

Original Research Article

Current Trend in the Treatment of Mandibular Fracture in Central India.”**Mrinal Satpathy¹, Saba Tiwari², Yogesh Sharma³, Sumit Bhargava⁴**¹*Associate Professor, Peoples Dental Academy, M.P, India*²*Associate Professor, LN Medical College & JK Hospital, Bhopal, India*³*Associate Professor, NSCBMC, Jabalpur, India*⁴*Professor, Department of Anaesthesiology, JKHMRC, Bhopal, India***Received: 03--2021 / Revised: 26-05-2021 / Accepted: 22-06-2021****Abstract**

Introduction: Maxillofacial trauma being one of the most commonly & frequently addressed disease condition in any trauma centre. Hence, providing a vast scope for timely research and audit for betterment of treatment being provided and also precautions to be implemented for such settings and locations. **Methods:** Retrospectively 3 year medical records of mandibular fracture cases from 12 selected fracture treatment centers of central India were collected and analyzed. In all, 797 patients of mandibular fracture were reported, which had 1165 fracture i.e. approximately 1.5 fractures in every patient. **Results:** Parasymphysis region was the most common fracture site (33.3%), followed by body and condyle (21.3% & 21.1% respectively). Majority of the cases were managed by open reduction and internal fixation (ORIF) which accounted for 52.6% of total cases, cortical miniplates were used in majority of these cases. Closed reduction modalities were used in 15.8% of cases, in this arch bar was the most preferred modality for Inter-maxillary Fixation (IMF). 10.2% of the cases did not undergo any treatment, or palliative treatment was advised. Supplemental post operative IMF were given in 21.4% of the cases. **Conclusion:** In the present study, inclination for ORIF as treatment modality emerged which was in accordance with the majority of similar studies. Also escalating usage of post-operative supplementary IMF emerged after ORIF. Former finding highlighted the fact that surgical procedure is the most preferred option among surgeons, or the mandibular fracture cases been treated were indicated for ORIF. But the latter finding indicated 3 possibilities, first a large number of cases were displaced or comminuted fractures, second a large number of condyle fracture or concomitant condyle fracture cases, and third the lessened effectiveness of ORIF treatment to render functional rehabilitation at the earliest, post operatively.

Keywords: Mandible fracture, ORIF(Open Reduction Internal Fixation) , Inter-maxillary Fixation (IMF)

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Introduction

Maxillofacial trauma being one of the most commonly & frequently addressed disease condition in any trauma centre. In this, mandibular bone is one of the most common facial bone to get fractured, due to its prominent position in face [1-4]. The common causes for this being road traffic accidents (RTA), assaults, fall, sports related injuries etc.[2,5,6] with the predominant gender involved being male of age group 20-40 years[7, 8].

Fracture site location in mandible seems to be related to the etiology of injury in some cases and even depicts the vector of force striking the mandible. Contact sports and interpersonal violence mostly results to angle fractures. Moving motor vehicles and falls leads to higher counts of parasymphysis and condylar fractures as RTA victims mostly face posteriorly directed force to the mandible, like chin impact during fall or chin striking the steering wheel or dashboard [9]. Globally studies have shown differences in the pattern of injuries as well as management scheme. These variability's has been seen from country to country with varying socio-economic status of population as well as popularity of treatment trends among the clinicians of the region [8, 10-12].

Hence, providing a vast scope for timely research and audit for betterment of treatment being provided and also precautions to be implemented for such settings and locations. Thus, the aim of this retrospective study was to ascertain pattern & etiology of mandibular fractures and treatment trends of fractures of the mandible in central India, conducted in the second largest state of India. With an objective that this audit would highlight the treatment to be optimized and improvements in the patient's quality of life.

Materials and Methods

The study involved a 3-year retrospective epidemiological study at maxillofacial units of 5 dental colleges and 7 selected hospitals of central India with major trauma centres. The time period included January 2018 to December 2020. Specific details of source and patients were kept hidden in view of ethical grounds. Medical records of patients who sustained mandibular fracture reported and underwent treatment in all these units were pooled and analysed.

Inclusion criteria

- Patient diagnosed of mandible fracture.

Exclusion criteria

- Critically injured patients where mandible fracture was not addressed for definitive or palliative care.
- Posthumous diagnosis of mandible fracture.

The following data were extracted from the medical records: age; gender; site of the fracture(s); cause of the trauma and method of treatment(s). In all records of 797 patients with mandibular fracture were analyzed. The treatment rendered in the first medical appointment, who presented with mandibular fractures like dental splint for re-approximation and immobilization of fractures, were not

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recorded and the final treatment modality with which the patient was discharged was recorded. The age of the patients was stratified decade wise, along with gender. The site of the fracture were recorded as symphysis; parasymphysis; body; angle; ramus; coronoid; condyle and mandibular dentoalveolar region. The treatment was classified into broad categories of; open reduction and internal fixation (ORIF); closed reduction method; ORIF along with supplemental post operative intermaxillary fixation (IMF); and no treatment/ palliative treatment category.

In case of ORIF category, technique of fixation type was recorded, but intraoperative IMF type was not recorded. Closed reduction

category involved recording of closed reduction modalities. Category of ORIF with supplemental post operative IMF, involved recording of IMF technique used. No treatment/ palliative treatment included where no active surgical intervention or reduction method was employed and only observation or palliative treatment was rendered which included drugs regime, soft diet therapy, protection devices, physiotherapy, and close follow-up.

Observation Chart

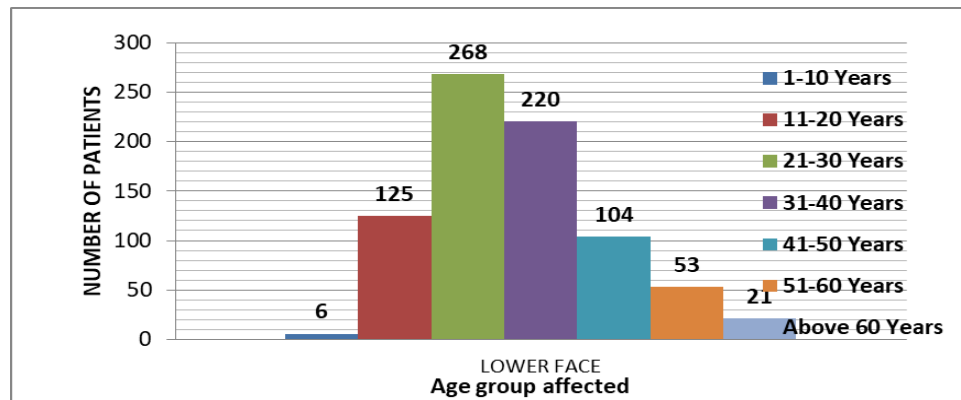


Fig 1: Patient's age distribution with mandible fracture

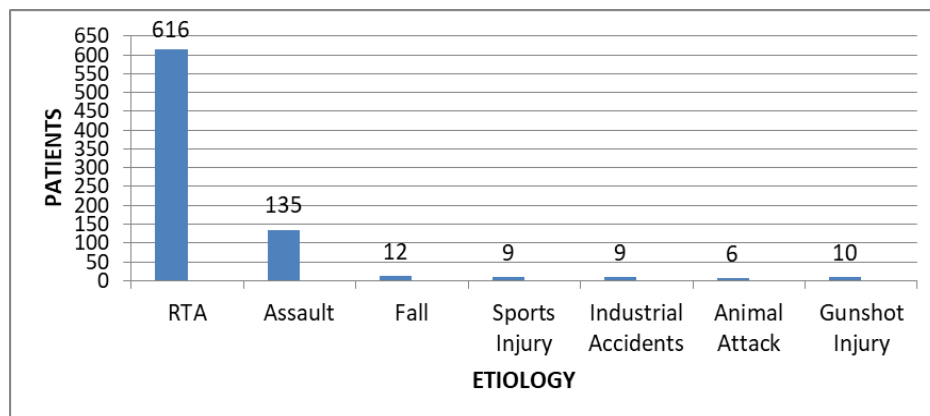


Fig 2: Causative factors resulting mandible fracture

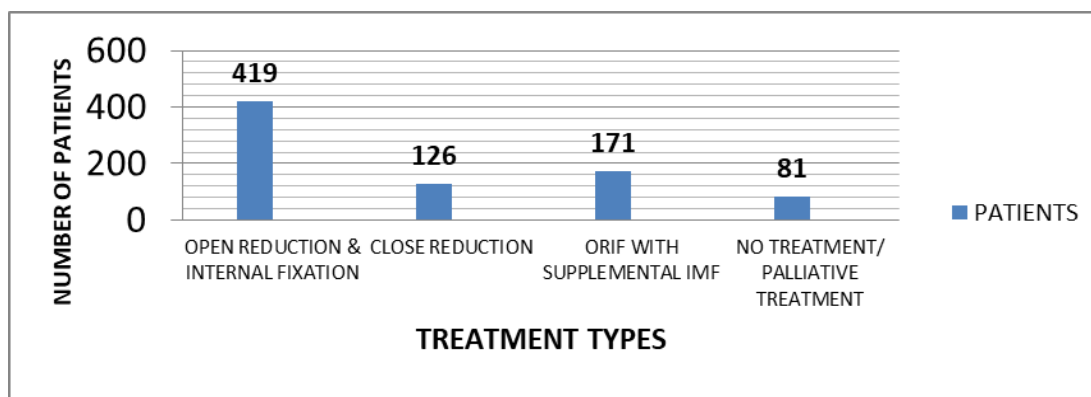


Fig 3: Treatment employed in all patients

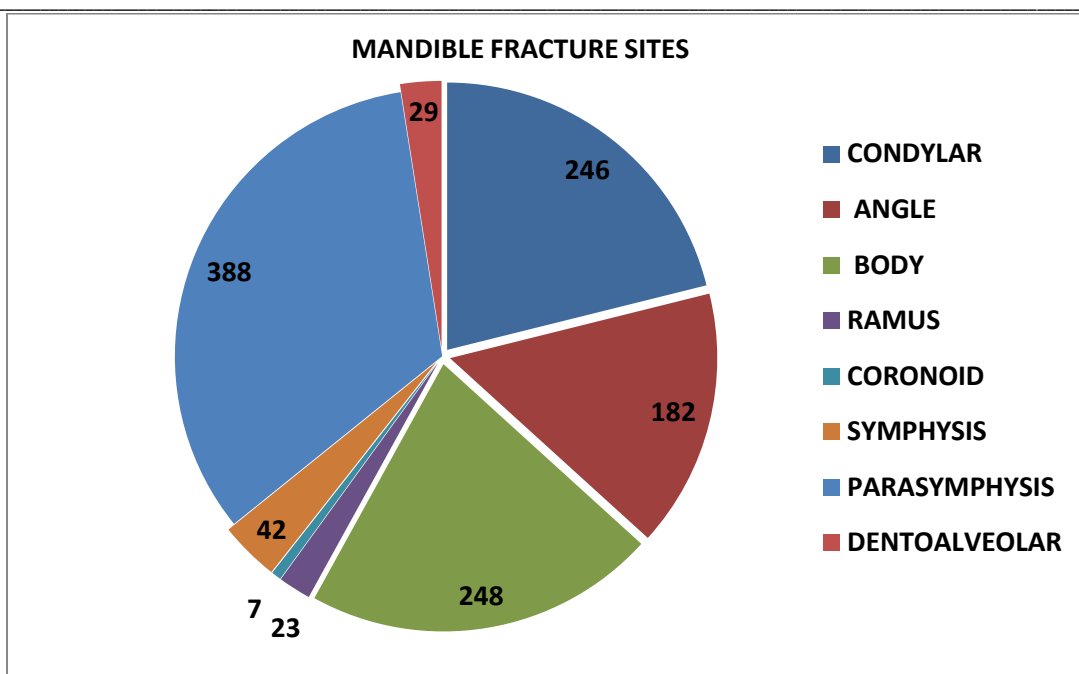


Fig 4: Mandibular fracture sites.

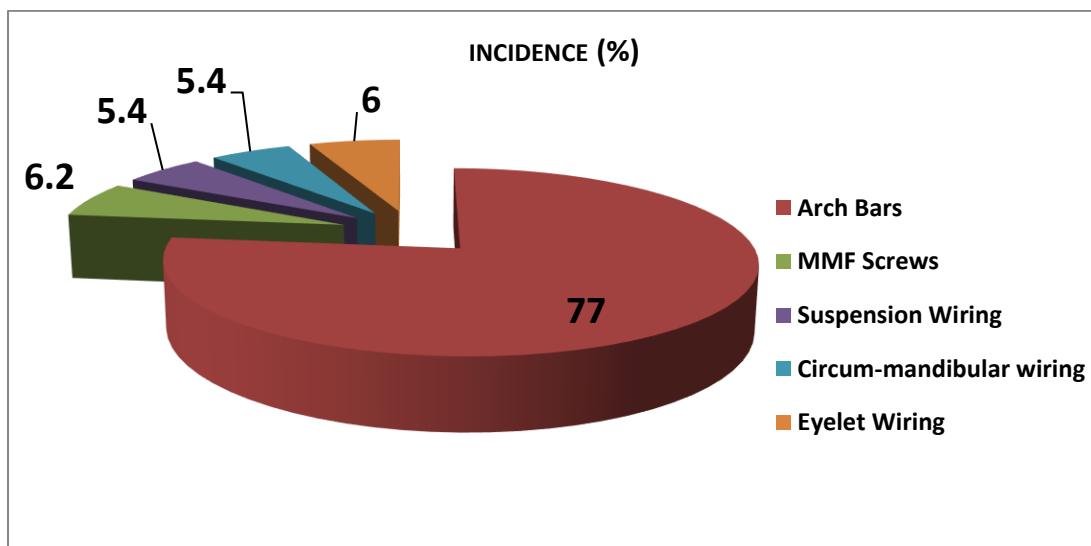


Fig 5: Close treatment specific

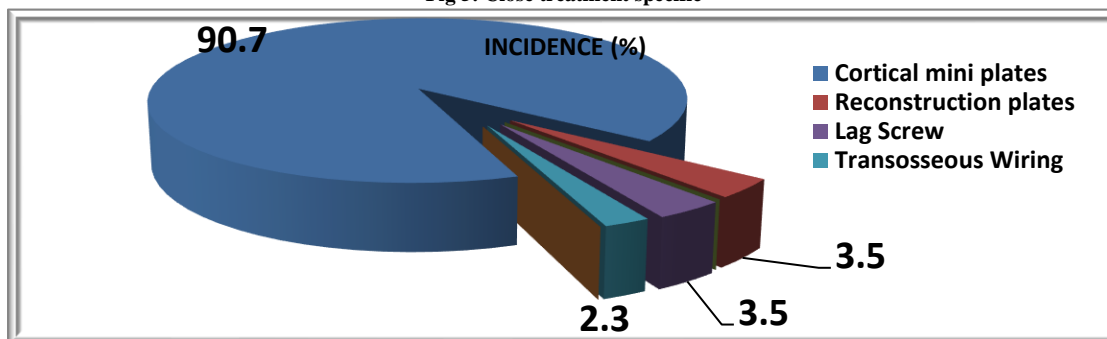


Fig 6: Open treatment specific.

Results

Age & Gender Of the 797 patients, 609 (76.4%) were men and 188 (23.6%) were women with male to female ratio as 3.2:1. The highest numbers of patients affected were found of the age group 21-30 years as shown in Fig 1. Male patients were predominantly involved in all the age groups.

Etiology RTA was found to be the paramount etiological factor, being the causative reason in 616 patients (77.3%). Interpersonal assault led to mandibular fractures in 135 patients (16.9%). Other aetiologies were fall, sports injury, industrial accidents, animal attack and gunshot injury as shown in Fig 2.

Fractures In 797 patients, 1165 fractures were found, in other words approximately 1.5 fractures in every patient. In 616 patients (77.3%) isolated mandible fracture was found, and in rest 181 patients (22.7%) other maxillofacial bones were also fractured along with mandibular bone. 112 patients had single site of fracture in mandible, whereas 685 patients had more than single fracture in mandible. Parasymphysis region was the most common fracture site with 388 instances (33.3%), followed by body and condyle having 248 instances (21.3%) and 246 instances (21.1%) respectively. Mandibular angle was found to be fractured in 182 instances (15.6%). Other sites fractured were ramus (2%), symphysis (3.6%), coronoid (0.6%), and mandibular dentoalveolar (2.5%) as shown in pie chart 1.

Treatment Majority of the cases were managed by ORIF which accounted for 52.6% of total cases, closed reduction modalities were used in 15.8% of cases, and 10.2% of the cases did not undergo any treatment, or palliative treatment were advised. In 21.4% of the cases supplementary post operative IMF was given after employment of ORIF modality as shown in Fig 3. Arch bar was the most employed closed treatment modality used in 77% of the cases, followed by IMF screws and eyelet wiring (pie chart 2). Cortical miniplates were the most employed fixation system in case of ORIF i.e. it was employed in 90.7% of cases, followed by lag screws and reconstruction plate (pie chart 3).

Statistical Analysis

Quantitative analysis All the information from the records was fed into a computer for analysis of frequency and correlation of different parameters. The significances of the findings were evaluated using 'Pearson Chi-Square test'. It was used to evaluate the association/significance difference between different variables/parameters. The correlation of etiology, age and gender was found statistically significant on application of Pearson's Chi square test. Statistically significant difference was found in relation of age and gender affected ($P < 0.05$). There was statistically significant difference ($P < 0.05$) found in relation of gender and major treatment methods employed. The same statistically significant test resulted in statistically non significant value ($P > 0.05$) when applied for relationship of age group and major treatment method employed.

Discussion

Maxillofacial injuries are now becoming a common encountered problem in hospitals. Particularly mandible being the most prominent and mobile bone of the face. Its fracture affects the individual not only by limiting the functional aspect, but also hampers the aesthetics and ultimately affecting the individual's quality of life. The diversity of the causes of trauma produces different patterns of fractures depending on sociodemographics, lifestyle, industry, and outdoor activities. Reconstruction aims to restore the preinjury anatomy and function as much as possible.

Mandibular fractures can lead to significant functional and aesthetic sequelae if treated improperly. They may act as an indicator of concomitant trauma and are very demanding on the public health care system. Thus, knowledge of mandibular fracture epidemiology is critical to effective prevention, as well the establishment of accurate trauma evaluation protocols. To identify the epidemiology of mandibular fractures and therefore this study was undertaken to

clarify the pathogenesis of these epidemiological patterns and suggest potential targets for preventive efforts. Our aim was to evaluate the demographics, etiologies, patterns, treatment modalities and outcomes of management of Mandibular Fractures.

Arch bar as a means for closed reduction IMF was the highest employed technique found in our study. This might explain that arch bar is the most stable form of IMF modality. In addition, it holds superior place in altering the occlusal abnormalities resulted because of fractures. In the present study, 10.2% of patients did not undergo any treatment, or were advised palliative treatment. These findings are lower than the findings published by Buchanan J. et al [8]. Also in the present study those patients records were excluded who succumbed due to additional injury before any active or palliative treatment for mandible fracture could have been employed. Previously, similar papers have been published in various time periods regarding mandibular skeletal injuries [13-15]. Most studies [1, 16] in the last decade have shown RTA as the leading cause for mandibular fracture irrespective of geographical location of study. Largely, mandibular fractures have been affected while driving a motor vehicle, pedestrians hit by a fast moving vehicle, cyclists driving on road and passengers in a moving vehicle meeting with a collision on road [17]. In the present study too, RTA was the single largest contributing factor for mandibular fractures (67.7%). This is in agreement with the other studies conducted in India [9, 18]. Thus, attributing to the fact that motor vehicles are the most popular means of transportation in both urban and rural settings in our region and result in highest contribution to the mandibular fractures. Male to female ratio in the present study was found to be as 3.2:1. This finding is in accordance with previous studies by Zachariades N. et al [19], Gupta D. S. et al [1] and Gadre K. S. et al [18], where it was 3:1, 3.7:1 & 2.5:1, respectively. In the present study, the age group of 21-30 years and 31-40 years category accounted for maximum number of cases, which concurs with the earlier report of Bataineh A. B [20], Ahmed H. E. A. et al [21] and Matos F. P. D. et al [22].

Among frequency of fracture sites involved in mandible, the highest site affected was parasymphysis region of mandible, followed by body and condyle. This is in agreement with the study conducted by Gupta D.S. et al [1], Bali R. et al [9], and Sawhney C. P. et al [23] who in their study found that parasymphysis and canine region fractures more frequently than condylar region. In the present study, 77.3% patients had isolated mandible fracture, whereas, in rest 22.7% other maxillofacial bone along with mandible was also found to be fractured. The most common combination in this was found of zygomatic complex (ZMC) and mandible. 85.9% of patients had more than single site of fracture in mandible, in which the most common occurrence was found of parasymphysis and opposite side condyle fracture or body fracture with contralateral condyle fracture. This pattern shows the transfer of impact force causing fracture of the side directly affected and resultant indirectly fractured condyle due to transfer of impact force posteriorly. In all 52.6% of the patients were treated by ORIF. ORIF along with post operative supplemental IMF was found to be employed in 21.4%. Which if taken together with all the cases which underwent ORIF treatment was found to be 74%. In the study by Gadre K. S. et al [18] ORIF method were found to be employed for 70.6% of the patients, which is similar to the present findings. In their study instances of supplemental IMF were found to be employed only where concomitant condyle fracture was present. This is dissimilar to our study, where supplemental IMF was done not only in patients with additional condylar fracture, but largely in those with no condyle fracture, post operatively. So it might be attributed that cases that underwent supplementary IMF were cases of majorly displaced and comminuted fractures requiring some occlusal adjustment post operatively through IMF, or the lessened effectiveness of ORIF treatment practiced by clinicians to render functional rehabilitation at the earliest post operatively. Present findings were also found to be

very high compared to 0.02% of supplemental IMF given to patients in the study by Brasileiro B. F. and Passeri L. A [24].

The treatment modalities being practiced in developing countries [3, 20] like ours have shown variability in the usage of ORIF. In our study the percentage of ORIF was on the higher side similar to the studies of developed countries [2, 8, and 21]. This difference in scenario from other developing countries to ours can be attributed to the fact that the financial burden involved in ORIF, is more in reach of the common people in our country than the other developing nations. In the present study, cortical miniplates as means for internal fixation was found to be employed in 90.7% of the cases treated with ORIF method. Thus, it might depict, that the use of miniplates in mandibular fracture fixation has enough of strength to abide the strains acting upon mandible both from musculature and function, as explained by Maximechammy [25].

Fridrich KL et al did a review on changing trends with mandibular fractures. To evaluate current trends in facial trauma, records from 1,067 patients sustaining 1,515 mandibular fractures were reviewed. The greatest number of fractures occurred between the ages of 20 to 29 years. Sex distribution was approximately three males to one female. Altercations were found to have caused about half of the fractures, and motor vehicle accidents accounted for nearly one-third. Angle fractures were most common, constituting 26.7% of the total. The most common site of mandibular fracture resulting from altercation was the angle (39.1%); condylar, symphysis, and alveolar fractures less commonly resulted from altercations than from motorcycle and automobile accidents.[26]

Schön R et al on the other hand studied incidence and aetiology of mandibular fractures. Treatment was done using the 2.0 AO/ASIF miniplatesystem. Most fractures ($n=128$, 83%) resulted from fights. The rest being a result of road traffic accidents (10%), falls (3%), accidents caused by falling objects (3%) and sport accidents (2%). The mandibular angle ($n=66$, 43%) and the symphyseal area ($n=40$, 26%) were the most common fracture sites. Combined fractures were found in 30% patients (26%). Of all angle fractures, 97% were related to third molars. One-hundred-and-five patients had open reduction by an intraoral approach and stabilization by 2.0 AO/ASIF titanium miniplates and nine closed reduction. Complications included temporary sensory deficit of the mental nerve (3%), minor malocclusion (2%) and infection or dehiscence (5%). It was concluded that osteosynthesis of mandibular fractures by the 2.0 AO/ASIF titanium miniplate system is reliable.[27]Hassanein AG et al studied trends and outcomes of management of mandibular fractures. Records of 1371 patients with MFs were reviewed to study the incidence, causes, patterns, treatment modalities and outcomes of surgical management. The MFs are common in the youth. The road traffic accidents are the most common etiology. This can be reduced by simple measures like compulsory seat belts and wearing the helmet. Open reduction and internal fixation is the commonest treatment modality.[28]Chrcanovic BR et al did a study in which the objective was to analyze the mandibular fractures which presented over a 3-year period at an emergency hospital. Czerwinski M et al did work on enhancing injury prevention and patient evaluation. The data collected included age, sex, aetiology, date of trauma, associated maxillofacial trauma, anatomic site of fracture, and treatment. Traffic accidents were the major causes of trauma, followed by violence and falls. A high incidence of fractures in women due to violence was observed. The condyle region was found to be the most common fracture site in the mandible. A surgical approach was performed in most cases. There were more accidents causing mandibular fractures on the weekends. The individuals with mandibular fractures due to "traffic accidents" were younger than those due to "violence" and "falls". [29,30]Our study is in close adjunction of all above studies. There is a significant statistical association between age and aetiology as well as between sex and aetiology of mandibular fractures. The epidemiological review revealed several potential prevention targets as well as significant

trends. Further research into the impact of these preventive measures could more objectively identify their impact on mandibular trauma.

Conclusion

Treatment of mandibular fracture with the ORIF techniques, not only mitigated the morbidity associated with the closed methods of treatment, but also improved the quality of life of the patients.

What This Study Add to Existing Knowledge

Treatment of mandibular fracture with the ORIF techniques, along with highly potent antibiotic emergence has led the surgeons to opt for open surgical methods for treatment very frequently. Still the findings of the study prompts us to improve our management modalities to provide better functional rehabilitation as it being the ultimate goal for any hard tissue fixation. The present epidemiological review reveals several potential prevention targets as well as significant trends. Further research into the impact of these preventive measures could more objectively identify their impact on mandibular trauma.

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