

Clinical profile and Pattern of Mandibular Fractures

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ABSTRACT

Background: Mandibular fractures are a major component of maxillofacial trauma due to the prominent anatomical position in facial skeleton. Their prevalence, etiology, and injury patterns vary across age groups and are influenced by environmental and geographical factors. This study aims to analyze clinical, demographic profile and pattern of mandibular fractures presenting over a period of 5 years in a tertiary institute.

Methods: An observational retrospective study was conducted over a 5-year period from hospital record of National Academy of Medical Sciences, Bir Hospital, Kathmandu, Nepal. Data of all reported mandibular fracture cases were collected and analyzed based on age, gender, mechanism of injury, fracture site, and monthly variation.

Results: A total of 839 mandibular fractures were recorded among 395 patients, with 331 males and 64 females. The most affected age group was 21–30 years (41.8%), while the least affected was 0–10 years (1.0%). Road traffic accidents were the leading cause (60.5%), followed by falls (24.5%), interpersonal violence (13.6%) and sports injuries (1.0%). Road traffic accidents were most common in young adults, whereas falls were more frequent at the extremes of age. Combination fractures involving multiple mandibular sites were more common (33.7 %) than single-site fractures. Among single-site fractures, Parasymphysis (25.1%) was most frequently involved, followed by condyle (13.4 %) and angle (11%). A higher incidence of cases was observed in December followed by July, and August. There was significant association between age group and etiology ($p=0.001$) and age group and fracture site ($p=0.008$).

Conclusions: Road Traffic Accident are the leading cause of mandibular fracture in young adults with multiple site combination mandibular fracture being the commonest.

Keywords: Mandibular fracture; maxillofacial injuries; road traffic accidents; young adults.

INTRODUCTION

Mandibular fractures are among the most common maxillofacial injuries, representing a substantial proportion of facial bone fractures worldwide.^{1,2} The mandible plays a vital role in essential functions such as mastication, speech, and facial aesthetics, making its structural integrity critical for both physical and psychological well-being.³ These fractures arise from various causes, including road traffic accidents, falls, interpersonal violence, and sports-related injuries, with the pattern and severity often determined by the mechanism of trauma.^{1,3}

Epidemiological evidence consistently indicates a higher prevalence of mandibular fractures among young adult males.^{4,6} In contrast, older populations

are more susceptible to fractures resulting from falls. Additionally, geographical and socioeconomic factors significantly influence incidence rates.^{1,2,7}

Despite prior studies, a complete understanding remains limited because of complex contributing factors. This study evaluates the demographic and epidemiological characteristics of mandibular fractures at a tertiary care center in Nepal, focusing on patient demographics, etiology, fracture sites, and monthly variations.

METHODS

This retrospective hospital-based study included all diagnosed case of mandibular fracture who were treated or evaluated in the Department of Oral and Maxillofacial Surgery at the National Academy of Medical Sciences,

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Nepal between January 2020 and December 2025. Ethical clearance was obtained from the Institutional Review Board (Ref no. 531/2082/83). Patient records were retrieved and systematically reviewed to obtain relevant clinical and demographic information. Only cases with sufficient information on variables and documentation were included in the study. Cases with pathological fracture and incomplete data records were excluded from the study. Data were evaluated with respect to age, gender, mechanism of injury (etiology), anatomical site of fracture in mandible and monthly distribution. Patients were categorized into seven age groups: 0-10, 11-20, 21-30, 31-40, 41-50, 51-60, and above 60 years. The etiology of mandibular fractures was classified into categories including Road Traffic Accidents (RTA), Interpersonal Violence (IPV), fall injuries, sports-related injuries, and others when the etiology was not clear. Fracture sites were analyzed based on anatomical location and categorized into mandibular subsites: symphysis, parasymphysis, body, angle, ramus, condyle, coronoid, as well as combinations of these sites. In cases where multiple fracture sites in mandible were present, they were recorded as combination fractures. The monthly distribution of mandibular fractures was determined based on the time of patient presentation to the hospital. Each case was recorded according to the month in which the patient reported with the injury. All collected data were entered into Microsoft Excel and analyzed using Python version 3.10. Categorical variables were summarized as frequencies and percentage and were presented as number of patients (n) and percentage (%). Association between categorical variables were assessed using the chi-square test and with Fisher's exact test used where appropriate for small expected cell counts. The contingency coefficient was calculated to assess the strength of association between categorical variables. A P-value < 0.05 was considered statistically significant.

RESULTS

The demographic details are shown in Table I. During the 5-year study period, a total of 395 patients sustained 839 mandibular fractures. The age groups ranged from 0 to above 60 years. The highest incidence of mandibular fractures was observed in the 21 to 30 year age group (n=165, 41.77%). Here n is the total number of cases and % is percentage. This was followed by 31-40 year (n=92, 23.2 %), 11-20 years (n=64, 16.2 %), 41-50 years (n=38, 9.6%), 51-60 (n=23, 5.8 %) and above 61 years (n=9, 2.2 %). The lowest number of cases was observed in the 0-10 years age group (n=4, 1.0%). Among the 395 patients, 331 (83.8%) were males and 64 (16.2%) were females, giving a male-to-female ratio of approximately 5.2:1. This indicates a clear

male predominance in mandibular fracture cases.

The age-wise distribution for mechanism of injury is shown in table I. Mandibular fractures were attributed to various etiology across all age groups. Road traffic accidents (RTAs) were the most common cause (n=238, 60.2%) followed by falls (n=97,

24.6%), interpersonal violence (IPV) (n=54, 13.7%), sports related injury (n=4, 1.0%) and other causes (n=2, 0.5%) where etiology was not clear. The distribution of etiological factors across different age groups revealed that road traffic accidents (RTA) were the predominant cause of mandibular fractures in most patients. The highest incidence of RTA-related injuries was observed in the 21-30 years age group (n=109, 66.1%), followed by the 31-40-year age group (n=58, 63.0%) and 11-20-year age group (n=38, 57.6%). A gradual decline in the proportion of RTA was noted with increasing age, with 41-50 years (n=21, 55.2%), 51-60 years (n=8, 34.8%), and above 60 years (n=3, 33.3%) age groups showing lower percentages. The lowest occurrence of RTA as an etiological factor was observed in the 0-10-year age group (n=1, 2%). In contrast, fall injury was the leading cause of mandibular fractures in the extremes of age. It accounted for most cases in the 0-10 years age group (n=3, 7%) and remained the most common etiological factor in patients of the age group 51-60 (n=9, 39.1%) and older than 60 years (n=5, 55.5%). These findings indicate a clear age-related variation in the causes of mandibular fractures, with RTAs predominating in the younger and middle-aged population, while falls are more common among children and the elderly. The χ^2 - test showed a significant association between age group and etiology (χ^2 - test=58.24, p=0.001, degree of freedom= 24). The distribution of fractures according to anatomical location is presented in Table 2. In the total 839 mandibular fractures, the combined fracture pattern was commonly observed (n=283, 33.8%) which shows involvement of more than one site in mandible. The commonest single site was parasymphysis, followed by condyle, angle, symphysis, body of mandible, ramus and coronoid. On assessing the association between fracture site and patient demographic characteristics, a statistically significant association was observed between age group and fracture site (χ^2 - test=67.16, p=0.008, degree of freedom= 42). Combination of any two or more sites were most frequently observed in the 21-30-year age group compared with the other age groups. However, χ^2 - test showed no significance between etiology and fracture site (χ^2 - test=120.36, p=2.01, degree of freedom= 28).

Table 1: Distribution of Gender and Mechanism of Injury for all age groups.

AGE CATEGORY	GENDER		RTA	FALL	IPV	SPORTS	OTHER	TOTAL n (%)
	M	F						
0-10	3	1	1	3				4 (1.0)
11-20	55	9	38	14	10	2		64(16.2)
21-30	137	28	109	35	19	2		165(41.7)
31-40	81	11	58	18	16			92 (23.2)
41-50	31	7	21	13	4			38(9.6)
51-60	17	6	8	9	4		2	23(5.8)
Above 60	7	2	3	5	1			9 (2.2)
TOTAL (%)	331(83.8)	64(16.2)	238(60.2)	97(24.6)	54(13.7)	4(1.0)	2 (0.5)	395(100.0)

Table 2. Distribution of fractures according to anatomical location.

Site	No. of patients (n)	Percentage (%)
Symphysis	65	7.8
Parasymphysis	211	25.1
Body of mandible	62	7.4
Angle of mandible	93	11.0
Condyle	113	13.5
Coronoid process	3	0.4
Ramus of mandible	9	1.0
Combination of any two or more	283	33.8
Total	839	100.0

The monthly distribution is shown in Table 3. Analysis of the monthly distribution revealed that the highest incidence of mandibular fractures occurred during December (13.6%), July (11.4%) and August (10.1%), followed by September (8.9%) and November (8.9%). The other months included January (7.1%), February (5.8%), March (6.1%), April (7.6%), May (7.6%), June (7.3%) and October (5.6%). No statistically significant association was observed between age group and monthly distribution and between etiology and monthly distribution (χ^2 - test=42.29, $p=0.5$, degree of freedom= 44). But it was found that RTA was more frequent etiological factor for mandibular fractures for month of July and December.

Table 3. Monthly distribution of patients with mandibular fractures.

Month	No. of patients (n)	Percentage (%)
January	28	7.1
February	23	5.8
March	24	6.1
April	30	7.6
May	30	7.6
June	29	7.3
July	45	11.4
August	40	10.1
September	35	8.9
October	22	5.6
November	35	8.9
December	54	13.7
Total	395	100.0

DISCUSSION

Mandibular fracture is a significant public health concern and represent one of the most frequently occurring types of maxillofacial injuries worldwide.^{2,8} Their incidence and distribution are closely linked to various epidemiological factors such as age, gender, socioeconomic status, geographic location, and the mechanism of injury.^{4,9,10} Understanding these factors is essential for effective prevention strategies, resource allocation and the development of targeted treatment protocols.

The present study analyzed the pattern of mandibular fractures over a 5-year period, focusing on age and gender distribution, etiology, anatomical location, and seasonal variation. The findings highlight important epidemiological trends that are consistent with, yet distinct from, observations in other populations. A global study done in Australia by Lee et al.¹ shows that the mandible is the commonest site of fracture in cases of maxillofacial trauma which is consistent with the findings of present study. Owing to its prominent position in the facial skeleton, its mobile nature and less bony support puts it into a vulnerable position which can be easily injured during any untoward events.³ However, the location of fracture within mandible depends upon the mechanism of injury and the impact sustained by the mandible.¹¹

Most of the studies conducted in the Nepalese population have reported findings that are consistent with the results of the present study, reinforcing the observed epidemiological trends of mandibular fractures.^{4,5,12-14} Similar to previous studies by Atilgan et al,¹⁵ Kartik et al,¹⁶ Maharjan et al,⁴ Lin et al⁶ and Ghezta et al¹⁰ a higher incidence was noted among young adult males, particularly in the second and third decades of life. This pattern is widely attributed to increased exposure to risk-prone activities such as road traffic accidents, low socioeconomic status and poor traffic management leading to the overuse of two wheelers, use of alcohol while driving, poor road conditions, hilly terrain, interpersonal violence, and occupational hazards.¹⁴ The predominance of male patients within this age group likely reflects underlying sociocultural and behavioral factors that increase their susceptibility to trauma, particularly within the context of a Nepalese society.^{5,13,16} The male predominance in this study is in accordance with almost all the studies which are listed here.

The present study clearly reveals an age-related variation

in the etiology of mandibular fractures, with road traffic accidents being the predominant cause among younger and middle-aged individuals, particularly in the 21-30 years age group. These finding are consistent with several studies conducted in Nepal and other developing countries, where RTAs have been identified as the leading cause of maxillofacial injuries among young adults because of increased mobility, risk-taking behavior, and greater exposure to vehicular traffic.^{1,5,14} The high incidence in the second and third decades of life reflects the active and economically productive segment of the population, which is more frequently involved in outdoor activities and transportation.¹⁷

The declining trend of RTA-related fractures with increasing age observed in this study is also supported by the literature.^{5,15,16} Reduced mobility, decreased exposure to high-speed travel, and more cautious behavior among older individuals may account for this pattern. Conversely, fall injuries were found to be the predominant etiological factor at the extremes of age, particularly among children (0-10 years) and the elderly population (51-60 and above 60 years). This finding aligns with established evidence suggesting that children are more prone to falls due to underdeveloped motor coordination, while elderly individuals are at higher risk due to factors such as impaired balance, reduced vision, and comorbidities.¹¹ In the present study the number of fractures was the lowest in 0 to 10 years age group as the mandibular bone is more elastic with presence of thick overlying adipose tissue and presence of unerupted permanent teeth and good parental care or supervision.^{5,16}

The findings of the present study are in agreement with global epidemiological trends, which highlight RTAs as the principal cause of mandibular fractures in younger populations and falls as the leading cause in older age groups.^{5,15,16} According to a recent study by Raymond et al¹⁴ in 2026, Nepal suffers the highest burden of RTAs constituting a major public health and socioeconomic challenge. These results underscore the need for targeted preventive strategies, including stricter traffic regulations, good and well-lit roads which will increase the nighttime visibility and stricter rule for use of helmet and seatbelt. Additionally, there is a need for fall prevention programs for vulnerable age group and safety guidelines for construction site workers. Public health interventions tailored to specific age demographics could significantly reduce the burden of mandibular fractures and associated morbidity.

The result of present study demonstrates that fractures

involving multiple anatomical sites are more common than isolated single-site fractures which is similar to the findings of Atilgan et al.¹⁵, Chen et al.⁹, Lin et al.⁶ and Jaisani et al.³ These findings contrast with the study by Maharjan et al.⁴, Lin et al.⁹ and Saravanah et al.¹⁷ in which single-site fractures were reported as the most frequent presentation. Morris et al.² explained the mechanism underlying single and multiple fracture patterns, noting that road traffic accidents, typically high-velocity injuries, are more likely to result in fractures at multiple sites, whereas interpersonal violence, usually involving low-velocity impact, tends to cause fractures at a single site. Consistent with this explanation, the results of this study also support the greater number of combined fractures than a single-site fractures as RTAs were more frequent etiological factor.

In cases of single-site fractures, the parasymphysis was the most frequently affected region, followed by the condyle and the angle of the mandible. This pattern is consistent with findings reported by Jaisani et al.³, Maharjan et al.⁴, Kansakar et al.⁵, Kartik et al.¹⁶ and Lin et al.⁹ Studies done in UAE, Jordan, Nigeria and Iran where RTAs were common causative factor for maxillofacial injuries due to high velocity impact in the absence of shock absorbing effects of airbags explain the high frequency of anterior and body of mandibular fracture.¹ In contrast, studies by Ghetza et al.¹⁰ and Lin et al.⁸ reported the condyle as the most common fracture site whereas Morris et al.² and Lee et al.¹ identified the angle as the predominant location.

The parasymphysis is particularly susceptible to fracture because of its anatomical position along the curvature of the mandible and the presence of long-rooted canines, which create areas of structural weakness.^{3,16} Condylar fractures are also common, as a thin condylar neck is prone to fracture upon impact, often serving as a protective mechanism that dissipates force and reduces the risk of more severe cranial injury.⁸ Angle fractures are frequently associated with trauma resulting from interpersonal violence, as this region represents a biomechanically weaker area of the mandible, especially in the presence of impacted or erupted third molars.¹⁸ In addition to studies done in developed countries,^{1,2,11} where interpersonal violence is the common mechanism for injuries angle of mandible are the common site due to the way the jaw is struck.

An evaluation of the monthly distribution of fracture incidence in the present study revealed an increased number of cases during the months of December, July and August. These findings are consistent with

studies conducted by Morris et al.,² Ascaini et al.⁷ and Atilgan et al.¹⁵ In contrast, Ghetza et al.¹⁰ reported the highest incidence in April and the lowest in December, while Tripathy et al.¹³ observed a peak in June and a minimum in December. The largest study on maxillofacial trauma done by Lee et al.¹ shows that the monthly variation is different for different countries as Australia has a higher incidence in winters because of hazardous condition, for Poland and Brazil it is spring as good weather leads to reckless driving and Canada has the highest incidence in summer.

Variations in monthly patterns across different studies can be attributed to seasonal differences and associated environmental and social factors. During the summer months, fracture incidence tends to increase due to greater participation in outdoor activities and the occurrence of festivals that attract large crowds.^{2,7} In the context of Nepal, July and August coincide with the monsoon season, characterized by heavy rainfall, which contributes to poor road conditions, landslides, and slippery surfaces, thereby increasing the risk of road traffic accidents and fall-related injuries.^{10,13} The higher incidence observed in December corresponds to the winter season, during which fog and mist reduce visibility—particularly in the early morning and late evening—while frost formation can make roads slippery.¹⁵ Additionally, Raymond et al.¹⁴ study done in Nepal have shown higher rates of trauma seen in month of October due to increased social gatherings and festivities during this period may contribute to a higher incidence of alcohol-impaired driving.

As this study was conducted at a single tertiary care hospital, the findings may not fully represent the epidemiological patterns of mandibular fractures across the country. Therefore, multicenter studies involving diverse geographic regions and healthcare settings are recommended to provide a more comprehensive understanding of the demographic characteristics, etiological factors, fracture patterns, and temporal trends of mandibular fractures in Nepal.

CONCLUSIONS

Road traffic accidents are the leading cause of mandibular fractures in young adults and fall in the extreme of ages. Combination fractures involving multiple mandibular sites was the commonest pattern with most involving Parasymphysis.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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