

**CAUSES AND PATTERN OF CLINICAL AND RADIOGRAPHIC PRESENTATION OF
MAXILLOFACIAL FRACTURES**

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ABSTRACT

Introduction: The face is an important aesthetic and functional unit of human body. The maxillofacial skeleton is susceptible to injury due to its prominent position. An understanding of maxillofacial trauma helps us to assess the pattern of trauma and to establish effective measures through which injuries can be prevented. **Objective:** The aim of the study was to determine the causes and pattern of clinical and radiographic presentation of maxillofacial fractures in patients presenting at three tertiary care institutions of Punjab province of Pakistan. **Material and Methods:** The study was carried out on 312 patients with 570 maxillofacial fractures reported at three tertiary care institutions of Punjab province of Pakistan i.e. Nishtar Institute of Dentistry, Multan, de'Montmorency College of Dentistry/Punjab Dental Hospital, Lahore and Rashid Latif Medical and Dental College, Lahore in time period of two years from August, 2016 to July 2018. **Result:** Road traffic accidents (RTAs) were the most common etiology accounting for 71.15% whereas falls were second (18.3%). The mandible was the most frequently fractured bone (64.21%) followed by zygomatic bone (16.84%). A male to female ratio of 12:1 was recorded and patients with age range of 21-30 years were mostly affected (37.5%). **Conclusion:** This study revealed the high predilection of male as compared to female. Also the main cause of the fractures was found to be road traffic accident and mandibular fractures were the most common fractures with highest percentage.

KEYWORDS: Pattern, Trauma, Midfacial, Maxillofacial fracture, Mandible.

INTRODUCTION

Maxillofacial injuries in general occur quite commonly following trauma and these injuries if not properly managed can negatively influence both the psychosocial and functional activities of the patient.^[1] This is as a result of the centrality of the facial region as a key factor in human identity, esthetics and general well-being.^[1,2] These injuries can affect both skeletal and soft tissue structures of facial region.^[3] Most of the times, based on etiology and mechanism of injury, these fractures occur in association with other systemic injuries thereby requiring multidisciplinary approach for their management.^[3-6] These fractures result in severe morbidity, disfigurement and malfunctioning like sensory disturbance, malocclusion and ocular

dysfunction etc.^[7,8] Therefore, maxillofacial fractures are mainly considered and treated to re-establish the function and aesthetics according to the pattern of fracture and involvement of other adjacent structures.^[9]

The etiologies of maxillofacial fractures vary from one geographical location to another due to social, economic, cultural consequences, awareness of traffic regulations and also among different age groups.^[10] The main causes of maxillofacial fractures are road traffic accidents, falls, assaults, sports-related and gunshot injuries. Road traffic accidents are still among the most frequent cause of facial fractures (**Fig. 1**) all over the world, although interpersonal violence and self-inflicted injuries are becoming a frequent cause in many developed countries.^[11,12,13,14]

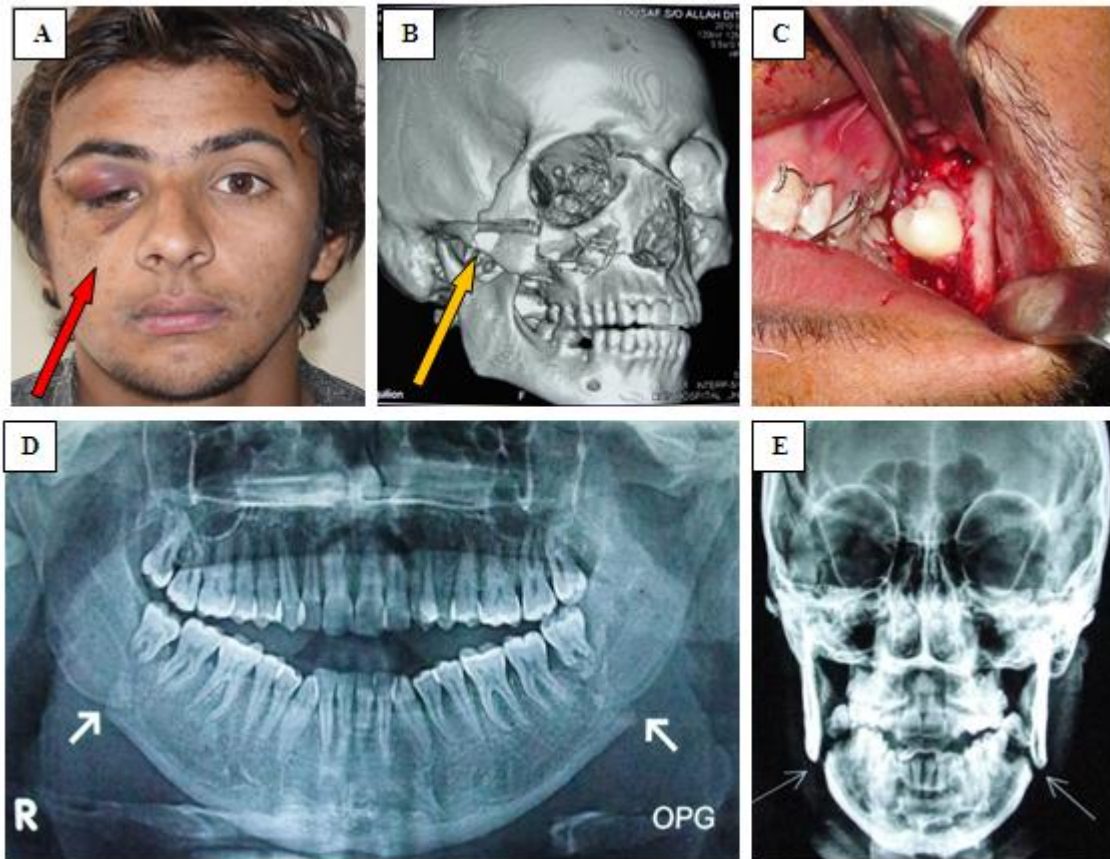


Fig. 1: A. Malar Flattening and Upper Eye Lid Swelling in Patient of Right Zygomatic Bone Fracture (red arrow). B. Zygomatico-maxillary Complex Bone Fracture in 3- D Reconstruction CT Scan of Face (orange arrow). C. Per-operative View of Left Mandibular Angle Fracture. D. Bilateral Mandibular Angle Fracture on Panoramic View (white arrows). E. Bilateral Mandibular Angle Fracture on Frontal View.

The management of maxillofacial trauma is challenging. Advancements in the diagnostic investigations, tissue handling and surgical techniques have led to better surgical outcome.^[15] Appropriate and timely management of facial fractures is essential for successful surgical outcome. The current study will be helpful in assessing the aetiology, types and presentation of maxillofacial fractures in local population and formulation of rules and regulations and implementation of different safety measures for decreasing the frequency of maxillofacial fractures in Punjab province of Pakistan.

MATERIALS AND METHODS

The current cross sectional study was conducted in time period of two years from August, 2016 to July 2018 at three institutions of Punjab province of Pakistan i.e. Nishtar Institute of Dentistry, Multan which is located in South of Punjab, de'Montmorency College of Dentistry/Punjab Dental Hospital, Lahore and Rashid Latif Medical and Dental College, Lahore, located in North of Punjab, Pakistan. These tertiary care hospitals are central referral emergency hospitals in the Punjab province of Pakistan and all kind of maxillofacial trauma patients are referred to these hospitals. Prior to the research, protocol of the study was approved by the corresponding ethical committees of the institutions.

Three hundred and twelve patients with maxillofacial fractures were included in this study. In this study, mandibular fractures were classified according to anatomical sites as condylar, coronoid, ramus, angle, body, symphysis, parasymphysis and dentoalveolar fractures. Midfacial fractures were recorded as Le Fort I, II, and III types, zygomatic bone, nasal bone, orbital and naso-orbito-ethmoidal fractures. Radiographical assessment using orthopantomogram (OPG), postero-anterior/frontal view, occipitomeatal view, submentovertebral view and computed tomography (CT) scan were done to confirm the clinical diagnosis (**Fig. 1 & 2**). All the data were collected and entered in IBM SPSS version 21 and analyzed through its statistical package. Frequency distributions and percentages for different variables were worked out and results were analyzed and presented in tables and charts accordingly. Mean and standard deviation (mean \pm SD) were calculated for age of patients. Frequency and percentages were calculated for age, gender, presenting complaints and causative factors. Chi-square test was applied to compare aetiological factors, type of maxillofacial fractures, and their clinical and radiographic presentation in maxillofacial region of male and female patients. P value ≤ 0.05 was considered significant.

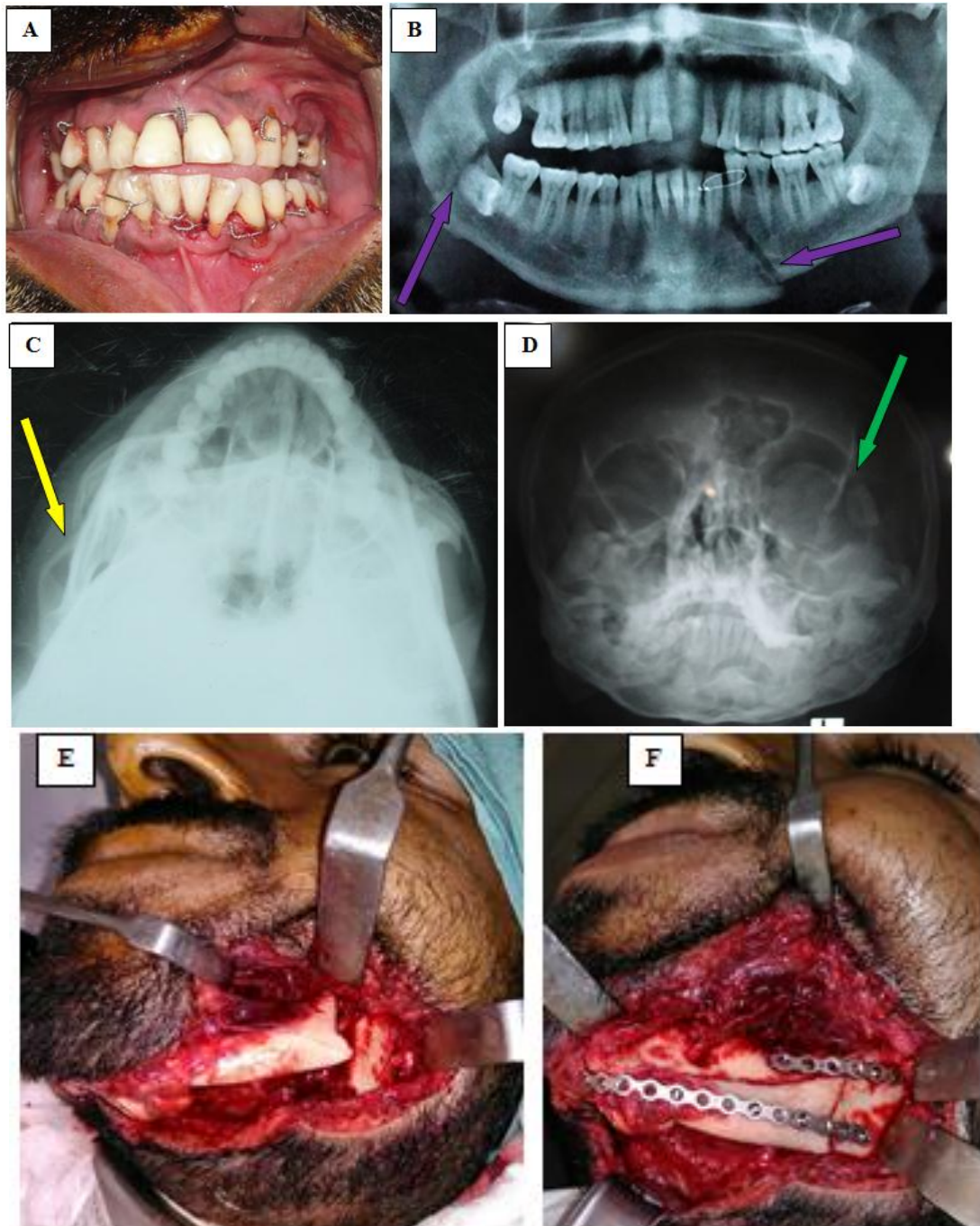


Fig. 2: A. Malocclusion in Patient with Mandibular Fracture. B. Panoramic View Showing Mandibular Right Angle and Left Parasymphysis Fracture (purple arrow). C. Submentovertex View Showing Right Zygomatic Arch Fracture (yellow arrow). D. Occipitomental View Showing LeFort I, II & III Fractures (green arrow). E. Intra-Operative View of Mandibular Fractures. F. Reduction & Fixation of Fractures.

RESULTS

Out of 312 patients, 288 were male and 24 were female patients. The gender distribution is shown in **Fig. 3**. The youngest patient included in this study was 1.5 years old

and the oldest one was 60 years of age. The maximum maxillofacial fractures occurred in 117 patients (37.5%) in age range of 21-30 years and minimum fractures presented in the age range of 51-60 years.

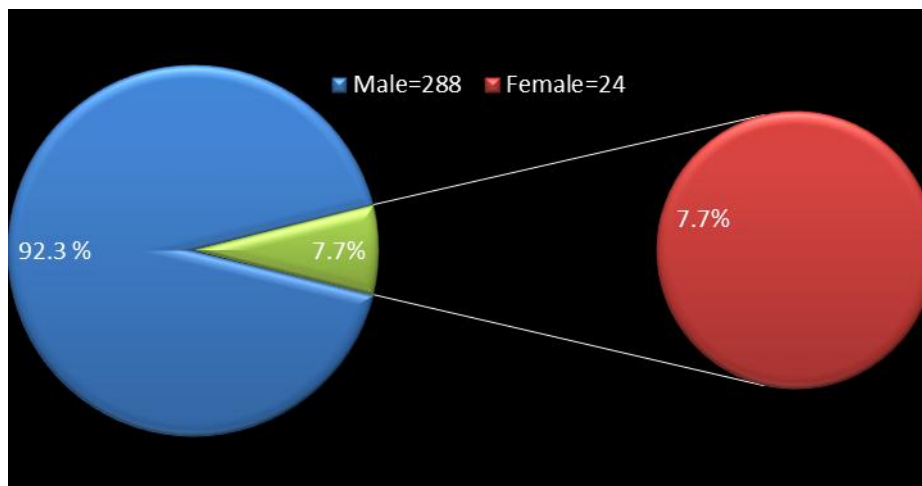


Fig. 3: Frequency and Percentage of Gender Distribution.

The most common cause of maxillofacial fracture was road traffic accident, the second most common cause was fall followed by assaults, sports injuries, gunshot injuries

and iatrogenic causes as shown in **Fig. 4**. Most of the patients were motorcyclist and were without helmets at the time of accident.

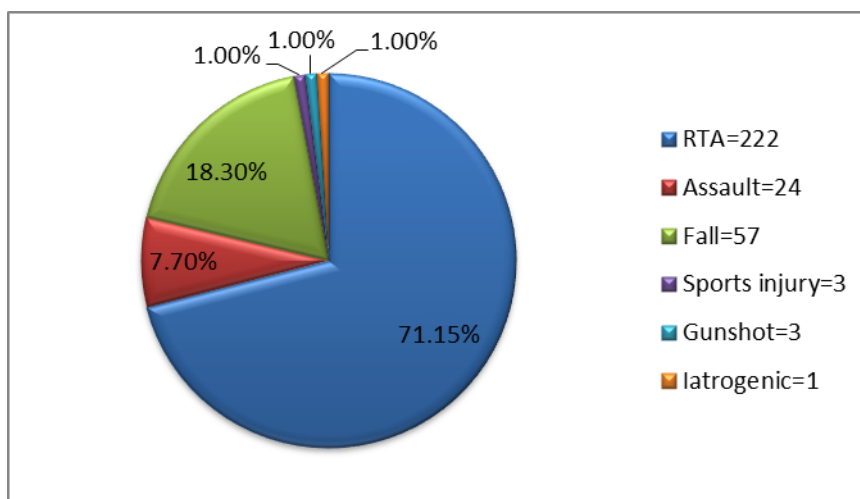


Fig. 4: Frequency and Percentage of Aetiology of Maxillofacial Fractures.

A total of 570 maxillofacial fractures were observed in 312 patients in three institutions. Among these, mandibular fractures were the most common. There were

366 (64.21%) mandibular fractures, 48 were on right side, 66 on left side and 126 were bilateral mandibular fractures as shown in **Table I and II**.

Table I: Distribution of Fracture Site.

Fracture site	No. of Fracture	Percentage
Zygoma	96	16.84%
Dentoalveolar	33	5.78%
Maxilla	54	9.47%
Orbital	15	2.63%
NOE	6	1.05%
Mandible	366	64.21%
Total	570	100%

Table II: Distribution of Fracture According to Side.

Type of Fracture	Fracture side	Frequency
Zygomatic Bone Fracture (n=90)	Unilateral right	45
	Unilateral left	39
	Bilateral	6
Dentoalveolar Fractures (n=24)	Unilateral right	3
	Unilateral left	12
	Bilateral	9
Maxillary Fractures (n=27)	Bilateral	27
Orbital Fractures (n=12)	Unilateral left	9
	Bilateral	3
NOE Fractures (n=3)	Bilateral	3
Mandibular Fractures (n=156)	Unilateral right	48
	Unilateral left	66
	Bilateral	126

Among the mandibular fractures, symphysis/parasymphysis were the most common sites of fracture followed by condyle, angle (Fig. 5), body and ramus as

shown in **Table III**. In few of the patients, mandible was also fractured in combination with other maxillofacial fractures.

Table III. Distribution of Mandibular Fracture Sites.

	Fracture site	Frequency	
		Right	Left
Mandible (n=156)	Condyle	54	38
	Ramus	12	3
	Angle	33	45
	Body	12	27
	Symphysis/Parasymphysis	63	69
	Total	174	192

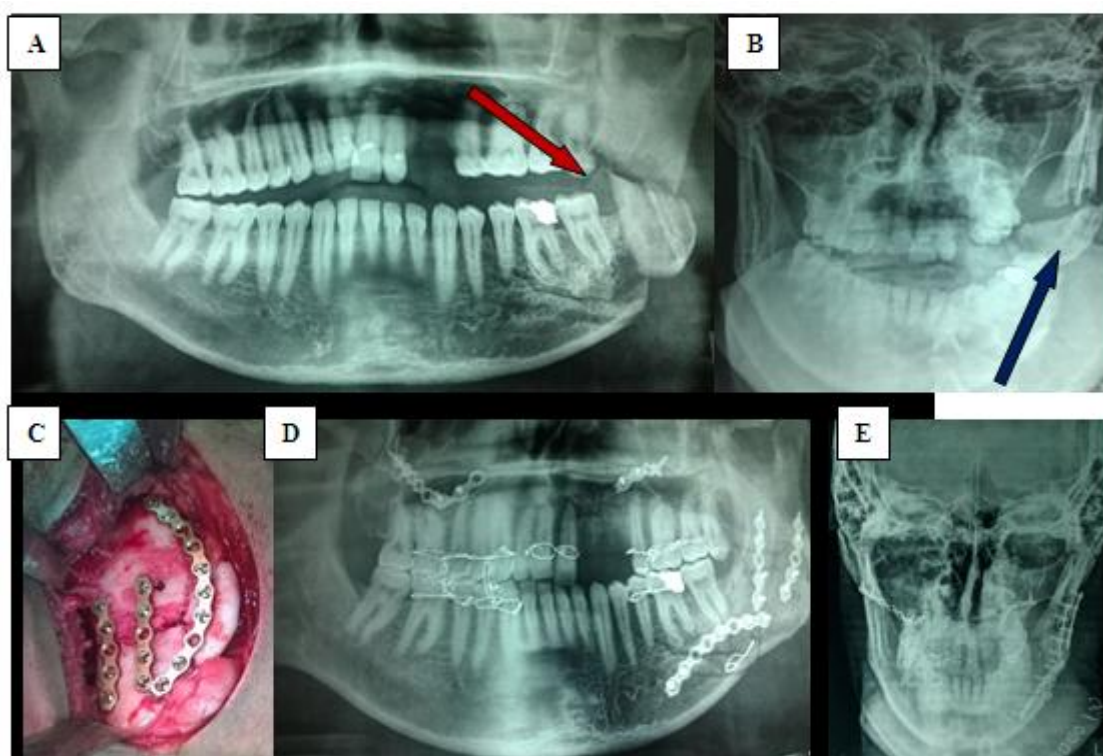


Fig. 5: A. Panoramic View Showing Mandibular Left Angle, Body & Ramus Fracture (dark red arrow). B. Frontal View Showing Left Angle Fracture (dark blue arrow). C. Intra-operative View of Reduction and Fixation of Fractures. D. Post-op Panoramic View of Mandibular Fractures. E. Frontal View.

In maxilla, 54 bilateral fractures were noted that constituted 27 Lefort fractures. Out of these, 15 fractures were Lefort II and 12 were of Lefort III type as shown in Table IV.

Table IV: Distribution of Maxillary Fractures.

Maxilla (n=54)	Fracture site	Frequency	
		Right	Left
	Lefort I	0	0
	Lefort II	15	15
	Lefort III	12	12
	Total	27	27

DISCUSSION

Fractures of the facial skeleton are common following trauma. The male predominance is observed in the

current study is almost a universal finding reported from other countries such as Canada, Australia, Poland, Nigeria, India and Iran.^[16-21] In our study male to female ratio was 12:1 which is very high when compared with other studies. This is may be due to the fact that males are more involved in outdoor activities and are responsible for bread and butter of their families. The maximum maxillofacial fractures occurred in age range of 21-30 years (37.5%) which is similar to a study conducted in Nigeria by Obimakinde and Iran by Mesgarzadeh, et al.^[18,21] This is possibly because the third and fourth decade of life is an active period when individuals are more energetic and are involved in high speed transportation, reckless driving and outdoor activities which account for a major proportion of maxillofacial fractures (Fig. 6,7).

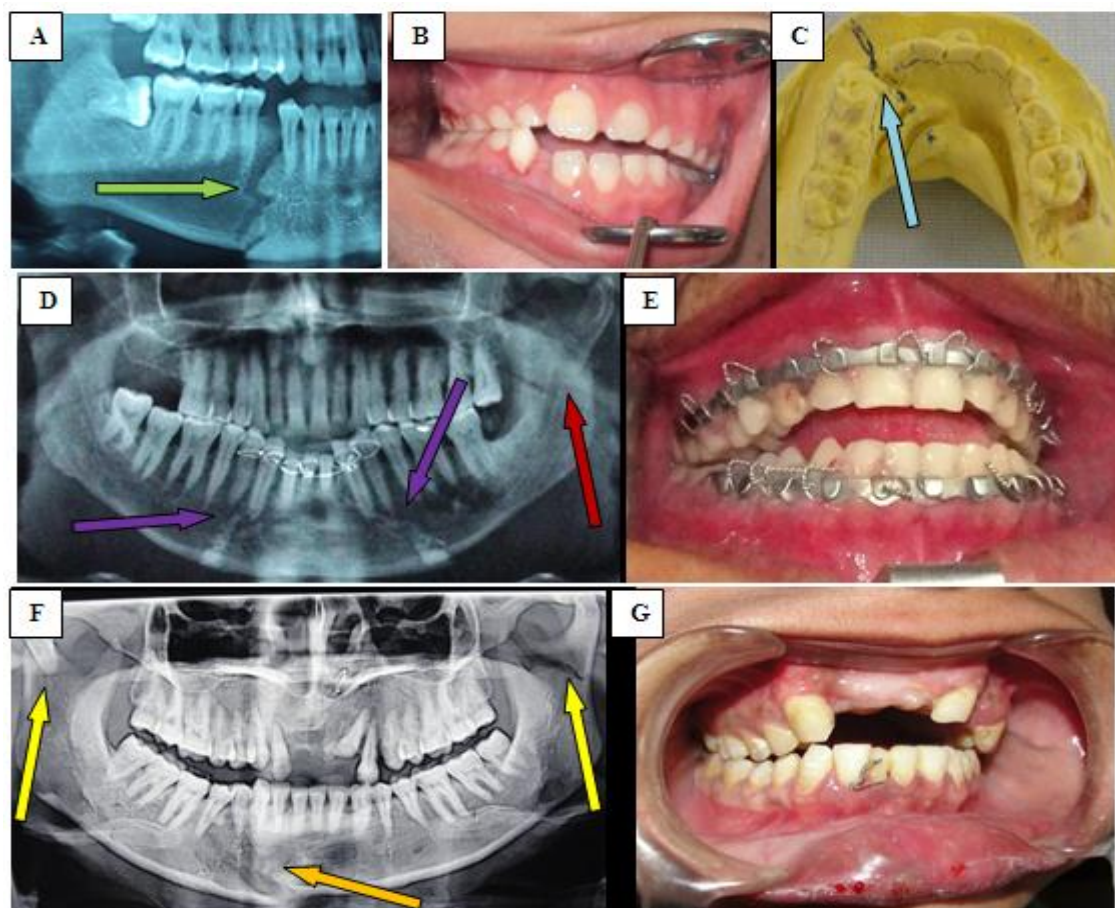


Fig. 6: A. Panoramic View of Mandibular Right Body Fracture (light green arrow). B. Intra-oral View of Malocclusion in a Pediatric Patient with Parasymphysis Fracture. C. Step in Dentition on Dental Cast due to Fracture (aqua arrow). D. Panoramic View of Mandibular Bilateral Parasymphysis (purple arrows) and Left Sub-condyle Fracture (dark red arrow). E. Intra-oral View of Malocclusion in Patient with Mandibular Condylar Fractures. F. Panoramic View of Mandibular Bilateral Condylar (yellow arrows) and Right Parasymphysis Fractures (orange arrow). E. Intra-oral view of Patient in Fig. F.

Trends and characteristics of maxillofacial injuries vary from one population to another depending on certain peculiarities such as socioeconomic, cultural and environmental factors.^[22,23] It has been observed that

changes in the community lifestyle, industrialization, transportation and legislative measures, the causes of maxillofacial fractures also tend to change.



Fig. 7: A. Extra-oral View of Patient with Multiple Facial Fractures. B. Intra-oral View of Malocclusion of the Patient. C. Multiple Facial Fractures in 3- D Reconstruction CT Scan of Face.

As a result, etiologies differ in various parts of the world. In most developed countries violence and falls are increasingly replacing traffic accidents while in many developing areas traffic accidents still remain the dominant cause. Since the implementation of programs to reduce RTAs and apply restraints in some countries, the ease of acquiring weapons and increasingly aggressive behavior in urban centers have led to a rise in the number of assaults and replaced RTAs as the leading cause of maxillofacial injuries in industrialized countries.^[24] Sports injuries remain quite rare all over the world, with the exception of Europe where they constitute more than 10% of facial trauma.^[11] In current study, road traffic accidents were found to be the leading contributors of maxillofacial fractures (71.2%) which is comparable to the study conducted by Obimakinde but high when compared with our neighbouring country Iran, study of Mesgarzadeh, et al.^[18,21] The falls result in 18.3% of maxillofacial fractures in the current study which is supported by study of Singaram.^[20]

In our study, the most common bone fractured was mandible (64.2%) which is in agreement with many universal studies e.g. study of Obimakinde, S.E.Udeabor, Mesgarzadeh et al.^[17,18,21] Symphysis and parasymphysis the most common sites to be fractured in the mandible which can be compared with study of Melek in which parasymphysis is most common site unlike many studies in which angle is the most common site of fracture as in study of Mesgarzadeh, et al, S.E.Udeabor, and in study by Obimakinde body of mandible is the most common site of fracture.^[17,18,21,25] The second bone to be fractured is zygoma (15.1%) followed by maxillary bone (9.47%). In our study orbit only accounts for 2.63% which is far more less when compared to a study conducted in Australia by Ferreira MC in which orbit is the common site of fracture in maxillofacial region (36.6%).^[16]

CONCLUSION AND RECOMMENDATIONS

From our study, we found that RTAs are the most common etiology of maxillofacial fractures. Mandible is the most commonly fractured bone in maxillofacial region followed by zygomatic bone. We strongly recommend the implementation of road traffic safety

measures including the use of helmets for motorcyclists and seatbelts for the vehicle drivers and strict adherence to the rules and regulations in obeying the traffic signals, zebra crossings and speed limits etc. Moreover, strict legislation should be implemented for the use of firearm weapons by the general masses. Frequent campaigns and awareness programs should be conducted through media to educate the public for prevention of maxillofacial injuries.

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