the remaining portion is part of the fixed facial axis, the fracture of mandible is never neglected because it is very arduous pain that aggravates on mastication and phonation movements and even respiratory movements. Sometimes, there are facial asymmetry complaints. Mandible fractures may lead to deformities caused by displacement or nonrestored bone losses, with dental occlusion affection or TMJD.<sup>[11]</sup> Therefore, it is very mandatory to fathom their epidemiology that will concede us to more effectively destinate our preventive efforts and reconstruct current trauma evaluation practices.<sup>[12]</sup> The present retrospective study was conducted in King George's Medical University, Lucknow, in which 1015 cases of mandibular fractures were reviewed.

In the present study, 1015 cases were reviewed. Majority of the patients were between 18 and 35 years of age (47.4%)

followed by the age group of 36–50 years (33.2%). This was authenticated by Kamulegeya *et al.*,<sup>[13]</sup> Ahmed *et al.*,<sup>[14]</sup> and Leles *et al.*,<sup>[9]</sup> who stated in their study that the predominance

of fracture was observed in the 18–34 years of age group and mostly males were affected. The reason behind that might be in this period of life, people were more engaged in sporting, fights, violent activities, industry, and high-speed transportation and also there was adrenaline rush which urged them to indulge in dangerous physical activities. The low frequencies in the very young and old age groups were due to reduced physical activities. Other authors also backed these reasons. The sex ratio in the present study population showed that male patient proportion (78.6%) was higher than female (21.4%). This was authenticated by Kamulegeya *et al.*,<sup>[13]</sup> Ahmed *et al.*,<sup>[14]</sup> Leles *et al.*,<sup>[9]</sup> and Qudah *et al.*,<sup>[15]</sup> who observed male predominance of 3:1 in their study, but Subhashraj *et al.*<sup>[7]</sup> stated male:female ratio as 5.1:1 in their study. The reason for male predominance was due to their more frequent participation in high-risk activities, such as driving vehicles, sports that involve physical contact, an active

**Table 12: Association of gender and symphyseal fractures**

Symphyseal fracture	Gender		Total (%)
	Male (%)	Female (%)	
Yes	119 (14.9)	8 (3.7)	127 (12.5)
No	679 (85.1)	209 (96.3)	888 (87.5)
Total	798 (100.0)	217 (100.0)	1015 (100.0)

**Table 13: Association of gender and coronoid fractures**

Coronoid fracture	Gender		Total (%)
	Male (%)	Female (%)	
Yes	34 (4.3)	10 (4.6)	44 (4.3)
No	764 (95.7)	207 (95.4)	971 (95.7)
Total	798 (100.0)	217 (100.0)	1015 (100.0)

**Table 14: Association of age and parasymphyseal fractures**

Parasymphyseal fracture	Age intervals (years)					Total
	Below 18 (%)	18-35 (%)	36-50 (%)	51-60 (%)	>60 (%)	
Yes	56 (53.3)	192 (39.9)	134 (39.8)	25 (30.5)	2 (20.0)	409 (40.3)
No	49 (46.7)	289 (60.1)	203 (60.2)	57 (69.5)	8 (80.0)	606 (59.7)
Total	105 (100.0)	481 (100.0)	337 (100.0)	82 (100.0)	10 (100.0)	1015 (100.0)

**Table 15: Association of age and angle fractures**

Angle fracture	Age intervals (year)					Total
	Below 18 (%)	18-35 (%)	36-50 (%)	51-60 (%)	>60 (%)	
Yes	11 (10.5)	151 (31.4)	102 (30.3)	22 (26.8)	6 (60.0)	292 (28.8)
No	94 (89.5)	330 (68.6)	235 (69.7)	60 (73.2)	4 (40.0)	723 (71.2)
Total	105 (100.0)	481 (100.0)	337 (100.0)	82 (100.0)	10 (100.0)	1015 (100.0)

**Table 16: Association of age and condylar fractures**

Condylar fracture	Age intervals (years)					Total
	Below 18 (%)	18-35 (%)	36-50 (%)	51-60 (%)	>60 (%)	
Yes	22 (21.0)	119 (24.7)	102 (30.3)	35 (42.7)	2 (20.0)	280 (27.6)
No	83 (79.0)	362 (75.3)	235 (69.7)	47 (57.3)	8 (80.0)	735 (72.4)
Total	105 (100.0)	481 (100.0)	337 (100.0)	82 (100.0)	10 (100.0)	1015 (100.0)

**Table 17: Association of age and symphyseal fractures**

Symphyseal fracture	Age intervals (years)					Total
	Below 18 (%)	18-35 (%)	36-50 (%)	51-60 (%)	>60 (%)	
Yes	21 (20.0)	57 (11.9)	46 (13.6)	3 (3.7)	0	127 (12.5)
No	84 (80.0)	424 (88.1)	291 (86.4)	79 (96.3)	10 (100.0)	888 (87.5)
Total	105 (100.0)	481 (100.0)	337 (100.0)	82 (100.0)	10 (100.0)	1015 (100.0)

**Table 18: Association of age and coronoid fractures**

Coronoid fracture	Age intervals (years)					Total
	Below 18 (%)	18-35 (%)	36-50 (%)	51-60 (%)	>60 (%)	
Yes	1 (1.0)	31 (6.4)	10 (3.0)	2 (2.4)	0	44 (4.3)
No	104 (99.0)	450 (93.6)	327 (97.0)	80 (97.6)	10 (100.0)	971 (95.7)
Total	105 (100.0)	481 (100.0)	337 (100.0)	82 (100.0)	10 (100.0)	1015 (100.0)

social life, and drug and alcohol habits, whereas on contrary females most often were confined to housework and they drove vehicles less frequently and carefully and were less exposed to accidents, fights, industrial works, and sports and less participated in trading or farming.<sup>[16]</sup> Furthermore, Dibaie *et al.*<sup>[17]</sup> observed in the study that males were more prone to traffic accidents since they drove motor vehicles carelessly and most likely to be involved in interpersonal violence; this supported our study results.

In the present study, it was noted that common site of location of fracture was parasymphiseal fracture (40.3%) followed by angle (28.8%) and coronoid process of mandible (4.3%). This was supported by Barde *et al.*<sup>[18]</sup> and Adi *et al.*,<sup>[19]</sup> who showed that the parasymphiseal fracture was the most common site of mandibular fractures. Malik *et al.*<sup>[20]</sup> also found parasymphysis as the most common site of fracture in the mandible.

The mandibular angle fracture is more common in females (47.9%) than males (23.6%) and this association is statistically significant ( $P < 0.001$ ). Olson *et al.*<sup>[21]</sup> showed that there was a higher incidence of angle involvement in patients with mandibular trauma in females than males. However on contrary, Patel *et al.*,<sup>[22]</sup> Adekeye,<sup>[23]</sup> Nair and Paul,<sup>[24]</sup> and Adebayo *et al.*,<sup>[25]</sup> concluded that mandibular angle fracture is more common in males than females who reported the body as the most prominent site whereas van Beek and Merckx<sup>[26]</sup> found the condyle as the most common site and Chalya *et al.*<sup>[27]</sup> stated the angle as the most prominent site of fracture. Barde *et al.*<sup>[18]</sup> stated that the parasymphiseal fractures were found to be most common in RTAs while fall resulted in maximum fractures at condyle region. Mandibular angle fractures were most common in assault cases while symphysis and condyle fractures were rare. On associating gender with mandibular fracture, the present study showed that males were more involved than females in parasymphiseal, condylar, and symphyseal fracture with a significant  $P$  value. On associating age with mandibular fracture, the present study showed that maximum cases were found in 18–35 years in all fractures whether parasymphiseal, symphyseal, condylar, angle, and coronoid region followed by 36–50 years of age group. On correlating condylar with parasymphiseal fracture, it was found that 5.1% are those who had condylar as well as parasymphiseal fracture and it was statistically significant. Facial injuries of all severity levels can be reduced by 25% by the use of restraints, thereby decreasing the frequency of health-care services.<sup>[28]</sup> Preventive measures such as the obligatory wearing of a crash helmet, use of seat belt and the accentuated enforcement of the law regarding “drinking and driving,” educating individuals about

the dangers of all-terrain injuries, and providing proper safety guidelines before the purchase of a vehicle showed striking reduction in RTAs. Traffic accidents are the leading cause of maxillofacial fractures from the observations made from the study. Citizen awareness programs have to be initiated. Legislative preventive measures are to be enforced and abided by every citizen.

## CONCLUSION

Epidemiological reviews and studies of these mandibular injuries are essential to identify the risk factors leading to such trauma and help to train medical and dental practitioners to diagnose facial trauma and to provide immediate and long-term treatment. Hopefully, the present study proves to be a milestone in the success of treatment and the implementation of preventive measures is more reliant on the epidemiological assessments.

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## Conflicts of interest

There are no conflicts of interest.

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