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## RESEARCH ARTICLE

### PREVALENCE OF MANDIBULAR FRACTURES IN CENTRAL INDIA

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#### ABSTRACT

**Aim:** To understand and deduce the prevalence of mandibular fractures in patients having maxillofacial injuries which includes isolated mandibular fracture, maxillo-mandibular fractures and poly-trauma from a 42 month retrospective survey in central region in India.

**Material & Methods:** The data base of 42 months has been evaluated from trauma centers in Central India in which we have assessed only those patients whose case history was complete with radiographic evidence. A total number of 596 cases of mandible fractures either present as a single entity or associated with poly-trauma. The total number of 1197 fractures was noted in mandible in 596 patients. Manual data analysis was done to evaluate the prevalence of mandibular fractures concerning the site and differentiated on the basis of age and gender. In our study we have excluded those patients which are having incomplete or inappropriate data.

**Results:** We have found that maximum prevalence concerning the site of mandible fracture in the central region is at symphysis and parasymphysis region (34%) followed by body (22.3%), condyle (19.5%), angle (17.7%), dento-alveolar region (3%), comminuted fractures (2.4%) and coronoid fractures (0.66%). There is prevalence of fractures with gender ratio of 3.3:1 with domination of males with decreased association of other bone injuries (37%) as compared with its individual incidence (63%). We have also found the higher range of double site fractures in comparison with single and multiple ones.

**Conclusion:** Maxillofacial injuries in the last few years has been decreased due to compulsory use of helmets and seat belts while driving. The pattern of fractures determines that the fractures are mainly due to high impact trauma and knowing a precise idea about the prevalence we can fabricate proper preventive measures and protocols for treatment regime.

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## INTRODUCTION

The maxillofacial region is one of the most commonly fractured sites of the body, in which mandible is the second most common part to be fractured as its location is prominent and unprotected second to that of nasal bones. (Brook and Wood, 1983; Czerwinski et al., 2008; Ravindran et al., 2011; Natu et al., 2012) Mandibular fractures can lead to significant functional and aesthetic consequences if treated inappropriately which includes facial asymmetry, malocclusion, temporomandibular joint disorders and osteomyelitis sequentially. 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. (Brook and Wood, 1983; Czerwinski et al., 2008) Apart from the road traffic accidents other reasons for

the maxillofacial trauma encompasses assaults, falls, trauma due to sports activities and firearms. It may also be associated with pathology. Alcohol consumption is a well-known associated finding common to maxillofacial trauma. There is a significant reduced incidence of road traffic accident even after the prohibition of alcohol use in few places in India. There has been alteration in the incidence of maxillofacial trauma in last few years is due to the compulsory use of helmets and seat belts for safety purpose while driving. (Marya et al., 2017) These rules and regulations have led to wide changes which needs to be assessed further. Prevalence of mandibular fracture vary according to the time of the study and various factors that affect the study population such as implementation of laws, literacy, cultural and social deeds thus different trends of injuries are present in rural and urban areas of the country. Young adults are mostly seems to be disposed towards these injuries though it involves peoples of all ages because high proportion of population comprises of youth. In our study we have assessed the prevalence of mandibular fractures in the

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central India region which are site and gender specific, associated with poly-trauma or present as a single entity. We have retrospectively assessed the records of 42 months from well-known centers in Central India which guides us about the injury patterns and thus proper management protocols can be fabricated.

## MATERIALS AND METHODS

We retrospectively studied the medical records from renowned centers located in Madhya Pradesh where the principle investigator is a consultant maxillofacial surgeon. We reviewed the medical records from the last 42 months from 2012 to 2016. A total number of 596 patients were included in the study. The patients were chosen in accordance to the inclusion and exclusion criteria mentioned as, all the patients were included irrespective of their age and gender and those which are having multiple fractures at different site are included in the study and the records of the patients were update. Those patients whose records are improper pertaining to their radiographs and history or there is a discrepancy in the records were excluded from the study and those who did not survived during their stay at the hospital. All the records were then re-evaluated for duplicity and few records were excluded from the study. The analysis of the data was after complete collection of the records. These records were then evaluated manually and tabulated and statistically analyzed and studied in detail.

## RESULTS

The total number of patients whose reports were complete only were included in the study. After analysis of case sheets of about 1031 patients only 596 were included in the study. The remaining case sheets were found to be incomplete or there were missing radiographic data to support the history. On detailed analysis of the details in attempt to find the sexual predilection it was noted that out of 596 patients only 137 patients were females and the remaining 459 patients were male. We have calculated the site specific prevalence in total (Table 1, Figure 1). The details further signified the male female ratio to be 3.3:1 in the central region of the India (Figure 2). The age ranged from 5 to 78 years with a mean age of 32 years in the collected data. Hence it was conclusive that most of the patients are of young to middle age and gender specific and demonstrated in Table 2 and Table 3. Among them in males “symphysis and parasymphysis” fractures are more common and in females “body” region has a higher value. Then site specific analysis of the fractures was done to find out the exact incidence of the fractures in patients. The most common fracture involving the mandible was found to be that of symphysis and parasymphysis region to which the percentage of its incidence calculated was 34%. This was owing to fact of projected location of the mandible and the direct injury to the symphyseal region. This was followed by fracture of the body region having the incidence of 22.3%. Fracture of condylar process of the mandible has the incidence of 19.5% mostly as a result of “Wishbone Effect”. Prevalence of angle region fracture is 17.7% which also contributes to the higher rate of occurrence in site specific analysis. The dentoalveolar (3%), comminuted (2.4%) and coronoid process (0.66%) fracture has relatively a lower rate of occurrence. A total number of 1197 fractures were noted in 596 cases where were included in the study for documentation from the retrospective analysis of the records out of which 756 (63%)

are of mandibular fractures only and 441 (37%) are associated with other bone fractures thus falls in the category of polytrauma, (Figure 3) mostly these incidences are caused due to road traffic accidents but are also resulted from falls, assaults, sports injuries and firearm injuries. There is a higher percentage of double fractures as compared to the others which depicts’ the counter coop mechanism thus condylar fractures are closely related to fractures in symphyseal and parasymphyseal region. (Table 4)

**Table 1. Prevalence of mandibular fractures in central India (including both male and female)**

S. No.	Site of fracture	Number of fractures	percentage
1.	Symphysis and Parasymphysis Fracture	409	34 %
2.	Body fractures	267	22.3 %
3.	Condylar fractures	234	19.5 %
4.	Angle fracture	213	17.7 %
5.	Dentoalveolar fractures	37	3 %
6.	Comminuted fractures	29	2.4 %
7.	Coronoid process fracture	8	0.66 %

**Table 2. Prevalence of mandibular fractures in central India among males: 916 fractures**

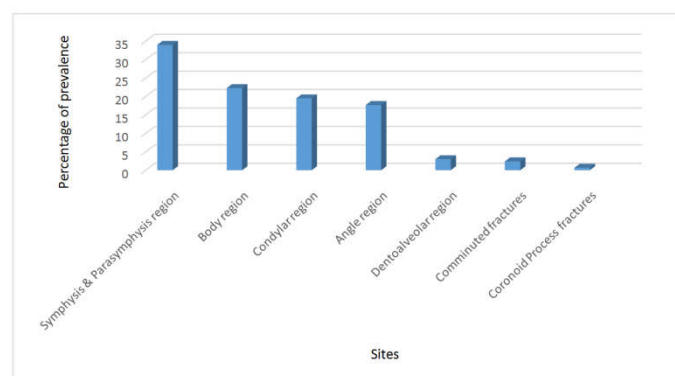
S. No.	Site of fracture	Number of fractures	Percentage
1.	Symphysis and Parasymphysis Fracture	349	38.10%
2.	Body fractures	153	16.70 %
3.	Condylar fractures	178	19.43%
4.	Angle fracture	195	21.29 %
5.	Dentoalveolar fractures	15	1.64 %
6.	Comminuted fractures	21	2.29 %
7.	Coronoid process fracture	5	0.55 %

**Table 3. Prevalence of mandibular fractures in central India among females: 281 fractures**

S. No.	Site of fracture	Number of fractures	Percentage
1.	Symphysis and Parasymphysis Fracture	60	21.3 %
2.	Body fractures	114	40.5 %
3.	Condylar fractures	56	19.9 %
4.	Angle fracture	18	6.4 %
5.	Dentoalveolar fractures	22	7.8 %
6.	Comminuted fractures	8	2.8 %
7.	Coronoid process fracture	5	1.7 %

**Table 4. Incidence in accordance with the number of fractures**

Single fracture	Double fracture	Multiple fractures	Communicated fracture	Dentoalveolar fracture
63	379	88	29	37



**Figure 1. Site specific prevalence**

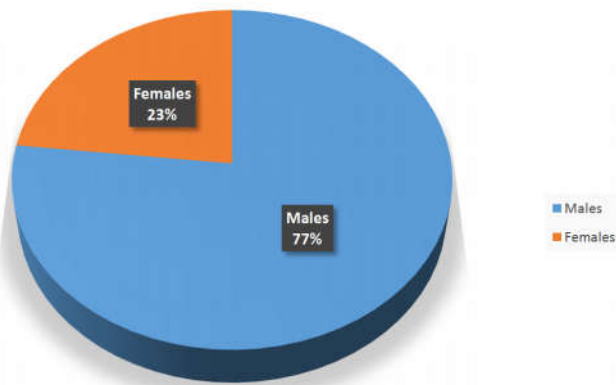


Figure 2. Male : Female - 3.3:1

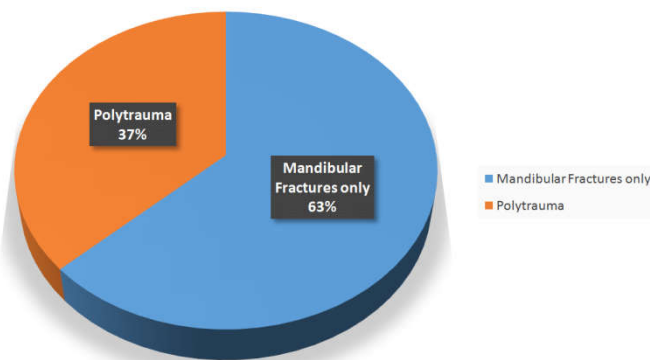


Figure 3. Categories

## DISCUSSION

Mandible is the 2<sup>nd</sup> most common bone to be fractured in the maxillofacial skeleton after the nasal bone due to trauma pertaining to the same region. (Brook and Wood, 1983; Czerwinski *et al.*, 2008) They can lead to significant complication if remain untreated in which malocclusion can be regarded as the early one and osteomyelitis as late. Subsequently, mandibular fracture prevalence and sequel have diminished because of the compulsory use of helmets and seat belts which were enforced by the law. Magnitude of force has a potent influence on the multiple fracture site in the mandible owing to the formation of the tensile strain at different sites. (Kuroda *et al.*, 2009) Condyle fracture accounts for approximately 30% and 37% of mandible fracture in dentulous mandible patients and edentulous mandible patients, respectively which are the results of high magnitude of force. Complications associated with it are non-union or malunion, malocclusion, TMJ dysfunction (derangement & ankylosis), growth disorders and facial asymmetry, condyle resorption, nerve injury and infection. (Kang-Young Choi *et al.*, 2012) In children the development centers of the mandible are condylar processes thus can be treated conservatively. (Kuroda *et al.*, 2009; Zhou *et al.*, 2014) The most prominent site of mandible being the symphyseal and parasymphyseal region is more prone to fracture and the same has been depicted in our study. There has been various studies in the past which were done to analyze the incidence and pattern of fractures that are seen in any region. Studies have also assessed the incidence of mandibular fracture in different parts of the world and their relationship with various cultural behavior pattern and etiology of the trauma. In Northern part of India the mean age range of the patient is 21 – 30 years having mandibular fractures with the commonest site being parasymphysis and also with a

combination of subcondyle and has a male predominance which is noted in our study too. (Natu *et al.*, 2012; Hu Weihsin *et al.*, 2014) In the central part of India our study revealed that the ratio of male to female ratio has been 3.3:1 where as in southern part of India a prospective study reveals male predominance with a ratio of 4.1: 1. (Ravindran *et al.*, 2011) This is found in sync with the usage of the helmets which were made compulsory by the law makers as the other study was conducted before making the law. The males in almost all the studies are predominant. A 12 year retrospective study in Gujarat (India) on 4437 patients shows that most of the patients were male with main causes of road traffic accidents and interpersonal violence. (Hu Weihsin *et al.*, 2014) The most common cause of the fractures in almost all Indian studies still remain to be road traffic accident. The studies of incidence carried outside India revealed increase in incidence of violence among young adults in addition to a lower drinking again Quebec may be partly responsible for the increased incidence of alcohol use in young assault victims. (Czerwinski *et al.*, 2008) London a retrospective study was carried out on 1261 patients in which the common site of fracture was angle with a male female ratio to be 6.6:1 and the peak incidence was found to be at 30 years of age for both males and females which again was similar to the incidence observed in our study. (Arif Rashid *et al.*, 2013) Most of the studies shows that there is male predominance in mandibular fractures with an average age of 20 to 40 years (Barde *et al.*, 2014; Giri *et al.*, 2015) Apart from the road traffic injuries various other as observed in other studies carried out in different part of the world. In Tasmania (Australia) the main cause of mandibular fractures reviewed to be assault followed by sports injuries, falls and the last contributing cause was road crashes which shows improvement in road safety rules. (Verma and Chamber, 2015) This should be taken up by all other countries and reduce the incidence of trauma. Wilson *et al.* conducted study in a British city, in their study they have concluded that assault is the most common cause of mandibular fracture which was also observed by Kyung-Pil Park *et al.* in their study in the Seoul metropolitan region where assault was at 2<sup>nd</sup> place next to fall as etiology. (Wilson *et al.*, 2016; Park *et al.*, 2015) There is a close relationship between the specific site fractures and associated soft tissue injuries and among different fracture sites which remained almost common in almost all studies carried out.

## Conclusion

Understanding the epidemiology of mandibular fracture allows us to more effectively target our preventive efforts and reorganize current trauma evaluation practices. Mandibular fractures are frequently associated with another major facial or other organ system injury. These potentially life-threatening injuries must be aggressively diagnosed by individuals with appropriate training. Proper implementation and following of traffic rules for safety has an outstanding effect in the reduction of maxillofacial injuries.

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