

## Analysis of mandibular fractures – a retrospective study

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### Abstract

**Aim:** The aim of the study was to analyse the incidence, etiology, and localization of mandibular fractures treated in the Department of Oral and Maxillofacial Surgery, Govt. Dental College & Hospital, Rajeev Gandhi Institute of Medical Sciences, Kadapa.

**Materials and Methods:** The medical records of 218 patients with mandibular fractures, treated between 1 January 2015 and 31 December 2017, were reviewed and the following data were analysed: age, gender, etiology, fracture area and treatment.

**Results:** The male: female ratio was 3.9: 1. The majority of patients (55.96%) were young people, aged 11-30 years. The main cause of mandibular fractures was Road traffic accidents (RTAs) (73.85%) followed by falls (20.64%) and assaults (4.59%). The most common fracture area was parasymphysis (26.61%) followed by mandibular angle (11.47%) and condylar process fractures (11.01%). Closed reduction was done in 25.68% of patients, open reduction and internal fixation was performed in 72.93% of cases, while 1.37% of them were treated conservatively.

**Conclusions:** The presented results are in line with other studies. The present study highlights the importance of strict enforcement of traffic regulations, assessment and development of preventive schemes to reduce the incidence of Road traffic accidents.

**Keywords:** Maxillofacial Trauma, Road traffic accidents, Mandibular Fractures.

### Introduction

The Mandible is particularly more prone for maxillofacial trauma and fractures due to its unique mobility, shape and chin prominence in the facial skeleton. Mandibular fracture is the second most common facial injury after nasal bone fractures.<sup>1</sup> It is the 10th most fractured bone in the whole body<sup>2</sup> and accounts for 15.5% to 59% of all facial fractures.<sup>4</sup> Surveys have shown that the etiology of mandibular fractures varies from one country to another and even within the same country depending on the prevailing socioeconomic, cultural and environmental factors.<sup>3</sup> The location and pattern of the fractures are determined by the mechanism of injury and the direction of the vector of the force. In addition to this, the patient's age, the presence of teeth, and the physical properties of the causing agent also have a direct effect on the characteristics of the resulting injury.<sup>5</sup> Purpose of our study was to evaluate the incidence, etiology and pattern of fractures of the Mandible over a retrospective period of three years from 2015–2017.

### Materials and Methods

This study is based on the data pertaining to patients who suffered trauma and attended the oral & maxillofacial surgery department, Govt. Dental College & Hospital from Jan 2015 to Dec 2017. Govt. Dental College & Hospital is attached to Rajeev Gandhi Institute of Medical Sciences which is a tertiary level care hospital located in Kadapa district of Andhra Pradesh. Data was collected from patients medical records, which are standardized. The variables analyzed included age, sex, etiology of injury, anatomic site of

fracture, associated maxillofacial trauma, and treatment. The cause of injury is divided into 1) Road traffic accidents, which included accidents involving automobiles, motorcycles, and bicycles; (2) falls (3) interpersonal violence, assault; (5) sporting injuries; and (6) others.

### Exclusion Criteria

1. Cranial bone fractures and soft tissue injuries were usually referred to emergency departments and managed without recording.
2. Isolated nasal bone fractures were also not included in the study as they were managed by ENT team.

### Results

In three years of retrospective study 218 patients had sustained mandibular fractures.

**Mandibular Fractures Distribution by Gender:** Of the total 218 patients males accounted for 79.82%(174) and females accounted for 20.18%(44) resulting in a male to female ratio of 3.9:1. (Table 1)

**Mandibular Fractures Distribution by Age:** Patients with mandibular fractures ranged from a 6 yr old girl to a 77yrs old male. The age group 21-30yrs revealed the highest incidence of mandibular fractures 38%(83), this was followed by age group 31-40yrs 18%(41). Age distribution in patients with fractures 0.92%(2) occurred in first decade, 17.89%(39) occurred in second, 38.07%(83) in third, 18.81%(41) in fourth, 16.51%(36) in fifth, 5.96%(13) in sixth, 1.38%(3) in seventh and 0.46%(1) in eighth. Of all injuries 75.69%(165) occurred in first four decades of life. (Table 2)

**Mandibular Fractures Distribution by Etiology:** In this study the major cause of mandibular fractures was Road traffic accidents consisting of 73.85%(161)of entire sample the second most common cause was falls 20.64%(45) followed by assault 4.59%(10), sports 0.46%(1) and others 0.46%(1). (Table 3)

Of the patients injured in automobile accidents 62.84%(134) were male and 11.01%(24) were female. 42.66%(93) were less than 30yrs old, 29.82%(65) were between 20 and 29 yrs of age. Falls accounted for 20.64%(45) of mandibular fractures with 14.22%(31) in men and 6.42%(14) occurred in women. Most of the patients sustained fractures during syncopal attacks, seizures, fall from height, in some cases cause of injury was not clear. Altercations were accounted for 4.59%(10) with equal distribution among male & female patients. Most commonly assaults resulted because of interpersonal violence, spouse abuse was reported especially in female patients.

**Anatomical Distribution of Fractures:** Of 218 patients who had mandibular fractures 74.31%(162) patients this was the only facial bone involved the other

25.69%(56) were found to have associated with other fractures, in this study single parasymphysis fractures were the most common constituting 26.61%(58) of the total followed by angle fractures accounted for 11.47%(25) and condyle 11.01%(24), remainder of the fractures were distributed as follows dentoalveolar 9.63%(21), body fractures 7.34%(16), symphysis 6.88%(15), ramus 1.38%(3) as single fractures. Table 4

**Combination of Mandibular Fractures:** 11 different mandibular fracture combinations involving more than one fracture were observed. The most common combinations were parasymphysis and condyle 5.96%(13) followed by parasymphysis and angle 5.05%(11), bilateral parasymphysis 1.83%(4), bilateral condyle and parasymphysis 1.83%(4), body and condyle 1.83%(4), bilateral condyle 1.38%(3), symphysis and condyle 1.38%(3). (Table 5)

**Treatment:** Of 218 patients, open reduction was performed on (159) fractures; closed reduction was the treatment in (56) cases and treatment was limited to observation and soft diet in (3) cases. (Table 6)

**Table 1: Distribution of mandibular fractures by gender**

S. No	Gender	No of Subjects	Percentage
1	M	174	79.82
2	F	44	20.18
	Total	218	100.00

**Table 2: Distribution of mandibular fractures within each age group**

S. No	Age Group (Years)	No of Subjects	Percentage
1	0 - 10	2	0.92
2	11 -20	39	17.89
3	21 - 30	83	38.07
4	31 - 40	41	18.81
5	41 - 50	36	16.51
6	51 - 60	13	5.96
7	61 - 70	3	1.38
8	71 - 80	1	0.46
	Total	218	100.00

**Table 3: Distribution of mandibular fractures by etiology**

S. No	Etiology	No of Subjects	Percentage
1	RTA	161	73.85
2	Fall	45	20.64
3	Assault	10	4.59
4	Sports	1	0.46
5	Others	1	0.46
	Total	218	100

**Table 4: Distribution of mandibular fractures by anatomical location**

S. No	Site	No of Subjects	Percentage
1	Symphysis	15	6.88
2	Para symphysis	58	26.61
3	Body	16	7.34
4	Angle	25	11.47
5	Ramus	3	1.38

6	Condyle	24	11.01
7	Dentoalveolar	21	9.63
	Total	162	74.31

**Table 5: Distribution of mandibular fracture combinations**

S. No	Site (Combination)	No of Subjects	Percentage
1	Symphysis + condyle	3	1.38
2	Parasymphysis + Condyle	13	5.96
3	Parasymphysis + Lefort 1	3	1.38
4	Parasymphysis + Angle	11	5.05
5	Bilateral Condyle	3	1.38
6	Bilateral Parasymphysis	4	1.83
7	Bilateral Condyle & Parasymphysis	4	1.83
8	Angle + Condyle	2	0.92
9	Body + Angle	2	0.92
10	Body + Condyle	4	1.83
11	Body + Lefort 1	1	0.46
12	Parasymphysis + Lefort 2	1	0.46
13	ZMC + Angle	1	0.46
14	ZMC + Body	1	0.46
15	Zygomatic Arch + Angle	1	0.46
16	Zygomatic Arch + Condyle	1	0.46
17	ParaSymphysis + Ramus	1	0.46
	Total	56	25.69

**Table 6: Treatment of mandibular fractures**

S. No	Treatment	No of Subjects	Percentage
1	ORIF	159	72.94
2	Closed Reduction	56	25.69
3	Conservative Management	3	1.38
	Total	218	100.00

## Discussion

Despite the fact that mandible is the largest and strongest facial bone, by virtue of its position and prominence on face, it is most commonly fractured when maxillofacial trauma has been sustained. The osteology of mandible, various muscle attachments and their influence on presence of developing or complete dentition, all play a notable role in producing inherent weaknesses. Therefore fractures are seen more frequently in certain isolated areas. This study has tabulated the percentage of occurrence of various mandibular fractures and fracture combinations which reported to the department of oral and maxillofacial surgery during the period of 2015–2017. The results will vary from study to study, geographic area, social conditions and time of study. The major variable responsible for different patterns in results is the etiology of fracture. A number of epidemiological studies report that RTAs are among the main etiological factors of facial trauma. In our study RTAs are the leading cause of mandibular fractures 73.85%(161) corresponds to the findings of different published work.<sup>5-11</sup> The reasons for this high frequency may be due to inadequate road safety awareness like failure to

wear helmets, violation of speed limit and traffic rules, use of alcohol and inexperienced young drivers.

The gender distribution in our study revealed a male to female ratio 3.9:1, male predominance in our study agrees with the findings reported in literature.<sup>11-16</sup> Males are at greater risk due to their greater participation in high risk activities like driving vehicles, active social life that involve physical contact and alcohol consumption.

The majority of patients in our study were young since direct trauma is the most common cause of mandibular fractures 75.69% of the study were younger than 40yrs of age. The predominance of mandibular fractures in younger age group is consistent with findings of other studies<sup>17-21</sup> with peak incidence in 21-30yrs age group.

In mandible the most predominant site was parasymphysis fracture 26.61% in single fracture cases, similar findings were also reported in other studies.<sup>9,11,14,17,22-24</sup> Most frequent combination of mandibular fracture was that of parasymphysis with condyle. This may be related to horizontally directed impact to the parasymphysis that led to the concentration of the tensile strain at the condylar neck resulting in condylar fracture., Present study illustrated

that mandibular fractures can occur in combination with other injuries corresponds to the findings of other studies on mandibular fractures.

**Treatment of Mandibular Fractures:** Primary management of soft tissue injuries - namely suturing, pressure dressing, splinting of bony fragments - was done in the specialized department, while the final intervention in mandibular fracture with close or open reduction and follow up was performed in the Department of oral & maxillofacial surgery. Most of the patients with mandibular fractures 72.94% (159) were treated by open reduction and internal fixation (ORIF) with miniplates. Closed reduction was the treatment of choice in 25.69%(56) of the patients, namely a non-surgical approach of intermaxillary fixation, application of eyelet wires or archbars or intermaxillary fixation screws and wire or elastics for four to six weeks. These patients had multiple fractures, in most cases in the condyle region.

Predictability of facial patterns is not necessarily consistent within all groups and hospital settings studied. Hospital location and community demographics play an important role in etiology and distribution of facial trauma patterns. Despite many variables associated with the causes of mandibular fractures, motor vehicle accidents and assaults are undoubtedly the primary causes throughout the world. Reports have shown that on average more than 75% of mandibular fractures are caused by motor vehicle accidents and interpersonal violence, whereas 7% are work related, 7% occur as a result of fall, 4% occur in sport related accidents, remainder have miscellaneous causes. However it is important to note that local laws and socioeconomic conditions in developed versus developing countries create mixed results for case by case studies.

## Conclusion

In our study motorcycle accidents were the major cause of mandible fractures, The possible reasons for high incidence in this geographic area especially among bikers may be due to lack of safety measures in the form of helmets, violation of traffic rules, excessive speed driving and improper road conditions. Preventive measures which include awareness programmes, use of helmets, lower speed limits, driver education programmes, strict enforcement of traffic rules, prohibition of driving under the influence of alcohol can significantly reduce the incidence of maxillofacial trauma in future.

## References

1. Patrocínio LG, Patrocínio JA, Borba BH, Bonatti Bde S, Pinto LF, Vieira JV, Costa JM. Mandibular fracture: analysis of 293 patients treated in the Hospital of Clinics, Federal University of Uberlândia. *Braz J Otorhinolaryngol.* 2005;71(5):560–5.

2. Stanley RB. Pathogenesis and evaluation of mandibular fracture. In: Mathog RH, editor. Maxillofacial trauma. Baltimore: Williams and Wilkins; 1984. p. 136-147.
3. Adeyemo WL, Ladeinde AL, Ogunlewe MO, James O. Trends and characteristics of oral and maxillofacial injuries in Nigeria: A review of the literature. *Head Face Med.* 2005;1:7-15.
4. Ellis E, Moos KF, El-Attar A. Ten years of mandibular fractures: an analysis of 2,137 cases. *Oral Surg Oral Med Oral Pathol.* 1985;59:120-129.
5. Fasola AO, Obiechina AE, Arotiba JT. Incidence and pattern of maxillofacial fractures in the elderly. *Int J Oral Maxillofac Surg.* 2003;32:206–8.
6. Ansari MH: Maxillofacial fractures in Hamedan province, Iran: a retrospective study (1987e2001). *J Craniomaxillofac Surg.* 32: 28e34, 2004.
7. Oji C: Jaw fractures in Enugu, Nigeria, 1985e95. *Br J Oral Maxillofac Surg.* 1999;37:106e109.
8. Sakr K, Farag IA, Zeitoun IM: Review of 509 mandibular fractures treated at the University Hospital, Alexandria, Egypt. *Br J Oral Maxillofac Surg.* 2006;44:107e111.
9. Subhashraj K, Nandakumar N, Ravindran C: Review of maxillofacial injuries in Chennai, India: a study of 2748 cases. *Br J Oral Maxillofac Surg.* 45: 637e639, 2007.
10. Tay AG, Yeow VK, Tan BK, Sng K, Huang MH, Foo CL: A review of mandibular fractures in a craniomaxillofacial trauma centre. *Ann Acad Med Singap.* 1999;28:630e633.
11. Sirimaharaj W, Pyungtanasup K: The epidemiology of mandibular fractures treated at Chiang Mai University Hospital: a review of 198 cases. *J Med Assoc Thai.* 2008;91:868e874.
12. Fridrich KL, Pena-Velasco G, Olson RA: Changing trends with mandibular fractures: a review of 1,067 cases. *J Oral Maxillofac Surg.* 1992;50:586e589.
13. Ogundare BO, Bonnick A, Bayley N: Pattern of mandibular fractures in an urban major trauma center. *J Oral Maxillofac Surg.* 2003;61:713e718.
14. King RE, Scianna JM, Petruzzelli GJ: Mandible fracture patterns: a suburban trauma center experience. *Am J Otolaryngol.* 25: 2004;301e307.
15. Martini MZ, Takahashi A, de Oliveira Neto HG, de Carvalho Júnior JP, Curcio R, Shinohara EH: Epidemiology of mandibular fractures treated in a Brazilian level I trauma public hospital in the city of São Paulo, Brazil. *Braz Dent J.* 2006;17:243e248.
16. Bormann KH, Wild S, Gellrich NC, Kokemüller H, Stühmer C, Schmelzeisen R, et al: Five-year retrospective study of mandibular fractures in Freiburg, Germany: incidence, aetiology, treatment, and complications. *J Oral Maxillofac Surg.* 2009;67:1251e1255.
17. M. Adi, G. R. Ogden, and D. M. Chisholm, "An analysis of mandibular fractures in Dundee, Scotland (1977 to 1985)," *British Journal of Oral and Maxillofacial Surgery.* 1990;28(3):194–199.
18. A. B. Bataineh, "Etiology and incidence of maxillofacial fractures in the north of Jordan," *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontics.* 1998;86(1):31–35.
19. P. Dongas and G. M. Hall. Mandibular fracture patterns in Tasmania, Australia. *Australian Dental Journal.* 2002;47(2):131–137.
20. H. E. A. Ahmed, M. A. Jaber, S. H. Abu Fanas, and M. Karas. The pattern of maxillofacial fractures in Sharjah, United Arab Emirates: a review of 230 cases. *Oral*

- Surgery, Oral Medicine, Oral Pathology, Oral Radiology and Endodontology*. 2004;98(2):166–170.
21. B. F. Brasileiro and L. A. Passeri, “Epidemiological analysis of maxillofacial fractures in Brazil: a 5-year prospective study,” *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology and Endodontology*, 2006;102(1):28–34.
  22. Deogratius BK, Isaac MM, Farrid S. Epidemiology and management of maxillofacial fractures treated at Muhimbili National Hospital in Dares Salaam, Tanzania, 1998-2003. *Int Dent J*. 2006;56:131-4.
  23. Patrocínio LG, Patrocínio JÁ, Borba BHC, Bonatti BS, Pinto LF, Vieira JV, et al: Mandibular fracture: analysis of 293 patients treated in the Hospital of Clinics, Federal University of Uberlândia. *Braz J Otorhinolaryngol*. 71:560e565, 2005.
  24. Khorasani M, Khorasani B: The epidemiology of mandibular fractures in Qazvin province Iran e a retrospective study. *Res J Biol Sci*. 2009;4:738e742.