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An Epidemiological Study on Incidence and Pattern of Mandibular Fractures at a Tertiary Dental Care Hospital

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Abstract

Introduction: Mandibular fractures being second most common facial fractures, constitute a significant proportion of maxillofacial trauma cases. The etiology and pattern of mandibular fractures differ among various study populations. The aim is to study the incidence and pattern of mandibular fractures at Tertiary level hospital in Telangana.

Materials and Methods: The medical records of 396 patients treated for mandibular fractures were reviewed between the time periods from January 2017 to December 2019. Data on age, gender, aetiology, anatomic site and multiple fractures within the mandible, seasonal variation were recorded and assessed.

Results: Maximum incidence of fractures was observed in the age group of 21-30 years (49.49%) followed by 31-40 years (23.23%) and 11-20 years (17.17%). Male to female ratio was 6.2:1 portraying a male predominance. Road traffic accidents (RTAs) were observed to be the predominant aetiological factor responsible accounting for 62.28% of the total injuries followed by assaults (21.42%) and falls (7.14%). Parasymphysis exhibited the highest incidence (28.33%) amongst the anatomic sites, followed by angle (26.48%), condyle (22.40%), body (12.03%), symphysis (10.18%), ramus (0.37%) and coronoid (0.18%). Parasymphysis-angle (23.56%) combination fractures were more common followed by parasymphysis-condyle (19%), symphysis-condyle (14%), and body-angle (10.19%).

Conclusion: Mandibular fractures occur in people of all ages and their causes often reflect shifts in trauma patterns over time. RTAs are most common etiological factor; good traffic sense needs to be imbibed in the public. The present assessments of mandibular fracture will be valuable to government policy makers and health-care professionals involved in planning future programs of prevention and treatment.

Keywords: Trauma, Mandibular Fracture, Maxillofacial Injuries, Incidence, Pattern

INTRODUCTION

Maxillofacial injury patients are common at emergency departments. These injuries can vary in severity ranging from minor soft tissue injuries to major fractures of the entire facial skeleton. Despite the fact that mandible is the largest and strongest facial bone, it is commonly fractured (second to nasal bone fractures) and accounts up to three-quarters of patients with maxillofacial fractures.[1] Mandibular fractures may occur alone or in combination with other facial and skeletal bones. The aetiology of mandibular

fractures could be caused by road traffic accidents (RTAs), accidental falls, assaults, industrial mishaps, sports injuries and firearm injuries.[2] There is reported variability in the pattern of mandibular fractures resulting from different causes of injury[3]. The etiology and pattern of mandibular fracture differ considerably among different study populations. Increased frequencies of RTA and domestic violence have emerged as the etiological factors in mandibular fractures in developing countries, owing to poor enforcement of law and ensuring the abidance by the existing traffic and speed limit regulations. Increasing proportions of adolescent and young adults are sustaining these injuries.

The type, direction and magnitude of traumatic force can be helpful in diagnosis. Pattern of Fractures sustained in vehicular accidents are usually different from those sustained in interpersonal violence. Greater magnitude of force such as in automobile and motorcycle accidents may result in multiple mandibular fractures whereas the patient hit by a fist may sustain single, nondisplaced fracture.

Despite many reports about the incidence and pattern of mandibular fractures, no recent study has documented the pattern of mandibular fractures in Hyderabad. The goal of the study was to document the current, predictable patterns of mandibular fracture and its associated variables. The development of reliable predictors of injury pattern will be a useful guide for prompt and accurate diagnosis and management of mandible fractures.

Government dental college and hospital, Hyderabad being a teaching and training institute is a tertiary level institute in Telangana and most of the cases were being referred to our centre. The objectives of the present study is to document, the pattern of mandibular fractures, epidemiology of the mandibular fractures and to appreciate the importance of demographics, influence of social habits and individual etiological factors contribution towards such injuries. Reliably documented and scientifically backed evidence could hasten the strict enforcement of road traffic rules.

MATERIALS AND METHODS

A retrospective analysis was conducted of the medical records of all trauma patients who had reported to the Department of Oral and Maxillofacial Surgery, GDCH, Hyderabad from January 2017 to December 2019. The data were identified and analyzed based on following parameters age group, gender distribution, mechanism of trauma, seasonal variation, number and anatomic location (based on the Dingman and Natvig classification).

RESULTS

Demographic data

A total of 396 mandiular frature patient's records were evaluated. Out of the total sample of 396 patients, 341 (86.11%) were males and 55(13.88%) were females pointing out to a male preponderance (6.2:1) Majority (n=196; 49.49%) were in the age group of 21–30 years followed by 31-40 years (n=92; 23.23%), 11-20 years (n=68; 17.17%), 41-50 years (n=19;

4.79%), 51-60 years (n=17; 4.20%), and 61-70 years (n-1; 0.25%). This shows that the young adults are mostly affected [Table 1].

Etiology

The RTAs (Road Traffic Accidents) (64.28%) clearly predominated in both genders, being the single largest reported aetiological factor contributing to the majority of mandibular fractures followed by assaults (21.42%), falls (7.14%) and sports (7.14).

Anatomical distribution

Out of 396 patients, 222 (56.06%) had simple (single) fractures and 174 (43.94%) had combination fractures. Based on the anatomical site of single unilateral fractures, angle fractures (n =72; 32.43 %) were most common followed by parasymphysis (n=69; 31.08%

), condyle (n=31; 13.96%), symphysis (n=24; 10.81%), body (n=23; 10.36%), Ramus (n=2; 0.90%) and coronoid (n=1; 0.45%) fractures [Table 3]. But when considering single and combination fractures, Parasymphysis (n=156; 28.51%) fractures are more common followed by angle (n=144; 26.32%), condyle (n=121; 22.12%), body (n=67; 12.24%), symphysis (n= 55; 10.54%), Ramus (n=3; 0.54%) and coronoid (n=1, 0.18%) [Table 2]. In combination fractures, condyle in combination with other fractures were common (n=90 ; 28.12%) followed by parasymphysis (n=87 ; 26.25%), angle (n= 72; 22.18%), body (n=44; 13.12%), symphysis (n=31; 10%), ramus (n=1; 0.31) [Table 3].

Parasymphysis fractures

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Among Parasymphysis fractures, 69 (45.09%) were unilateral fractures which are more commonly fractured on right side (44; 63.76%) than on left side (25; 36.24%) and rest were combination factures. Most prevalent were parasymphysis with angle (41; 26.79%) followed by parasymphysis with condyle (33; 21.56%), parasymphysis with body (5;3.26%), bilateral parasymphysis fracture (5; 3.26 %), Parasymphysis with body and condyle(2; 1.28%) and Parasymphysis with angle and condyle (1; 0.64).

Condylar fractures

Among condylar fractures, 31 (25.61%) were unilateral condylar fractures. In combination fractures 29 (23.96%) were condylar with parasymphysis fractures, 19 (15.70%) were condylar

with symphysis 16 (13.22%) were condylar with body fractures, 14 (11.57%) were bilateral condylar fractures, 9 (7.43%) were bilateral condylar with symphysis or parasymphysis fractures, 2(1.65%) were condylar with parasymphysis and body and 1(0.82%) were condylar with parasymphysis and angle/

Angle fractures

Among angle fractures, 72 (50.00%) are unilateral angle fractures which are more commonly fractured on left side (47; 65.27%) than right side (25; 34.73%). In combination factures, most prevalent were angle with parasymphysis (n =41; 28.47%) followed by angle with body (n = 19; 13.19%), angle with symphysis fractures (n= 6; 4,16%) and bilateral angle factures (n = 5; 3.47%), angle with Parasymphysis and condyle (1; 0.69%)

Symphysis fractures

In relation to symphysis fractures, 24 (43.63%) are single fractures and rest are combination fractures, which are more common in combination with condyle (24; 43.63%) followed by symphysis with angle (6; 10.90%), symphysis with Ramus (1; 1.81).

Body fractures

Among Body fractures, 23 (34.32%) were single unilateral fractures more commonly on the right side (15; 65.21%). Body-angle (19; 28.35%) combination are more common followed by body condyle (16; 23.88%), body-parasymphysis (5; 7.46%), bilateral body (2; 2.98%) and body with parasymphysis and condyle (2; 2.98%) fractures .

Mandibular fractures in females

In female, fractures are commonly seen in the age group of 21-30 (18; 51.42) years followed by 31-40 years (7;20%), 11-20 years (5; 14.28%) , 51- 60 years (3; 8.57%), 41- 50 years (2; 5.71%). Based on anatomic site of Fractures, Parasymphysis (11; 20%) is most common fracture, followed by angle (10; 18.18%), condyle (6; 10.90%), parasymphysis with angle (6; 10.90%), parasymphysis with condyle (5; 9.09%), , bilateral condylar (5; 9.09%),, Symphysis (3; 5.45%),, symphysis with condyle (3; 5.45%), angle with body (3; 5.45%), Bilateral parasymphysis (2;3.63%) and bilateral body (1.81%).

Seasonal variation

Seasonal peak of mandibular trauma was observed in the rainy season (35%) and a decline in Summer (31%)

Discussion

The aetiology and incidence of Mandibular fractures vary with geographic region, socioeconomic condition, cultural characteristics and era. Trends have been reported in other cities in India, but this is the first study of patients with mandibular fractures who presented to a tertiary centre, Government Dental college and hospital, Hyderabad.

The pattern seen in this study with regard to the mechanism of action is in standing with a national trend in urban trauma. In this study, road traffic accidents accounts for 64.28% of all mandibular fractures followed by 21.42% assaults which coincides with the other studies. Similar trends have been reported by Kolli Yada Giri et al [4] and Natu SS et al[5]. Very high use of two wheelers, early bikers, lack of safety measures in the form of helmets, seat belts, improper road conditions and consumption of some form of illicit substance may be the possible reasons for this in our region. Females have almost equal incidence of RTA and physical abuse.

The gender distribution in our study showed male predominance with 86.11% which is in accordance with Arif et al [6}, Yadagiri et al [4] Natu SS et al[5]. The Majority of the reports published have shown male preponderance ranging from 68% To 91.7%. Our Study is in accordance with other published data [7,8]. The Male predominance is belived to be by aggressive, dominant and outgoing persona as prevalent in the Indian community. Male to female ratio in our study

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is approximately (6.2:1), which is in confirmatory with Arif et al (6.6:1)[6]; Subhashraj et al. (5.1:1) [9] and in contrast to study by Natu SS et al (4.5:1), Allan BP et al. (4.4:1)[10] and Barde D et al (3.7:1) [11]. The decrease in ratio and the increase in the proportions of females affected may be assosiated to the fact that females are increasingly becoming exposed to risk factors for maxillofacial trauma due to increased mobility, social engagements and consumption of illicit substance.

Based on the age, the highest incidence of mandibular trauma was seen in the 21 to 30-year-old age group (49.49%) followed by 31- to 40-year-old group (23.23%). This was the peak age group in both the genders. This is consistent with other studies done on the age group, mostly involved with mandibular trauma Arif et al[6], Barde D et al [11], Naiya Shah [12] and is accounted for by the fact that young adults are most active age groups in the society and are more vulnerable to trauma through road traffic accidents, altercations and sports injuries.

In our study 56.06% of the total patients population presented with single fracture site and Natu SS et al et al[5] reported 56.10% and Arif et al[6] reported 56% of single (Isolated) fracture in the mandible. Most common site of fracture was angle (32.43%) followed by parasymphysis (31.08%), condyle, body, symphysis. Angle fractures are more commonly on left side and parasymphysis and body fractures more commonly on right side. complex biomechanics of the mandibular angle, such as, abrupt change in curvature, presence of third molar, having a thin cross-sectional area and the attachment of the masticatory muscles exerting their forces in different vectors makes it more succeptable to fracture. An interesting finding was that more than half the angle fractures were located on the patients' left side. As stated earlier, the overwhelming majority of patients had their injuries from fists to the face. According to McManus,[13] professor of psychology at University College London, approximately 90% of

humans are right-handed, explaining why the left side of the face is the most common location of injury.

Parasymphysis is next commonest site, it is partly to the length of canine root, weakening the structure. The other reason for being the commonest site of fracture is as follows. The bone fracture at site of tensile strain since their resistance compressive force is greater. Mandible being similar to an architectural arch distributes the applied force along its length but not being a smooth curve in a uniform cross-section. There are parts at which force per unit area developed is greater resulting in increased concentration of tensile strength leading to a fracture at the site of maximum convexity of the curvature.[5]

43.98% presented with more than one fracture site in the mandible. Considering the anatomic site in single and multiple fracture sites, parasymphysis fracture site is more common followed by angle, condyle and body fractures. This follows the same trend as the studies of Chaurasia et al [14], Oruç M[15} . According to the studies of Yadagiri et al[4] and S.S.Natu[5] Parasymphysis fractures is the most common fracture. Olson et al[16], Samman M, et al[17], . Bereket C et al[18], de Matos et al[19], and Schön R et a[20]l showed condyle is the most common fractures. Studies of Bolaji O et al[21] many others[10, 22,23] showed angle fractures are more common. It is in contrast to the trend of Hall and Ofodile,[24] where the body has the highest incidence of fractures, followed by the angle. On the other hand, the study of Vetter et al[25]shows the symphysis location as the most common mandibular fracture. This allows the conclusion that the pattern of presentation is multifactorial. Our results are closer to the studies done in India.

46.07% had combination fractures. The most common combinations were parasymphysis- angle followed by parasymphysis-condyle, symphysis-condyle, body-angle, conylar –body, Bi- condylar, angle-symphysis. In most of the combination fractures, contralateral sides are involved. Giri KY et al [4] and Dongus and Hall[26] reported that parasymphysis was commonly associated with angle. Next most common combinations were symphysis and condyle followed by parasymphysis and condyle, parasymphysis and body, angle and condyle. Study of Natu SS showed parasymphysis–condyle as the most common combination fracture [5].. Ogundare et al. [20] have reported that body with angle as the most common combination. A horizontally directed impact to parasymphysis, resulting fracture at the site of impact, this axial force of impact against parasymphysis proceeded along the mandibular body to the angle or cranial base through the condyle leading to the concentration of the tensile strain at the condylar neck hence resulting in its fracture.[5]

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Considering only body fractures, In our study 35.38% had unilateral body fractures which are more common on right side. Sergio Olate et al reported 45.5% of isolated body fractures. Body- anlge combination fractutes are more common in our study which is similar to the study of Sergio Olate et[27] and Subodh S. Natu et al [5].

Most of the females presented with single fracture site with highest incidence of parasymphysis fractures followed by angle, condyle, symphysis, body fractures.

In our study, the site of mandibular fracture correlated with the cause. Interpersonal violence was most often associated with fractures of the angle, while falls and road accidents were more commonly associated with condylar fractures. Parasymphyseal fractures were found to be most common in RTA. These trends reflect the direction of force applied to the mandible during different forms of trauma. Patients involved in accidents with posterosuperiorly directed energy such as falls and being struck by vehicles where chin receives the primary force of impact should be suspected of having condylar and sub-condylar injuries. Mandible angle fracture or combined angle-parasymphysis fractures should be suspected in cases of assaults. [28]. Trauma from a fist or other blunt object to lateral portions of the jaw, predisposing these patients to fractures such as angle and body The variable distribution of fractures according to etiology may be related to factors associated with the way the injury occurs. The direction and magnitude of force, the nature of object leading to impact, and may be the characteristics of the host bone are responsible for the varied clinical outcomes. Knowing the direction of force can help the clinician to diagnose the concomitant fracture. The data presented in our study support these observations.

Considering the bilateral fractures (same anatomical location on the contralateral side) maximum number of bilateral condylar fractures were reported followed by bilateral parasymphysis, bilateral angle and then bilateral body fractures.

Analysis of the study revealed a seasonal peak of mandibular trauma in the rainy season (35%) and a decline in Summer (31%). Which is similar to the study of Barde D et al [11] During monsoons roads become slippery and road conditions worsen.

CONCLUSION

The developing countries like. India, still have large number of mandibular fractures attributed to RTAs and incidence of Maxillofacial Fracture can be significantly reduced by strict enforcement of traffic rules. Use of seat belts, helmets and reduction in drunken driving has shown to reduce maxillofacial trauma. The results of our data will be helpful for the government and healthcare professionals towards planning future programmes of prevention.

Flaws in the present study

As our study is retrospective, we were unable to draw valid conclusions regarding the impact of patient's social history, including employment and use of illicit substances on patterns of mandibular fractures.

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Table 1: Distribution of sample according to age

Age (in Years)	Number(n)	Percentage(%)
1-10	3	0.75
11-20	68	17.17
21-30	196	49.49
31-40	92	23.23
41-50	19	4.79
51-60	17	4.20
61-70	1	0.25

Table 2: Distribution of fractures based on anatomic site (Single and combination fractures)

Type of fracture (based on anatomic site)	Single fractures	Combination fractures	Total	Percentage(%)
Parasymphysis	69	87	156	28.51
Angle	72	72	144	26.32
Condyle	31	90	121	22.12
Body	23	44	67	12.24
Symphysis	24	31	55	10.05
Ramus	2	1	3	0.54
Coronoid	1	0	1	0.18

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Table 3: Distribution of single fractures

Type of fracture (based on anatomic site)	No of cases	Percentage(%)
Angle	72	32.43
Parasymphysis	69	31.08
Condyle	31	13.96
Symphysis	24	10.81
Body	23	10.36
Ramus	2	0.90
Coronoid	1	0.45
	222	

Table 4: Distribution of combination fractures

Type of fracture (based on anatomic site)	No of cases	Percentage(%)
Condyle	90	28.12
Parasymphysis	87	26.25
Angle	72	22.18
Body	44	13.12
Symphysis	31	10.00
Ramus	1	0.31

Table 5: Patterns of Combination fractures

Site involved	Number of cases	Percentage
Parasymphysis with angle	41	23.56
Parasymphysis with condyle	33	18.96
Symphysis with condyle	24	13.79
Body with angle	19	10.91
Body with condyle	16	9.19
Bilateral condyle	14	8.04
Symphysis with angle	6	3.44
Parasymphysis with body	5	2.87
Bilateral Parasymphysis	5	2.87

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Bilateral angle	5	2.87
Bilateral body	2	1.14
Parasymphysis with body and condyle	2	1.14
Parasymphysis with angle and condyle	1	0.57
Symphysis with ramus	1	0.57
	174	

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