

# Prevalence and pattern of mandibular fracture in Central India

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## ABSTRACT

**Introduction:** The etiology and pattern of mandibular fracture vary considerably among different study populations. 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 South Asian countries. This study attempts to delineate predictable patterns of fracture based on patient demographics and mechanism of injury in central part of India.

**Materials and Methods:** The medical records of patients with mandibular fractures treated over a 3 years period were identified and analyzed based on age, sex, mechanism of trauma, seasonal variation, drug/alcohol abuse, number and anatomic location. **Results:** We reviewed 464 patients having mandibular fractures with age ranging from 7 to 89 years. Male (343, 79%) to female (91, 21%) ratio was 3.7:1, significantly higher for males. The highest incidence (37.5%) of mandibular fractures was in the age group of 21–30 years. The main cause was road traffic accidents (RTAs, 68.8%) followed by falls (16.8%), assaults (11%) and other reasons (3.8%). Parasymphyseal fractures were the most frequent 331 (41.1%), followed by condyle (135) and angle (124) fractures in occurrence. Mandibular angle fractures were found mostly to be associated with assault victims. **Conclusion:** The mechanism of injury correlates significantly with the anatomic location of fracture and knowledge of these associations should guide the surgeons for appropriate and timely management. Because RTAs are most frequent, good traffic sense needs to be imbibed and developed by the government as well as the public.

**Key words:** Etiology, incidence, India, location, mandibular fracture, retrospective study

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## INTRODUCTION

Mandible is the second most commonly fractured bone after nasal bone, though it is the largest and strongest facial bone.<sup>[1-4]</sup> Mandibular fractures can involve only one site or can often involve multiple anatomic sites simultaneously.

The etiology and pattern of mandibular fracture vary considerably among different study populations.

Recent overall shift in the mechanism of injury and age distribution of patients sustaining these injuries are well-documented. There is reported variability in the pattern of mandibular fractures resulting from different causes of injury, such as road traffic accidents (RTAs), assaults, and falls.<sup>[5,6]</sup> Increased frequencies of RTA and domestic violence have emerged as the etiological factors in mandibular fractures in developing countries like India. Furthermore, there is an increase in the proportion of adolescent and young adults sustaining these injuries.

The type and direction of traumatic force can be extremely helpful in diagnosis. Fractures sustained in vehicular accidents are usually far different from those sustained in personal altercation. Since the magnitude of force can be much greater, victims of automobile and motorcycle accidents tends to have multiple mandibular fractures, whereas the patient hit by a fist may sustain single,

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nondisplaced fracture. 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 South Asian countries. This study attempts to define current, predictable patterns of fracture based on patient demographics and mechanism of injury in the central part of the country. Furthermore, in cases of multiple fractures of mandible, association between specific anatomic sites is sought. The development of reliable predictors of injury pattern will be a useful guide for prompt and accurate diagnosis and management of mandible fracture in the trauma patient population.

## MATERIALS AND METHODS

This study is a retrospective analysis of medical records available with different secondary and tertiary trauma centers located at Nagpur, the geographical center of India, where the principal investigator of this study works as a maxillofacial consultant. The medical records of patients with facial trauma treated over the last 3 years (October 2010 to October 2013) were retrieved and reviewed. A total of 1842 facial trauma cases were identified, of that 464 were having some form of mandibular fracture. The complete medical records of these 464 patients were obtained viz., case history, clinical notes, radiographs, photographs, if any, surgical notes etc., Then data were analyzed based on the following parameters-age, and sex, mechanism of trauma, seasonal variation, drug/alcohol abuse at the time of trauma, number and anatomic location of fractures.

## RESULTS

Of the 1842 patients with panfacial injury, 464 patients (25%) had mandibular fractures. Their ages ranged from 7 to 89 years and there were 343 men (79.1%) and 91 women (20.9%). Male: Female was 3.7:1. The highest incidence of mandibular trauma was in the age group of 21–30 years (37.5%), followed by the age group of 31–40 (22.4%) as shown in Table 1. The main cause was RTA (68%) particularly in those travelling by motorcycles followed by falls (17%), assaults (11%) and miscellaneous (4%) which included animal bites, gunshot injuries, sports, pathological fractures etc., [Graph 1].

The total number of mandibular fractures found in our study amongst 464 patients was 751, almost 1.6 fractures/mandible. The most common mandibular fracture is found in the location of parasymphysis region (203, 39.8%), and the next most preferred location is shared by condyle and angle with equal distribution (135, 124 respectively) at

18% for both. Quite surprisingly dentoalveolar fractures are found to be very less (49, 6%).

The parasymphysis fractures are found to be most common in RTAs (203, 39.8%), while fall resulted in maximum fractures at condyle region (60, 46%). Mandibular angle fractures are most common in assault cases (30, 36%), while symphysis and condyle fractures were rare [Table 2].

The yearly distribution of occurrence of mandibular fractures is fairly evenly distributed throughout the year, except for May. The month of May is conspicuous for low incidence of mandibular fractures at 28 (6%), while the months of July, August, and September witnessed almost 32% of fractures among them with almost equal distribution at 11% [Table 3, Graph 2].

Of the total number of mandibular fracture, 204 (44.5%) patients had only one fracture, while 230 (49.5%) had two fractures and 30 (6%) had three fractures. There was history of drug/alcohol abuse in 36% of total patients of which 98% were males.

## DISCUSSION

This study is a retrospective analysis of mandibular fractures treated over last 3 years at different locations in Nagpur (Central India). Various similar analyses<sup>[1-12]</sup> had been reported in the literature to have in-depth insights about etiological factors as well as the site of fractures. The results of this study of mandibular fracture coincide with previous reports, particularly regarding age and sex of patients.<sup>[5,7-10]</sup> In our study, the highest incidence of mandibular fractures is found in the age group of 21–30 years (37.5%). The possible reasons for this in our geographic area may be very high use of two-wheelers, early bikers, lack of safety measures in the form of helmets and improper road conditions, as most of fractures in this group belong to RTAs.

Though there was male dominance the gender distribution shown in our study revealed a male: Female of approximately 3.7:1 in contrast to study by Subhashraj *et al.* (5.1:1). This shows an increasing trend of female

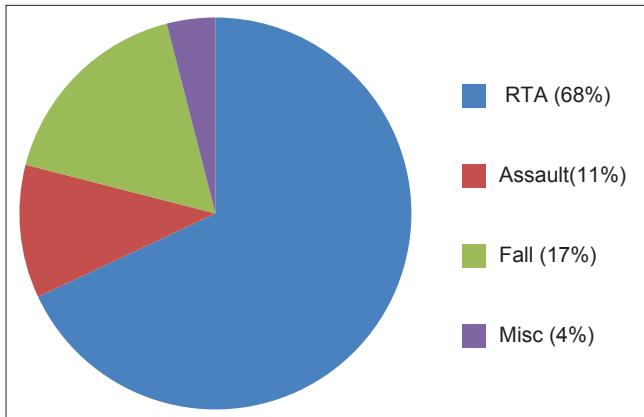
**Table 1: Distribution of mandibular fracture according to age**

Age	Number (%)
0-10	21 (4.5)
11-20	83 (17.8)
21-30	174 (37.5)
31-40	104 (22.4)
41-50	33 (7.1)
51-60	24 (5.1)
61-70	14 (3)
> 70	11 (2)
Total	464

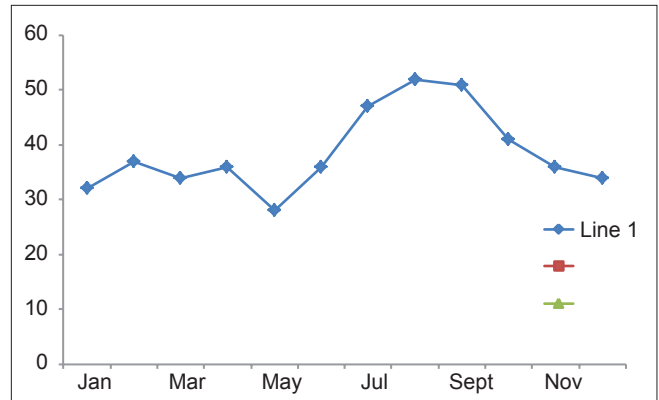
**Table 2: Distribution of location of mandibular fractures according to etiology**

Etiology	Site of fracture							
	Symphysis	Parasymphysis	Condyle	Angle	Body	Ramus	Coronoid	Dentoalveolar
RTA 511 (68)	64 (12.5)	203 (39.8)	69 (13.5)	72 (14)	52 (10)	26 (5)	03 (0.5)	22 (4.3)
Assault 83 (11)	05 (6)	17 (20.4)	03 (3.6)	30 (36)	10 (12)	07 (8.4)	-	11 (13.2)
Fall 128 (17)	17 (13)	14 (10)	60 (46)	16 (12.0)	03 (2.3)	06 (4.6)	02 (1.5)	10 (7.8)
Misc 29 (4)	02 (6.8)	06 (20.6)	03 (10.3)	06 (20.6)	02 (6.8)	03 (10.3)	01 (3.4)	06 (20.6)
Total 751 (100)	88 (11.7)	240 (32)	135 (18)	134 (18)	67 (9)	42 (5.5)	06 (0.8)	49 (6)

Figures in brackets indicate percentages. RTA: Road traffic accidents



**Graph 1:** Distribution of mandibular fracture according to etiology



**Graph 2:** Graphical representation of seasonal variation of incidences of mandibular fracture

involvement in maxillofacial trauma. The reasons may be related to increased mobility and social engagements of females. The male dominant culture is being shifted to work culture where men as well as women are getting equal opportunities.

There is a stark difference in the etiology of maxillofacial trauma in developing and developed nations. The common cause of maxillofacial trauma in developing countries is RTAs, while assault is the most common cause in developed countries. Our findings also support the same, as 68% of our patients; RTA was the cause of injury.

In 32% of our patients parasymphyseal fracture were seen, this is consistent with the report of Adi *et al.*<sup>[9]</sup> who showed that the parasymphyseal fracture is the most common site of mandibular fractures. However, Olson *et al.*<sup>[11]</sup> showed that there was a higher incidence of angle involvement in patients with mandibular trauma.

In our study, the parasymphyseal 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. Victims of fall were very likely to suffer from condylar fracture. Such type of data is barely reported in the literature. 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. An anterior blow directed to the chin can result in bilateral condylar fracture and an angled blow to the parasymphysis may cause a contralateral condylar or angle fracture.

Adults between the age group of 21 and 50 years were mainly victims of RTA whereas those over age 50 suffered fractures from falls. Although children and young adults seemed to suffer more parasymphyseal fracture and older adults from body fracture, correlation failed to show any observable difference.

The mechanism of injury correlates significantly with the anatomic location of fracture and knowledge of these associations should guide the treating physicians in their diagnostic setup for all head and neck trauma patients. Victims of violent crimes such as assault and gunshot wounds are more likely to suffer body and angle fractures than expected parasymphyseal fractures. Automobile accident victims will more commonly have symphyseal/parasymphyseal fractures and fewer body fractures than trauma from a fist or other blunt object to lateral portions of the jaw, predisposing these patients to fractures such as angle and body. Patients involved in

**Table 3: Seasonal variation of incidences of mandibular fracture**

Month	Number of patients
January	32
February	37
March	34
April	36
May	28 (6)
June	36
July	47 (10)
August	52 (11)
September	51 (11)
October	41
November	36
December	34
Total	464

Figures in brackets indicate percentages

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. The data presented in our study support these observations.

In our study, it was observed that the months of July, August, and September witnessed almost 1/3<sup>rd</sup> of fractures amongst them with almost equal distribution for all these 3 months. These months in India usually have monsoons leading to worsening of road conditions and also the roads become slippery.

As Bither *et al.*<sup>[12]</sup> pointed out, the other reasons for increased RTAs in India might be related to socioeconomic reasons such as poor traffic sense of the drivers and pedestrians as well as poor road conditions, inadequate enforcement of road safety regulation and speed limit, reluctance to use helmets, use of illicit drugs, decreasing tolerance, and increasing personal competitions among young, could be the positive explanations in particular in this part of the country.

## CONCLUSION

The developing nations, like India, still have large number of mandibular fractures attributed to RTAs and incidence of maxillofacial fractures can be significantly reduced by strict enforcement of traffic rules. Use of seat belt, helmet and reduction in drunken driving has shown to reduce maxillofacial trauma.

The etiology is closely associated with the anatomic location of mandibular fractures. The diagnosis of angle fractures should arouse a suspicion of interpersonal assaults, while the diagnosis of condyle fractures should be seen suspiciously for victims of fall. The diagnosis, pattern of fractures, and their management should be associated with a concern for medico-legal appropriateness.

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