

Original Research

A Retrospective study of 186 mandibular angle fractures: Influence of mountainous topography on etiology of mandibular angle fracture

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ABSTRACT:

Mandibular angle is one of the most fracture prone area of facial skeleton. Main etiology for angle fractures is Road Traffic Accident and Interpersonal Violence but the etiological factors may have regional variance. However, before initiating any discussion on the etiology, it would be pertinent to have a clear idea about the territory or the province of Himachal Pradesh as fall, remains the supreme cause of mandibular fractures over here. This 10 year retrospective study evaluated the records of 183 patients with mandibular fractures at Department of Oral and Maxillofacial surgery, HPGDC, Shimla. The parameters extracted from the records were age, gender, etiology and associated maxillofacial injuries. Males were more commonly affected as compared to females with Male: Female ratio of 11.2:1. Age group most commonly involved was 21-30 years and unlike other studies accidental fall is the most common etiology of angle fracture in this particular area. The etiology can usually be attributed to cultural, social, economic, and environmental factors.

Keywords: Mandibular angle, Etiology.

Received: 22 October, 2021

Accepted: 27 November, 2021

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This article may be cited as: Parmar M, Sahore M, Ghezta N, Bhardwaj Y, Ram R, Soni A. A Retrospective study of 186 mandibular angle fractures: Influence of mountainous topography on etiology of mandibular angle fracture. Int J Res Health Allied Sci 2022; 8(2):1- 6

INTRODUCTION

A physical injury usually occurs due to sustenance of sudden force in human body, in an amount that is beyond the verge of its physical tolerance. The mandibular bone, being an important anatomical and functional structure, constitutes the lower height and width of the facial skeleton. Mandible is a complex bony structure and has a vital anatomical articulation with other crano-maxillofacial components. Mandibular angle is the most common location for the mandibular fractures after blunt trauma to the face, accounting for 23 to 42% of all mandibular fractures. Mandibular angle fracture is often defined as an area where the body of the mandible meets the ascending mandibular ramus, usually in the third molar region. This transformation of forces from horizontal to vertical plane and the inherent anatomic vulnerabilities make this region prone for injury. The occurrence of trauma in the maxillofacial area does not only have a substantial impact in the psychology

and aesthetics of the patient, but also lays an everlasting effect on the behavior of the patient.^{1,2,3}

Nested between the snow capped Himalayan ranges H.P. is a pristine North Indian state with 12 districts and area of 55,673 km² situated at an elevation of 2276 meters above sea level and at the latitude and longitude coordinates of 32.084206 N^o, 77.571167 E^o. Shimla is the capital of H.P. and famous tourist destination, with a convoluted topography of interlocking mountain chains and river systems. H.P. Govt. Dental College & Hospital, Shimla being the prime institution of H.P. to render services for maxillofacial injuries, where a good number of trauma patients are referred from far flung remote areas of the state.

Being one of the major maxillofacial injuries, mandibular angle fractures are a serious risk to public health as severe morbidity, disfigurement and psychological problems are commonly associated with these fractures. Since the treatment cost and time

spent in hospital and off work, any inappropriate treatment would lead to severe consequences, both cosmetic and functional. The epidemiology may have regional variance. Some of the highest incidences of mandibular fractures have been reported from Greenland, Zimbabwe and Kenya in the tunes of 97%, 82% and 75% respectively and IPV being the major cause. However in India, France, Jordan the RTA constitutes the major cause of injury.⁶ Topographical features of a hilly terrain aggravates the propensity towards a serious accidental fall related injury in the mandibular angle region. Most of facial fractures, particularly in developing countries where the tradition and enforcement of highway discipline are yet to be established, most common etiology is Road Traffic Accidents.⁶ In developed countries, assault is now becoming commonest cause Of maxillofacial injuries and has replaced road crashes as leading cause.⁷

Thorough knowledge and understanding of etiology and epidemiology of facial injuries is fundamental for development and up gradation of health services, training of maxillofacial surgeons, and adoption of new methods of preventing injuries.

Aim of this study was to examine the current demographic patterns of mandibular angle fractures in the Himalyan Terrain, by reviewing the records of patients admitted to HPGDC, Shimla during the last 10 years i.e. 2009-2019 and to assess the difference in the etiologies of mandibular angle fracture in this region from the other regions.

PATIENTS AND METHODS

The records of all patients of mandibular angle fractures from 2009 to 2019 were reviewed. Factors considered were a clearer understanding of the associated maxillofacial injury, the month of occurrence, the etiology of fracture. A total of 183 patients with 186 mandibular angle fractures were assessed during this study.

RESULTS

Between the year 2009 and 2019, a total number of 183 patients reported to the Department of Oral and Maxillofacial Surgery, HPGDC, Shimla, who sustained mandibular injuries and out of these number of mandibular angle fractures were 186. Out of these patients 168 were males, and 15 were females. Records reveal more male patients in the age group 21-30 years, and none in the age group 0-10 years. Highest number of female patients were also recorded in the age group 21-30 years and none in the age group 51 years and above. Collectively highest number of cases (N=78) were in the 3rd decade of life while least was in the first decade of life (N=1). Majority of patients were admitted in the year of 2012 & 2014 and least in the year 2017.(Table1, Fig.1)

Mandibular angle fractures were reported in the two extremes of age with the youngest patient being 6.5 years old female child and the eldest being 73 years

old male patient. The prevalence of mandibular angle fractures was observed to be highest in men (N= 169, 92.34%).(Table 2, Fig.2)

Fall was the leading cause (N=93, 50.82%), followed by RTA (N=64, 34.97%), Assaults (N= 19, 10.38%), contact sports (N= 3, 1.64%), gun shots (N=1, 0.54%) and others (including collapse of a wall, injury while felling of wood, animal assault, N=3, 1.64%). Fall, RTA, assaults and sports injuries were highest in the age group 21-30 years. (Table 3, Fig.3)

Mandibular angle fractures commonly associated with other mandibular fractures (N=110), followed by midface fracture (N=22) and frontal bone fractures (N= 2).

DISCUSSION

Fractures of the mandibular angle account for the highest percentage of mandibular fractures in many studies. Angle of the mandible is associated commonly with fractures, for several proposed reasons, including the presence of the third molar, other reasons, such as the thinner cross-sectional area than that of the tooth-bearing region (biomechanically, the angle can be considered a “lever”) and biomechanical forces acting on the mandible (including the position of insertion of the masticatory muscles) may influence fracture location.^{4,5,6} Mandibular angle fracture can be defined as favorable or unfavorable depending on masseter and medial pterygoid muscle action on proximal and distal segments of the fracture, which has a potential effect on treatment and prognosis.⁷ Signs and symptoms include pain and edema, change in occlusion, lower lip paresthesia, abnormal mandibular movements, change in facial contour and mandibular arch form, lacerations, hematoma and ecchymosis, loose teeth, and crepitation on palpation.⁸

Knowledge about the epidemiology of maxillofacial trauma is fundamental for every maxillofacial surgeon and for all national health systems, and thanks to a thorough knowledge of the mechanisms of injuries, preventive measures can be introduced.⁷ 183 patients with mandibular angle fracture were recorded in a retrospective study between 2009-2019. Male to female ratio is an important variable. The results of our study in terms of age are not in agreement with those of previous reports whereas in terms of gender ratio results are somewhat similar. Highest incidence of mandibular fractures in our study was in the group 21-30 years unlike other study reports,^{6,9,10,11,12} but similar to few studies.^{13,14,15} Preponderance of male subjects has been reported widely,^{6,14,15,16} the explanations may be that men in his age group take part in the dangerous exercises and sports, drive motor vehicles carelessly, and are most likely to be involved in the violence. But in this study incidence of fracture in males compared to that of females is very high 11.2: 1, as males are engaged more in outdoor activities as females are confined to indoor activities in this part of the world.

Table 1: Mandibular Angle Fractures by Sex and year, Himachal Pradesh 2009-2019

Year	Male	Female	Total
2009	9 (4.91%)	2 (1.09%)	11(6.01%)
2010	20(10.92%)	0	20(10.92%)
2011	16(8.74%)	2(1.09%)	18(9.83%)
2012	23(12.56%)	2(1.09%)	25(13.66%)
2013	15(8.19%)	1(0.54%)	16(8.74%)
2014	22(12.02%)	3(1.63%)	25(13.66%)
2015	12(6.53%)	2(1.09%)	14(7.65%)
2016	18(9.835%)	1(0.54%)	19(10.38%)
2017	9(4.91%)	1(0.54%)	10(5.46%)
2018	12(6.53%)	1(0.54%)	13(7.10%)
2019	12(6.53%)	0	12(6.53%)
Total	169(92.34%)	15(8.19%)	183

Fig. No. 1: Mandibular angle fractures by sex and year, Himachal Pradesh 2009-2019

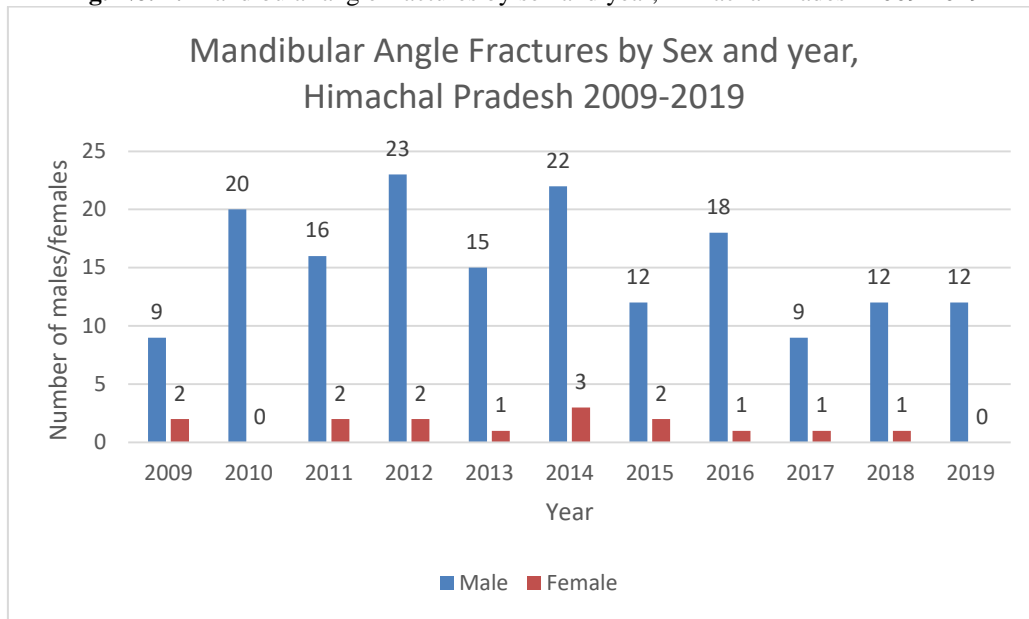


Table 2: Age groups and sex

Age group (years)	Male	Female	Total
0-10	0	1(0.54%)	1(0.54%)
11-20	23(12.56%)	3(1.63%)	26(14.20%)
21-30	74(40.43%)	5(2.73%)	78(42.62%)
31-40	40(21.85%)	1(0.54%)	41(22.40%)
41-50	20(10.92%)	5(2.73%)	25(13.66%)
51-60	9(4.91%)	0	9(4.91%)
60+	3(1.63%)	0	3(1.63%)
Total	169(92.34%)	15(8.19%)	183

Table No. 3: Number of Mandibular fractures by cause and age group

Age group	Fall	Road crash	Assaults	Sports	Gun shots	Others	Total
0-10	1(0.54%)	-	-	-	-	-	1(0.54%)
11-20	13(7.10%)	12(6.55%)	-	1(0.54%)	-	-	26(14.21%)
21-30	37(20.22%)	31(16.94%)	7(3.83%)	2(1.09%)	-	1(0.54%)	78(42.62%)
31-40	23(12.56%)	12(6.55%)	5(2.73%)	-	-	1(0.54%)	41(22.40%)
41-50	13(7.10%)	6(3.28%)	5(2.73%)	-	1(0.54%)	-	25(13.66%)
51-60	4(2.19%)	2(1.09%)	2(1.09%)	-	-	1(0.54%)	9(4.91%)
60+	2(1.09%)	1(0.54%)	-	-	-	-	3(1.64%)
Total	93(50.82%)	64(34.97%)	19(10.38%)	3(1.64%)	1(0.54%)	3(1.64%)	183

Fig No. 2: Number of mandibular fractures by cause and age group

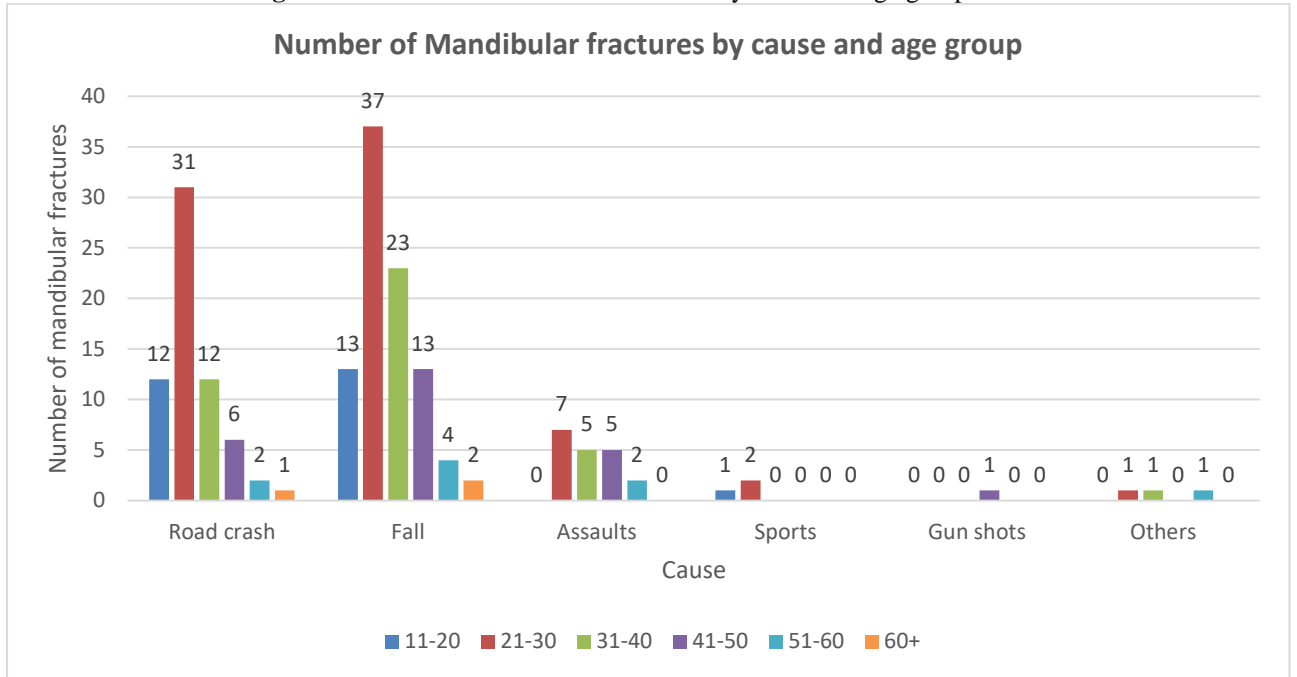
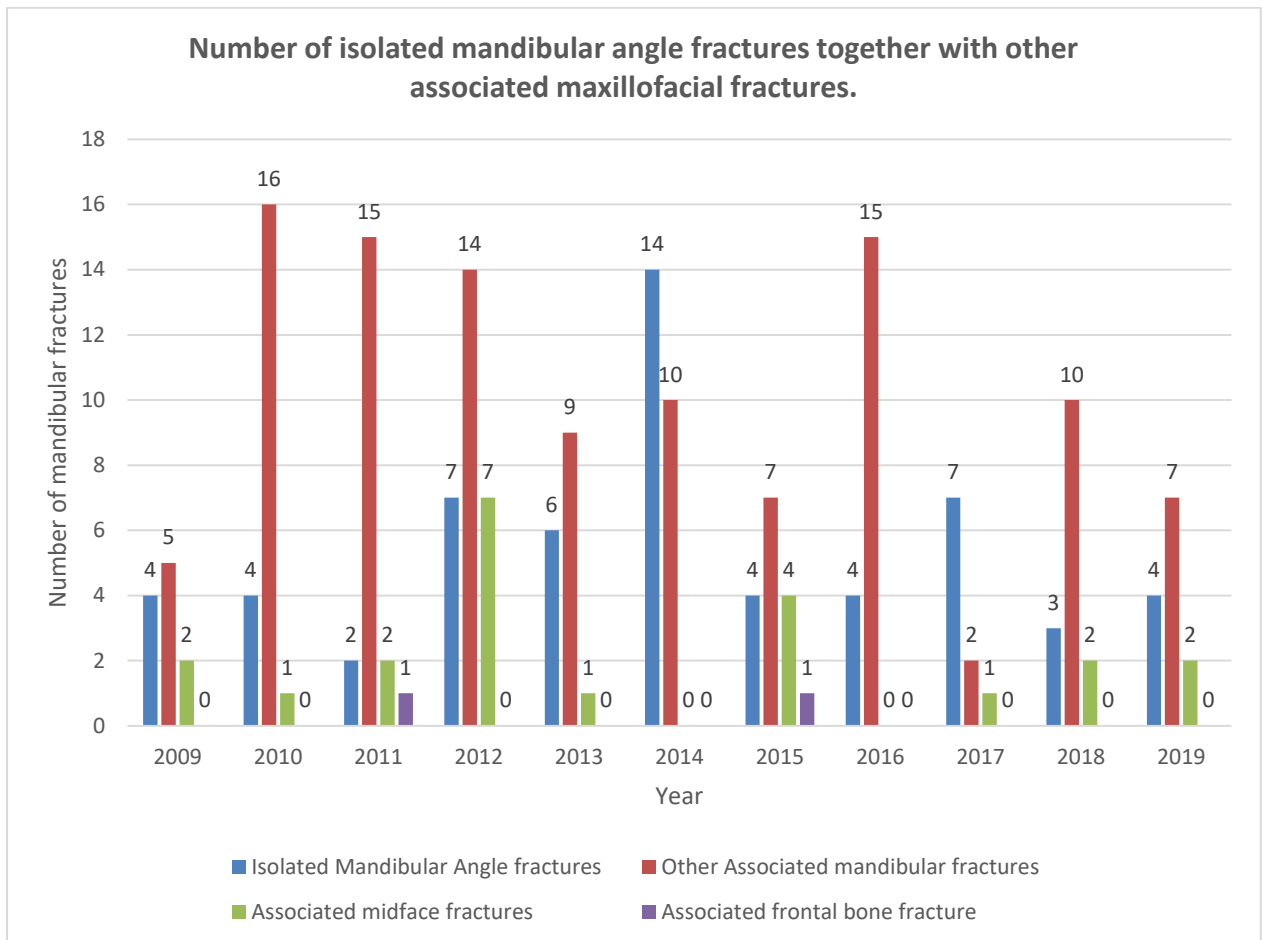


Fig. No. 3: Number of isolated mandibular fractures



There were 3 cases of bilateral angle fracture and the etiology in all 3 were different i.e. fall, gunshot wound and road crash respectively.

Traditionally, the main cause of facial fractures has been RTA, and it remains so in many developing countries, followed in second place by assaults. Of those fractures caused by altercations, left sided injuries were more common than the right sided, considering the preponderance of right handed people in society, one have expected more. Nevertheless, in some developed countries, altercations are emerging as the leading etiology, followed by RTA. In different series published in the United Kingdom, France, United States, Denmark, Japan, Middle East, and New Zealand, traffic accidents are still the main cause, whereas in other series from Zimbabwe, Sweden, and Finland, altercations predominate over any other etiology.¹⁷ In our study, fall represent the most frequent cause, closely followed by road traffic accidents and very less due to altercations as compared to other studies. Etiology of mandibular angle fracture in our study group was accidental fall, unlike many authors who have reported main cause of to be altercations^{5,18,19} and road traffic accidents (RTA).^{6,13,14,15}

Etiology of angle fracture even in other parts of India is RTA^{20,21} unlike accidental fall in our region. The high-altitude of the villages, landscape and the rocky terrain of the valley justifies to a certain extent why fall is the major cause of mandibular angle fracture in the state, followed by RTA and assault being the most lesser known in etiology. It also clearly points out to the fact that difference in the cultural, socioeconomic and environmental factors influence the major etiology of the fractures.

A distinctive aspect in our series was the relatively high percentage of fractures due to accidental fall (50.8%), followed by road traffic accidents (34.9%), assaults (10.3%), sports (1.6%), gun shots (0.54) and others (1.6%), among this 1.6%, other causes of the fractures were related to domestic animals, collapse of wall, working tools such as tools to cut wood, and others similar to them. Most of the associated fractures were located in mandible itself followed by midface. This etiology is not reflected as a single category in a majority of the series in the literature because of the very low percentage they account for. This is due to socioeconomic characteristics of the population our center covers, with an important weight of agricultural and livestock sectors. No other series in the reviewed literature of Western countries showed this kind of distribution.

With regard to age and gender, the higher incidence in young males is a repeated result in the majority of the series, and also in ours. The male: female ratio in our series (11.2:1) didn't coincide with that in other studies from countries, such as UK and France (5:1).²² But in other countries, somewhat similar results have been noticed regarding facial fractures i.e. 11:1,²³ as in Arabic countries, due to social and cultural

differences in the nature of work between men and women.

The demographic patterns of mandibular fractures will assist providers of health care in inciting a clear vision, and better understanding as they plan the treatment of maxillofacial injuries. Such epidemiological information can also be used to guide the fracture funding of Public Health Programmes geared towards prevention of such injuries.

COMPLIANCE WITH ETHICAL STANDARDS FUNDING

NA

CONFLICT OF INTEREST

Nil

ETHICAL APPROVAL

Not required

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