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Original Article

Maxillofacial Fractures: Etiology, incidence, Pattern and Treatment of Maxillofacial Injuries in a Government Medical College of Central India

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***ABSTRACT*:**

Introduction: The incidence of maxillofacial fractures varies widely between various geographic locations. The large variability in reported etiology, incidence and patterns of fracture presentation are consistently influenced by geographic area, social, cultural and environmental factors. **Aims and objectives:** This descriptive study retrospectively assessed the etiology, incidence, pattern and the modalities of management of maxillofacial fractures in Netaji Subhash Chandra Bose Medical College (NSCBMC) Jabalpur, Madhya Pradesh (M. P.) for a period of one year from September 2016 till August 2017. **Materials and methods: Design:** A descriptive retrospective study. **Place and duration of study:** September 2016 to August 2017 at the department of dentistry, NSCBMC, Jabalpur (M. P.). **Methodology:** 104 consecutive patients sustaining soft and hard maxillofacial tissue injuries were included in the study. The medical records of all patients who sustained maxillofacial fractures including age, sex, etiology, influence of alcohol, pattern of facial bone fractures and the management modality were retrieved and reviewed. **Results:** As per medical records a total of 6574 patients attended the dental outpatient department (OPD). A total of 146 patients attending the dental OPD and casuality emergency room at NSCBMC, Jabalpur sustained maxillofacial injuries. Out of which, 104 patients suffered maxillofacial fractures during the period under review. Nearly 79% of the patients were men, and the most frequently affected age group was 31 to 40 years (38.46%) with males outnumbering females in all age groups. The most frequent bone fractured was mandible, accounting for 63 cases (60.57%). Road traffic accidents (RTAs) (49.03%) were the primary etiological factor followed by assault in 27.88% cases. The main stay of treatment was closed reduction with maxillo-mandibular fixation (MMF) in 58 patients. **Conclusion:** This series reflects trauma patterns at our referral centre and , as such, can provide a guide to the design of programme geared towards prevention and treatment.

Key words: Maxillofacial, Fractures, Road traffic accidents, Retrospective study.

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INTRODUCTION

A great diversification of human exposure to aggressive agents, make them progressive targets of numerous kinds of trauma, including maxillofacial injuries. The face, as most exposed part of the body, is particularly vulnerable to trauma.[1] and if not properly managed can negatively influence both the psychological and functional activities of the patient.[2] This is as a result of the centrality of the facial region as a key factor in human identity, esthetics, and general well-being.[2-4]

Maxillofacial trauma can be limited to superficial lacerations or abrasions of soft tissues of the face or they may involve multiple fractures of the facial bones in association with concomitant spinal and systemic injuries thereby requiring multidisciplinary approach for their management.[5,6] Due to cultural, environmental and socio economic factors, causes for maxillofacial trauma differ worldwide.[7,8] Hence epidemiological studies are used to analyze the incidence and pattern of etiology, frequency, pattern and management of maxillofacial trauma.[9] A high incidence of maxillofacial injuries due to RTAs is reported in developing nations like India while incidence due to personal violence is more in developed countries.[10] Several literature reviews include the other etiological factors apart from RTA's and assault like falls, sports injuries, and animal bites and gunshot injuries. Falls

account for an important etiological factor in the facial fractures in both the very young and the elderly.[11]

As effective injury prevention effort depends on reliable and detailed information; on the incidence, causes and pattern of injury; periodic epidemiological studies are imperative. Thus, this study was planned at the dental department of NSCB Medical College, Jabalpur to analyze the etiology, incidence and prevalence, pattern of maxillofacial fractures and for the modalities of treatment planned for the management of these fractures at our centre.

METHODOLOGY:

This comprises of a retrospective descriptive study conducted in the department of dentistry at NSCBMC, Jabalpur. It is a main referral, tertiary care centre for all places in and around the area.

Inclusion criteria:

All maxillofacial fracture patients of any age and either sex presenting to the dental department and emergency casualty from September 2016 till August 2017 were included in the study.

Exclusion criteria:

1) Pathology cases such as tooth ache, dento alveolar abscess, space infection, pathological fracture, temporomandibular joint dislocation other than trauma were excluded from the study.
2) Too old fractures with malunion.
3) Patients having contraindications for local and general anesthesia.

Data collection procedure:

Following due clearance from the institutional ethical review board, the case sheet records of 104 patients were thoroughly scrutinized and data regarding the study variables age, gender, etiology of trauma, diagnosis and treatment were collected on pre- designed proforma. Before enrolling the patient informed written consent was taken from subjects or their attendants. The data were interrupted using percentages wherever necessary.

RESULTS:

As per medical records a total of 6574 patients attended the dental OPD at NSCBMC, Jabalpur from September 2016 till August 2017. Out of 146 patients sustaining maxillofacial injuries, 104 patients suffered bony injuries in the form of maxillofacial fractures.

AGE AND GENDER DISTRIBUTION:

The age of the patient at the time of injury ranged from 4-55 years. Most affected age group was from 31- 40 years (38.64%) followed by patients ranging from 21 to 30 years (21.5%). The lowest frequency was observed in the age group from 51- 60 years (0.96%).

TABLE 1: AGE DISTRIBUTION OF STUDY SAMPLE (n=104)

AGE GROUP (YEARS)	NO. OF PATIENTS	PERCENTAGE
0 – 10	12	11.54
11 – 20	08	7.7
21 – 30	22	21.15
31 – 40	40	38.46
41 – 50	21	20.19
51 – 60	01	0.96
TOTAL	**104**	**100**

TABLE 2: DISTRIBUTIONOF MAXILLOFACIAL ACCORDING TO GENDER (n=104)

Gender	No. of patients	Percentage
Males	82	78.84
Females	22	21.15
Total	**104**	**100**

In virtually all age- groups, more men than women were affected, the overall ratio being 3.7: 1.

ETIOLOGY OF MAXILLOFACIAL FRACTURES

TABLE 3: CAUSES OF MAXILLOFACIAL FRACTURES

CAUSES	NO. OF PATIENTS	PERCENTAGES
RTA	51	49.03
ASSAULT	29	27.88
FALL	09	8.65
SPORTS INJURY	07	6.73
MISCLLANEOUS	08	7.69
TOTAL	**104**	**100**

The most common etiology of maxillofacial injuries was RTA (51, 49.03%), followed by assault (29, 27.88%). Majority of injuries due to RTA were, as a result, of motorcycles (two- wheeler) accidents. They were either driver of vehicle or passengers and pedestrians. Alcohol by any means was found to be involved in majority of the cases. 29

(27.88%) patients fell prey to intentional injuries mainly due to assault and inter personal violence. The next common cause was due to accidental falls (09, 8.65%); sports injuries (07, 6.73%) and 08 patients (7.69%) got injured due miscellaneous causes like gunshot injuries, animal attacks, industrial accidents etc.

SITES OF FRACTURES

Fractures of the mandible were the most common type of fracture of maxillofacial skeleton (63, 60.57%). In the mandible, parasymphysis fracture was the most common type of fracture (23, 36.51%). In the midface region, most common type of fractures were fractures of zygomaticomaxillary complex (17, 41.46%).

TABLE 4: SITE OF MAXILLOFACIAL FRACTURES

SITE	NO. OF CASES	PERCENTAGES
MANDIBLE	63	60.57
MIDFACE	41	39.42
A) LEFORT B) ZYGOMATICOMAXILLARY C) NASO- ETHMOID		
TOTAL	104	100

TABLE 5: ANATOMICAL LOCATIONS OF MANDIBULAR FRACTURE

LOCATION	**NO. OF CASES**	**PERCENTAGES**
DENTOALVEOLAR	03	4.76
SYMPHYSIS	12	19.04
PARASYMPHYSIS	23	36.51
BODY	08	12.69
ANGLE	05	7.93
CONDYLE	07	11.11
RAMUS	03	4.76
CORONOID	02	3.17
TOTAL	**63**	**100**

TABLE 6: ANATOMICAL LOCATION OF MIDFACE FRACTURES

LOCATIONS	**NO. OF CASES**	**PERCENTAGES**
DENTOALVEOLAR	05	12.19
LEFORT I	03	7.31
LEFORT II	09	21.95
LEFORT III	04	9.75
ZYGOMATICOMAXILLARY	17	41.46
NASOETHMOID	03	7.31
TOTAL	**41**	**100**

TREATMENT PROTOCOL:

Several methods of reduction and fixation were used in the treatment of mandible fractures. Of the total 104 fractures, 58 cases (55.77%) were treated by closed reduction with arch bars and MMF. Splint fixation was used in 2 cases (1.92%) in a mandibular body fracture of a 4 years old child and in a double fracture of mandible in a 55 years old edentulous denture wearing patient. Most of the patients (34 cases, 32.69%) with mid face fractures and pan facial trauma cases were treated with open reduction and internal fixation (ORIF) with bone miniplates under general anesthesia (G. A.). All such cases were supported by MMF. However, in internal rigid fixation, early removal of MMF was advised. The plain Ehrich's arch bar was used to manage dentoalveolar fractures involving maxillary and mandibular teeth in 8 patients (7.69%).

TABLE 7: DISTRIBUTION OF TREATMENT MODALITIES

TREATMENT	**NO. OF CASES**	**PERCENTAGES**
ARCH BAR FIXATION	08	7.69
SPLINTS AND WIRING	02	1.92
CLOSED REDUCTION (MMF)	58	55.77
ORIF (BONE PLATES + MMF)	34	32.69
CONSERVATIVE	02	1.92
TOTAL	**104**	**100**

2 patients (1.92%) with trismus due solitary fracture of coronoid process of mandible were managed by conservative therapy of restrictions in diet and regular follow up for monitoring of increase in mouth opening and balancing of occlusion bilaterally.

DISCUSSION:

Fractures of the facial skeleton are a common finding following trauma and therefore form an integral part of the overall duty of an oral and maxillofacial surgeon.[12] The result of epidemiological surveys on the causes and incidence of maxillofacial fractures tend to vary with geographic region, socioeconomic status, culture, religion and era.[6,11,13,14]

Site and age distribution:

The maxillofacial fractures occur most commonly in young adults especially males in the third and fourth decades of life because they are majorly involved in many outdoor activities, take part in dangerous exercises and sports, and are most likely to be involved in violence.[5,12,15] In our study 78.84% patients were males with the male: female ratio of 3.7: 1. The sex ratio in various studies range from 2.3: 1[16] to 11.8: 1.[17] Injured males predominantly in their fourth decade (31- 40 years) reported to our centre. This differs slightly from most of the studies which considered injuries commonly reported in the third decade of life.[6,16,18,19] And contrasts with the report of Karyouti, [17] who gave the age group of 0- 5 years as having the highest incidence. This lowest frequency was observed in the age group above 50 years (0. 96%) which was most probably due to limited outdoor activities in old age.

Etiology of trauma:

In coincidence with the changes in the community lifestyle, industrialization, transportation and legislative measures, the causes of maxillofacial fractures also tend to change. In most previous epidemiological studies accidents were the most common cause of maxillofacial fractures,[8,14,17,20-22] and the present study supports these findings with 49.03% of the patients were injured in RTA's. However, in contrast to other studies carried out in developed countries, which reported assaults as the most common cause of maxillofacial injuries.[5,8,12,13,19] The reasons for this high rate of RTA in India includes poor road networks, improper licensing of drivers/ riders, no usage of seat belts, over speeding, overloading underage driving, neglect of helmets by motorbike riders and non compliance with traffic rules.[5,12] Alcohol and unemployment are also contributing factors which has commonly featured in other similar studies.[23-25] Other etiological factors reported in this study include falls from height and sports- related injuries, gunshot injuries, animal attacks and industrial accidents.

Sites and patterns of fractures:

When the maxillofacial region is injured, the mandible is more vulnerable than the mid face fractures.[14]This could be because the mandible is mobile and has less bony support than the well articulated midfacial bones. Mandibular fractures were the highest occurring fractures in the present review accounting for 60.57% of the total fractures. This is in agreement with other reports[8, 11, and 12] but differs from studies from the western world where nasal bone fractures[5] and zygomatic complex fractures[26] occur more frequently. In this study para- symphysis (36.51%) was the most common site involved in the injury similar to few other studies[8, 11 and 27] and differed from other some other studies which reported more frequent mandibular body fractures[5, 12] and condylar neck fratures.[28] In the middle third, the zygomatico maxillary complex is the most involved site due to its projection and multiple articulations with other facial skeletons making it very vulnerable to fractures on impact.[13,18,26]

Treatment protocol:

The age old principle of fracture management; reduction and immobilization also applies to maxillofacial region; however, the pathway to achieving this principle is influenced by many factors.[4] It should b noted that the treatment outcome of maxillofacial fractures is mainly dependent among other things on the degree of injury, type of fracture, the expertise of the surgeon, and available technology.[2-4] In the past 20 years, changes in maxillofacial trauma management have been strongly influenced by innovations in materials and technology,[29] since objectives such as early recovery, segment stability and patient comfort have been considered paramount in the treatment of maxillofacial fractures.[30] Thus, the management of maxillofacial injuries is a real challenge for any oral and maxillofacial surgeon and demands both skill and expertise. In our study closed reduction including MMF with the help of Ehrich's arch- bar was done in 58 fractures (55.77%) which coincides with other reports from literature where closed reduction was the most frequently used treatment modality for facial injuries.[4,28,29] All panfacial fractures (34 cases, 32.69%) multiple fractures with occlusal derangement and displaced fractures that were not reduced by closed reduction and unstable ZMC fractures after elevation were treated by open reduction and direct fixation by miniplate osteosynthesis. The place of ORIF with miniplate semirigid osteosynthesis in the surgical management promises a shortened period of MMF, bony union with minimal callus formation, rapid recovery of normal jaw functions, and maintenance of normal body weights among others.[4,31] Despite these advantages, ORIF of facial fractures has not become popular at our centre like in most developing countries mainly due to its cost and the time required to procure the plates.[4,32] And moreover simple methods of fixation give satisfactory results. However, advantages and effectiveness versus the cost of miniplates fixation need further survey in our region.

LIMITATIONS:

The major limitation of our survey is its retrospective design, mainly due to poor record keeping and insufficient data from the available patient's records. However, we tried to present an analysis based on prospective- database, although retrospectively analysed and it is for the first time that epidemiology and pattern of facial injuries have been brought into limelight in our environment. To overcome the limitation, a larger- data based prospective study may help to improve upon our

present findings and also discover subsequent changes in the trends and pattern of these fractures.[4]

CONCLUSION AND RECOMMENDATIONS:

Present study supports that regular epidemiologic evaluations of maxillofacial fractures allow a detailed analysis of facial injuries in our environment, providing important support to install clinical and research priorities, since risk factors and patterns of can be identified.[33] From our study, it seems reasonable to assume that RTA's remain the leading cause of maxillofacial fractures and is closely followed by assault especially among men in their productive years. Mandibular fracture was identified as the most frequently occurring bony injury on face with specific preponderance to the parasymphysis region in 36.5% of all lower jaw fractures. Even though miniplate osteosynthesis is now the 'gold standard'[33] of fracture management across the surgical world, ahigh proportion of our patients were treated by traditional methods of closed reduction and MMF.

In conclusion, this study provides relevant data on patterns of maxillofacial and dental trauma in a specific population. In light of this study, following recommendations are advised to reduce the maxillofacial trauma in this belt and improvise the treatment modalities-

1) Amendments in the traffic rules and legislations about seat belt and helmet usage followed by their strict implementation on roads.
2) Regular and timely maintenance of faulty roads by government.
3) Strict implementation of legislations against over loading in public vehicles and over speeding in youth.
4) Ensuring disposal of out of date vehicle by government.
5) Provision of pedestrian friendly paths and segregation of heavy and light motor vehicles.
6) Legal prohibition of drunk and driving and usage of cell phones while driving.
7) Improvement in education and socio economic set up aimed to reduce the incidence of fractures secondary to assaults.
8) Adequate safety features in building design in order to reduce the incidence of fractures secondary to fall in children.
9) Educational campaigns for recommending the use of mouth guards, helmets, knee and elbow-pads while practicing sports.

Thus, our efforts via this survey emphasize the need of our government to enforce the mentioned preventive measures in order to bring a steady decrease in facial injuries in our environment. The government is also hereby welcomed to enforce the health insurance scheme and ensure a good and secure environment for the marketing, distribution and prompt availability of bone plates at a tertiary care centre like ours in a developing country.

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