

ORIGINAL RESEARCH

A Retrospective Analysis of Maxillofacial Trauma in a Tertiary Care Centre in central India: A 8-year study

¹ Dr. Karuna Jindwani, ² Dr. Amit Kumar Sahu, ³ Dr. Geeta Tripathi, ⁴ Dr. Divashree Sharma, ⁵ Dr. Juhi Singh

¹Associate Professor, ²Ex Senior Resident, ³Professor and H. O. D, ⁴Assistant Professor, ⁵Senior Resident

¹⁻⁵Department of Dentistry S. S. M. C, Rewa, MP, India

Correspondence:

Dr. Karuna Jindwani

Associate Professor, Dept of dentistry, S. S. M. C, Rewa, MP, India

Email id: jindwanikaruna@yahoo.co.in

ABSTRACT

Introduction: The incidence of maxillofacial fractures varies worldwide. The information on epidemiological characteristics in association with the etiology and incidence of injuries help in prevention and appropriate treatment of such injuries.

Purpose: Thus, the aim of this retrospective study was to describe the prevalence, incidence, pattern, etiology, management of trauma cases at Shyam Shah Medical College (S. S. M. C), in a span of 8 years.

Patients & Methods: The data collected included age, sex, date and month (seasonal variations), etiology, site of fracture, associated injuries, treatment modalities used for the management of maxillofacial trauma patients reporting in the Department of Dentistry and emergency casualty department of S. S. M. C., Rewa from February 2013 till January 2021.

Results: A total of 892 cases depicted fractures of the facial skeleton. The mean age was 36 years. Though patients ranging from 4-75 years reported for treatment. Males outnumbered females with a male: female ratio of 8:1. Injuries commonly occurred in the 21-30 years age group. Road traffic accidents (RTAs) were the most common etiological factor in 631 patients followed by inter personal violence (IPV) in 147 patients. Mandibular fracture was the most frequently encountered fracture. The seasonal variation showed the peak incidence of cases in the months of January and December with 23.4 % of total patients. 15.13 % of the cases were managed conservatively, 7.29% patients with debridement and soft tissue repair, while closed reduction was used in 60.54 % of patients and 17.04 % were treated with surgical open reduction and internal fixation. There was no serious complication in any of our patient in the average follow up span of 6 months.

Conclusion: This study verified a young male predominance involved in maxillofacial trauma. RTAs contributed as the major etiological factor. Thus, similar long-span multi centric epidemiologic studies may help government and authorities to plan periodic review of driving skills & strict implementation of traffic rules policies.

Key Words: Maxillofacial trauma, Road Traffic Accidents, Retrospective study, Epidemiology.

INTRODUCTION

Maxillofacial fractures are a common finding encountered with varied associated injuries at various trauma centers and tertiary care centers.¹ Facial injuries can be disabling and remain as a serious clinical problem due to the sensitivity of this anatomic region involving the masticatory, ocular, olfactory and nasal apparatus.² Changes to the facial skeleton have a substantial impact on the psychology and aesthetics of the patient and lays a long lasting effect on the confidence and attitude of the patient.³ Many epidemiological studies discussing about the pattern and management of maxillofacial injuries have been published from different countries, but the demography and inferences vary considerably since it is linked to various variables based on social, cultural and environmental factors of different study populations.^{1, 4, 5, 6, 7 and 8.}

There is a varied etiology of maxillofacial trauma in various regions worldwide. As RTA was the leading cause of maxillofacial injuries in our study so we recommend periodic evaluation of such epidemiological studies which enforce the assessment of the proficiency of road safety measures such as speed limits, prohibited drunk driving and the introduction of seat belt legislations in order to suggest new ways to prevent maxillofacial injuries.⁵

Pattern and management of maxillofacial injuries have changed immensely over the past few decades. The Department of Dentistry in our institute routinely treats these cases and also the cases referred from the casualty department, surgery department, orthopedics department of this tertiary care center. Thus, this retrospective study was planned to comprehensively collect demographic pattern, etiology, site of maxillofacial fractures, monthly variations and management fractures in this belt of central India.

PATIENTS AND METHODS

A large number of patients with maxillofacial injuries who reported in the dental department at S. S. M. C, Rewa from February 2013 till January 2021 were enrolled in this study.

Study Design

During the mentioned span of 8 years, clinical records and radiographs of maxillofacial trauma patients with fractures were retrospectively retrieved and reviewed to collect the following information.

Study variables

- ❖ Demographics, e.g. Age, gender.
- ❖ Etiology of injury.
- ❖ Characteristics of injury – Site of injury, Pattern of fracture, Associated injuries
- ❖ Seasonal variation – Monthly and Day wise distribution of presentation of cases
- ❖ Management modalities – Conservative, Soft tissue repair, Surgical interventions as Closed or Open reduction of fractures.

RESULTS

During the 8 years period of study, the records of 892 patients with maxillofacial fractures were analyzed in the following tables.

Sex Distribution: (Table No. 1)

There were 795 males (89.12%) and 97 females (10.87 %) accounting to a male to female ratio of 8:1.

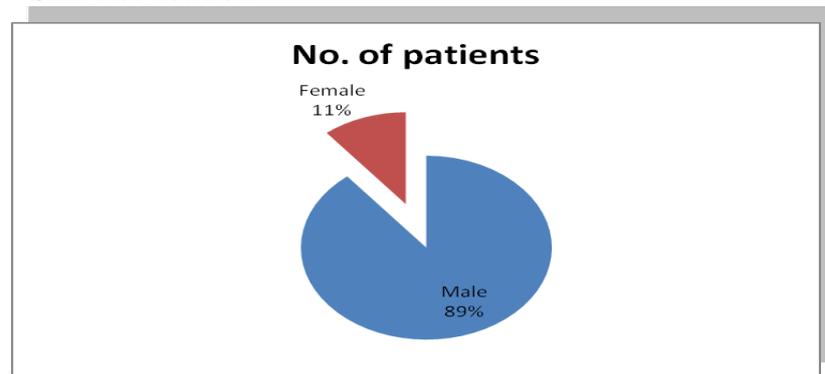
Table No. 1: Sex Distribution

(n= 892)

S. no.	Gender	No. of patients	Percentage
1	Male	795	89.12
2	Female	97	10.87
Total		892	100

Male: female ratio = 8 :1

PIE CHART 1: Sex Distribution



Age – Wise Distribution: (Table No. 2)

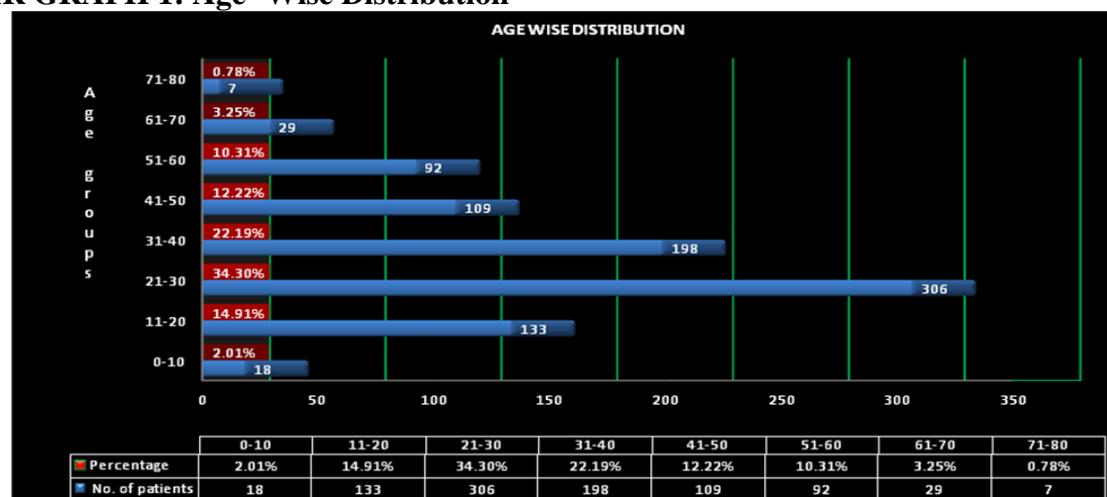
The study sample depicted the ages ranging from 4 to 75. A clear male predominance was found in all age groups when Table 1 and 2 were compared. The mean age was 36 years. The peak incidence was seen in 21 to 30 years age group involving 306 patients (34.3%) followed by 31 to 40 age group having 22.19% patients as per Table no. 2.

Table No. 2: Age – Wise Distribution

(n= 892)

S. No.	Age groups	No. of patients	Percentage
1	0-10	18	2.01
2	11-20	133	14.91
3	21-30	306	34.30
4	31-40	198	22.19
5	41-50	109	12.22
6	51-60	92	10.31
7	61-70	29	3.25
8	71-80	7	0.78
Total		892	100

BAR GRAPH 1: Age- Wise Distribution



Etiology of injury: (Table No. 3)

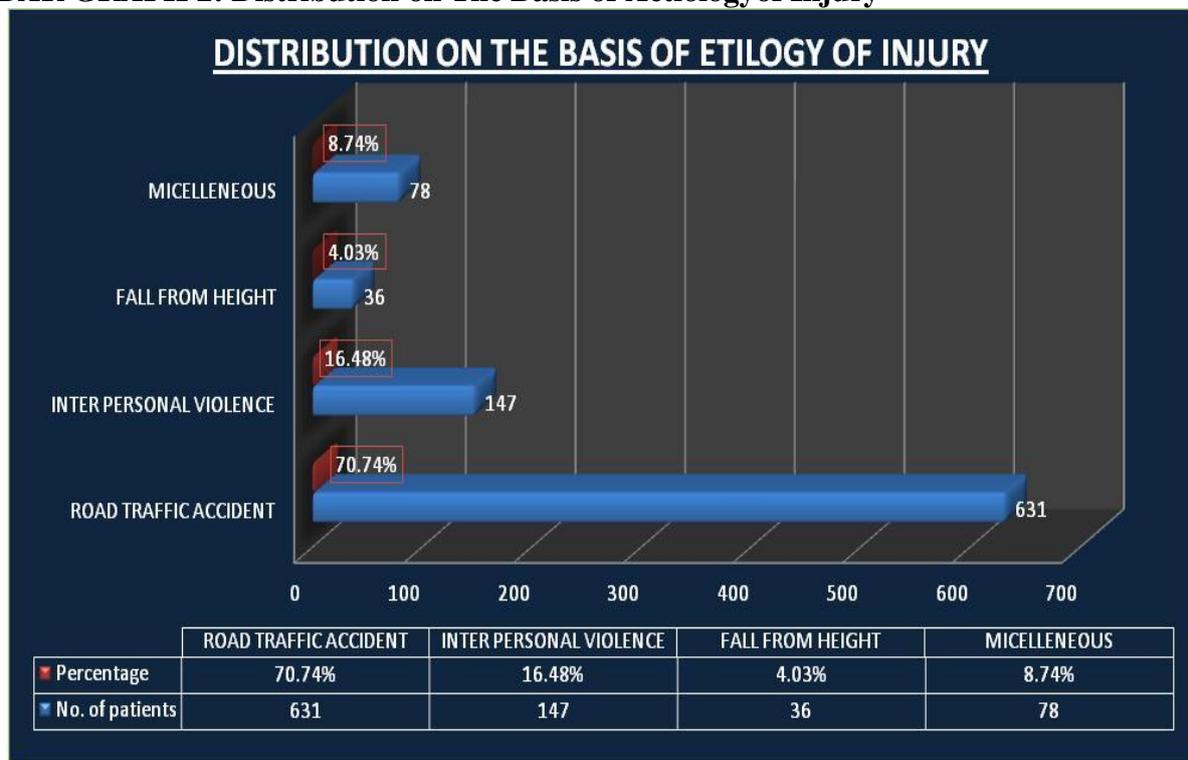
RTA was the leading cause of maxillofacial injuries with the incidence of 70.74% (631 patients), followed by IPV causing fractures in 147 patients (16.48 %). The least percentage of cases were reported due to fall from height in 36 patients.

Table No. 3: Distribution On The Basis Of Aetiology Of Injury

(n= 892)

S no.	Etiology	No. Of patients	Percentage
1.	Road traffic accidents	631	70.74
2	Inter personal violence	147	16.48
3	Fall from height	36	4.03
4	Micellaneous	78	8.74
Total		892	100

BAR GRAPH 2: Distribution on The Basis of Aetiology of Injury

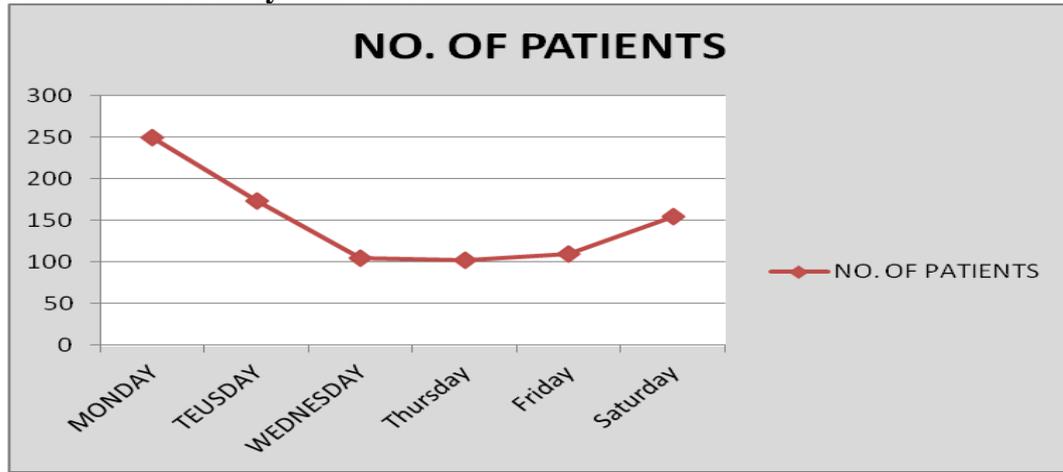


Seasonal variation of presentation of cases: (Graph No. 1 and 2)

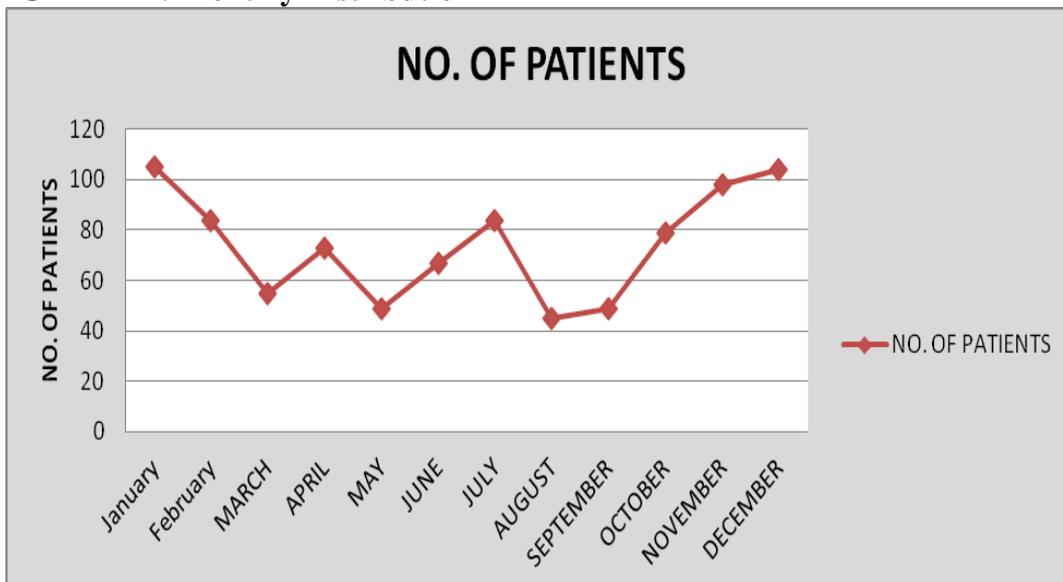
The maximum number of cases reported on Mondays, as they are the days of heavy road traffic due to the high attendance of public in markets and offices after holidays on Sunday (weekends). (Line graph 1)

Periodic variation lead to recording of maximum incidence in the months of January and December where rash driving, fog and celebrations like festivals and marriages lead to concentration of cases of road accidents. (Line graph 2)

LINE GRAPH 1: Weekly Distribution



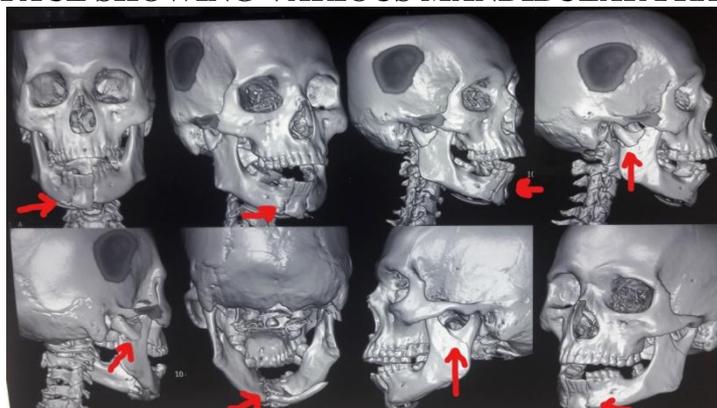
LINE GRAPH 2: Monthly Distribution



Pattern of Maxillofacial Fractures: Table No. 4

Maximum number of cases were managed from mandibular fracture group of patients in 481 cases. 185 cases were recorded with single fractures. (Fig 1. CT Scans of mandibular fracture cases)

FIG.1 3D CT OF FACE SHOWING VARIOUS MANDIBULAR FRACTURES

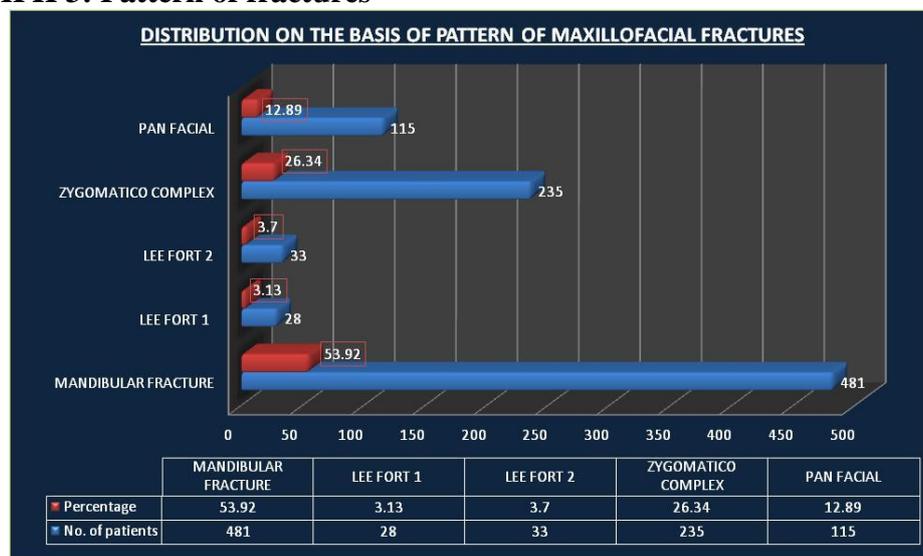


Associated injuries involving head injuries chest injuries, limb fractures abdominal injuries were seen in multiple pan facial trauma patients

Table 4 –DISTRIBUTION ON THE BASIS OF PATTERN OF MAXILLOFACIAL FRACTURES

S no.	Pattern of maxillofacial fractures	No. of patients	Percentage
1	Mandibular fracture	481	53.92
2	Le fort 1	28	3.13
3	Le fort 2	33	3.70
4	Zygomatico complex	235	26.34
5	Pan facial	115	12.89
Total		892	100

BAR GRAPH 3: Pattern of fractures



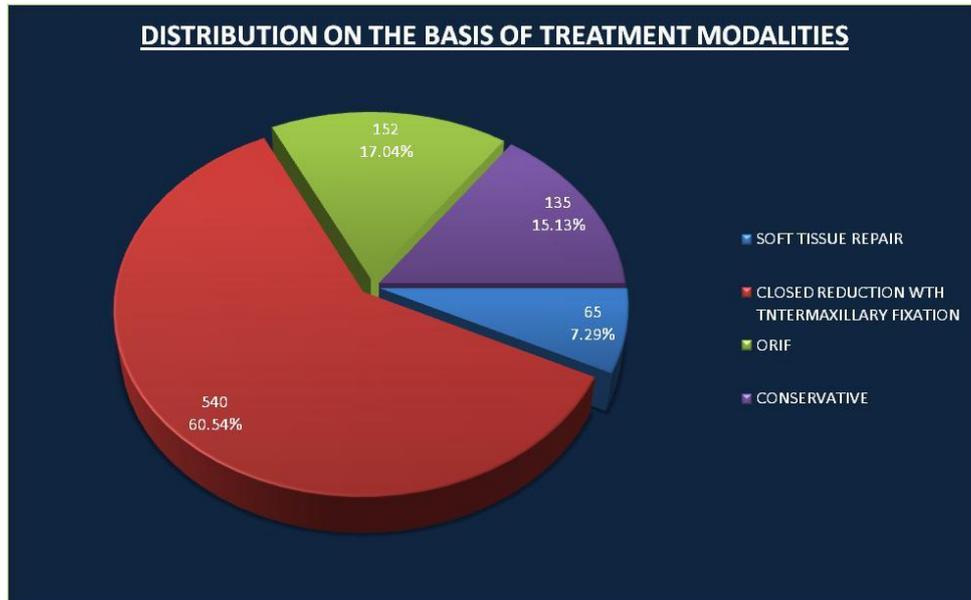
Treatment Modalities: Table No. 5

135 number of patients (15.13%) were treated conservatively for injuries like intracapsular condylar fractures or incomplete (green- stick) body and angle fractures of mandible. Soft tissue repair was done under general anesthesia in Operation Theater (OT) and under local anesthesia in our department for managing massive soft tissue injuries closed reduction with Intermaxillary fixation (IMF) using Arch Bars was used in 540 patients (60.54%). Open reduction and internal fixation with titanium and stainless-steel mini plates was the treatment of choice for unfavorable and multiple bone fracture cases in 152 patients. (17.04%)

Table No. 5: Distribution On The Basis Of Treatment Modalities

(n= 892)

S NO.	Treatment modalities	No. Of patients	Percentage
1	Soft tissue repair	65	7.29
2	Closed reduction wth tntermaxillary fixation	540	60.54
3	Orif	152	17.04
4	Conservative	135	15.13
Total		892	100

PIE CHART 2: Distribution on Basis of Treatment Modalities**DISCUSSION**

Trauma is associated with significant morbidity and mortality in individuals. Maxillofacial (MF) injuries may lead to functional impairment and aesthetically altered appearance if not attended promptly. Factors like the geographic area, population density socioeconomic status, and the cultural variances amongst the study population have influenced the incidence etiology and pattern of maxillofacial injuries since ages.^{1, 2, 6, 7, 8, 9, 10, 11}

Thus, findings from our study will reveal the characteristic association of variables leading to improved management statistics in entire central part of India.

PATIENTS DEMOGRAPHICS**Sex and age distribution**

The sex distribution of maxillofacial is quite high in males in nearly all studies reported in literature. The present study revealed male: female ratio of 8:1. Most of the studies revealed male preponderance.^{12, 13, 14 and 15} However, the sex ratio in various studies ranges from 2.3: 1 till 11.8: 1. The male preponderance is due to the fact that males are likely to be the earners in the family and also play more prone to be affected by accidents, violence episodes and outdoor sports activities.

Age of the patients ranged from 4 years to 80-year-old. The peak incidence of MF injuries occurred in young adults in their third decade 21 – 30 years age group involving 34.3% of all patients which correlates with various – epidemiological studies.^{1, 5, 16, 17, 18} This may reflect that the people in this age group are more active regarding sports, fights, violent activities, industrial and high-speed transportation. Table 2 and Bar graph 1

Etiology of trauma

Fractures of the facial skeleton are a common finding in multiple trauma cases occurring due to RTAs, IPV, Sports, falls, Industrial accidents etc. Literature reports of varying etiological statistics in developing and developed nations. RTAs as the main etiological factor found in 70.74% cases which is consistent with other parts of the world.^{16, 18, 19, 20, 21, 22}. Maximum number of road accidents were with 2 wheelers followed by 4 wheelers and then pedestrians. Similar studies have shown that the incidence of motorcycle crashes in other developing countries amounting to 45% - 65% of trauma cases.^{20, 21}

In contrast, four-wheeler remains to be the major cause for RTA in developed countries. On the other hand, assault related maxillofacial injuries due to IPV were reported to be more common in developed countries^{9, 22, 23, 24}. In our study, IPV constituted 16.48% of the cases.

Excessive consumption of alcohol is strongly associated with facial injuries as it impairs judgement, cognitive ability and one's ability to assess the risk and protect them.

In contrast, Al Ahmed et al reported alcohol does not play a major role in fracture etiology in the Middle East where it is forbidden in some countries and consumed minimally in the other countries and consumed minimally in the other countries due to religious and cultural beliefs.²⁵

Our study revealed 1/3rd of the total patients had alcoholic ingestion before the incidence of maxillofacial trauma. This is due to the impact of alcohol on balance of the patient and it bring about aggression in the activities of the individual.^{9, 26}

Gun Shot injuries were managed in 9 cases.

Time and Monthly Distribution (Seasonal Variations)

This study showed the peak incidence of fractures occurring in the months of December and January (Line Graph 2) which might be attributed to the increase in number of road crashes due to harsh weather conditions in peak winters and fog. Moreover, people are in hurry and in markets during celebrations and social gatherings due to marriages occurring in these months and intake of alcohol is also responsible for further enhancement in cases of assault. The next peak was seen in the month of July when rainy season promotes skidding of 2 wheelers. These finds coincide with the study done in Iran¹⁶ and western Nepal¹², but different from the findings of Kapoor and Kalra.²⁷

The number of MF traumas were significantly more on Mondays and Tuesdays (Line Graph 1). This was mainly due to people rushing for office, schools, colleges etc. from home after relaxation on Sundays & weekends. Studies where number of trauma cases was more on weekends.^{12, 16, 27}

Site, nature and pattern of fractures

In relation to type of injuries, soft tissue injuries were the most common type of injuries. They may be in the form of laceration or abrasion or contusion or a combination of bone injuries.

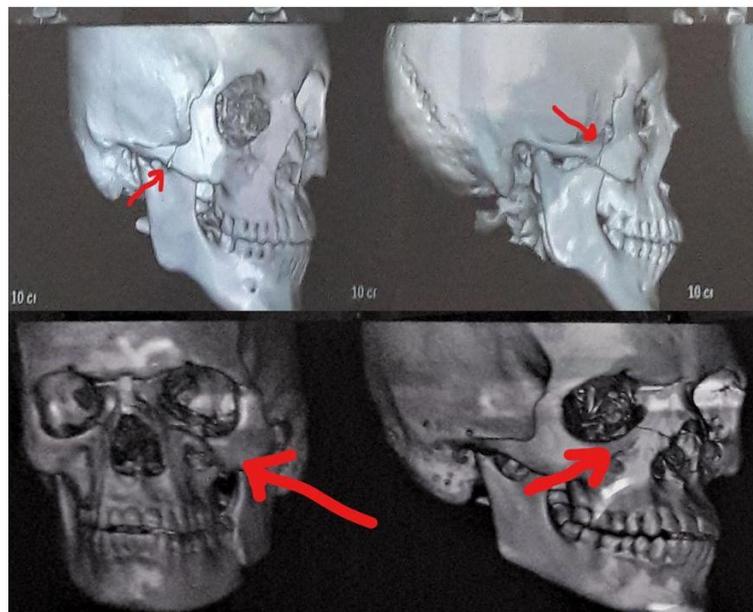
FIG.2 MASSIVE SOFT TISSUE INJURY AND REPAIR



When MF area is injured, mandible is the more vulnerable bone than the midface bones, this preponderance is due to the fact that mandible is the most prominent and only movable facial bone with less bony support and it is easily reached, as it is located at height of the aggressor's raised arm to affect the victim's self-esteem.²⁸

In the present study, mandibular fractures were the most common facial fractures encountered in 53.92% cases, particularly parasymphysis fractures were most commonly encountered. Various studies have supported this result.^{13, 14, 16, 18, 21, 22, 29, 30} Although some studies have shown nasal bone³¹ as the most common bone, others have reported higher rates of zygomatic³² or midface bone fractures.³³ Among fractures of the midfacial region, ZMC fractures were the most common site of the fractures accounting to nearly 26.34% of all trauma patients, similar findings were reported in other studies too.^{32, 34} (Fig 2. CT Scans of midface fracture cases)

FIG.3 3D CT OF FACE SHOWING VARIOUS MIDFACE FRACTURES



Associated injuries

Various studies have shown that 10% to 88% of patients with facial trauma present with associated injuries in other parts of the body.^{35, 36, 37} The head and brain injuries are commonly associated with facial trauma particularly the upper face. The findings of our study were in accordance with the facts mentioned in literature. Concomitant bodily injuries in the form of cervical spine injuries, upper and lower limb fractures, chest and abdominal injuries and pelvic fractures were managed well in our institute with coordinated collaboration of department of surgery and orthopedics. The wide variation in the frequency of associated injuries largely attributes to variation in mechanism of trauma.

Management

Management of MF injuries is a real challenge of oral and maxillofacial surgeons and demands both skill and expertise. In the past 30 years, changes in MF trauma management have been influenced by innovations in materials and techniques. Various treatment modalities were chosen according to anatomy, severity of fracture and condition of the patients are enumerated in Table no.5.

Soft tissue repair was done under local or general anesthesia, depending upon the presence of severity of trauma on the facial soft tissue and muscles (Fig.2) in 7.29% of cases. 15.13%

cases were managed conservatively for the reasons varying from absence of functional deficit, multiple ZMC fractures without esthetic or neurological deficits, non or minimally displaced fractures in higher (> 60 years) age group patients owing to high anesthesiologic risk and in few cases due to patient's refusal. Isolated zygomatic arch fractures not involving occlusion were elevated by Gillies temporal approach or intraoral vestibular approach and no fixation was done when stability was achieved.

Plate osteosynthesis in the form of open reduction and internal fixation (ORIF) has become popular in the management of facial fractures as it offers stable segment reduction, early recovery, less patient discomfort, bony union with less callus formation.^{16, 39} This mode of treatment was applied in 17.04% of cases in our institute. Despite of the various advantages of ORIF, our study suggests similar long-term results using closed reduction technique.³⁹ Internal fixations with the use of stainless steel and titanium miniplates and screws was used in 152 cases (17.04%). The present prevalence was not in accordance with some other studies reported in literature where majority of MF fractures were treated with ORIF.^{16, 38, 39} (Fig 4. Open reduction and internal fixation)

Fig.4 OPEN REDUCTION AND INTERNAL FIXATION



The treatment of facial fractures varies from surgeon to surgeon and it also depends on available instruments. Closed reduction using stainless steel arch bar fixation and ligature wires (fig 5) is a simple economic method used for treating maxillary and mandibular fractures yields satisfactory clinical results. Dentoalveolar fractures, condylar fractures without dislocation, other mandibular and maxillary fractures without displacement or occlusal derangement were treated successfully by closed reduction in 60.54% cases, confirming the effect of cost on treatment planning. The present study findings are in line with other reports where it was stated that ORIF has not become popular in most developing countries, mainly because of cost issue.^{20, 38, 40}

Fig.5 CLOSE REDUCTION



All pan facial fractures, multiple fractures with occlusal derangement and displaced or unstable fractures were treated by ORIF by miniplate osteosynthesis.

LIMITATIONS

The present study is a retrospective small-scale study where the trauma database was based on the injury report register maintained in the department of dentistry which included referred patients as well as patients coming directly to the dental OPD. Some of the patient medical records were incomplete and hence were excluded from our study. In order to enhance precision, reliability and integrity of patient information more larger sample size prospective multicentric studies are suggested to make conclusive finding on epidemiology of MF trauma in central India.

CONCLUSION

The usefulness of epidemiological studies in MF traumatology is widely recognized as it provides information with implications for access to treatment. Facial fractures have various causes and differ with different regions of world. In the present retrospective study, we analyzed a sample of 892 MF trauma patients in a span of 8 years. This study verified a frank young male preponderance. RTAs continued to be the leading cause of injury, majority of the fractures involved the mandible and most common treatment modality used was closed reduction. These findings should be aimed to ensure strict compliance of traffic rules, legal prohibition of drunk driving compulsory incorporation of safety measures like seat belts and helmets to reduce the incidence of MF injuries.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. Schaftenaar E, Bastiaens G JH, Simon ENM, Merkze MAW. Presentation and management of maxillofacial trauma in Dar E Salam, Tanzania. *East Afr Med J.* 2009; 86(6): 254- 8.
2. Bither S, Mahindra U, Halik R, Kini Y. Incidence and pattern of Mandibular fractures in rural population. A review of 324 patients at a tertiary hospital in Low Maharashtra, India. *dent traumatol* 2008; 24: 468 – 70.
3. De Sousa A. Psychological issues in acquired facial trauma. *Indian J Plast. Surg.* 2010; 43(2): 200.
4. Vande Gron d ZP, Hashemi A, Shoukain M. changing trends in adult facial trauma epidemiology. *J Craniofac Surg.* 2015; 26: 108 – 12
5. Motamedi MHK, Dadgar E, Ebrahim A, Shirani G, Haghghat A, Janalpour MR. Pattern of maxillofacial fractures a 5-year analysis of 8818 patients, *J Trauma Acute care Surg,* 2014; 77(4): 630 – 4.
6. A llareddy V, Allareddy V, Nalliah RP. Epidemiology of facial fracture injuries. *J Oral Maxillofacial Surg.* 2011; 69(10): 2613 – 8.
7. Gandhi S, Ranganatham LK, Solanki M, Mathew GC, Singh I, Bither S. Pattern of maxillofacial fractures at a tertiary hospital in northern India: a 4- year retrospective study of 718 patients. *Dent. Tramadol* 2011; 27: 257 – 62.
8. Akama MK, Chindia ML, Macigo FG, Guthua SW. Pattern of Maxillofacial and associated injuries in road traffic accidents *East Afr. Med J* 2007; 84: 287 – 95.
9. Telfer MR, Jones GM, Shepherd JP. Trends in the etiology of maxillofacial fractures in the United Kingdom(1977 – 1987). *Br J Oral Maxillofac Surg.* 1991; 29

10. Lee JH, Cho BK, Park WJ, A 4-year retrospective study of facial fractures on Jeju, Korea *J Craniomaxillofac Surg* 2010; 38:192-4.
11. Salentyn EG, Boffeno P, Boverhoff J, van den Bergh B, Forouzanfer T. The epidemiological characteristics of zygomatic complex fractures: A comparison between the surgically and nonsurgically treated patients. *Nati J Maxillofac Surg* 2013, 4:214-8.
12. Khadka R, Chaurasia NK. Four years prospective study of the maxillofacial trauma at a tertiary center in western Nepal. *J Orofac Sci* 2014; 6(2):78.
13. Pham- Dang N, Barthelemy I, Orliaguet T, Anola A, Mondie J M, Dallel R. Etiology, distribution, treatment modalities and complications of maxillofacial fractures. *Med Oral Pathol Oral G Bucal Ed inglesa*. 2014; 19(3); 261-9.
14. Guruprasad Y, Hemavathy OR, Giraddi G, Shetty JN. An assessment of etiological spectrum of injury characteristics among maxillofacial trauma patients of government dental college and research institute, Bangalore. *J Nat Sci Biol Med*. 2014; 5(1);47.
15. Begagnolo LA, Bregagnolo JC, Silveira Fd, Bergamo AL, Santi LN, Watanabe MG. Oral and maxillofacial trauma in Brazilian children and adolescents. *Braz Dent J* 2013; 24: 397-401.
16. Arabian HR, Tabrizi R, Allabadi E, Gholam M, Zarei K. A retrospective analysis of maxillofacial trauma in Shiraz, Iran a 6-year-study of 768 patients (2004-2010) *Dent*. 2014;15(1):15.
17. Abdullah WA, Al-Mutairi K, Al-Ali Y, Al-Soghier A, Al-Shnwani A, Patterns and etiology of maxillofacial fractures in Riyadh city, Saudi Arabia. *Saudi Dent J* 2013; 25(1): 33-8.
18. Bali RK, Sharma P, Garg A, Dhillon G. A comprehensive study on maxillofacial trauma conducted in Yamunanagar, India. *J Inj Violence Res*. 2013; 5(2): 108-16.
19. Oikarienen K, Schutz P, Thalib L, Sandor GK, Clokie C, Meisami T, Safar S, et al. Differences in the etiology of mandibular fractures in Kuwait, Canada and Finland. *Dent Traumatol* 2004; 20: 241-245.
20. Ansari MH, Maxillofacial fractures in Hamedan province, Iran: a retrospective study (1987-2001). *J Craniomaxillofac Surg* 2004; 32: 28-34.
21. Fasola AO, Nyko EA, Obiechina AE, Arotiba JT. Trends in the characteristics of maxillofacial fractures in Nigeria. *J Oral Maxillofac Surg* 2003; 61: 1140-43.
22. Batista AM, de Ferreira MC. Risk factors associated with facial fractures. *Braz Oral Res*. 2012; 26(2): 119-25.
23. Rubiev M. A retrospective analysis of facial fracture etiologies. *JIMAB Annu Proc Sci Pap* 2012; 18(2): 153-4.
24. Erol B, Tarikulu R, Gorgun B. Maxillofacial fractures: Analysis of demographic distribution and treatment in 2901 patients. (25-year experience). *J Craniomaxillofac Surg* 2004; 32: 308-313.
25. Al Ahmed HE, Jaber MA, Abu Fanas SH, Karas M. The pattern of maxillofacial fractures in Sharjah, United Arab Emirates: A review of 230 cases. *Oral Surg Oral Med Oral Pathol Oral Radio Endo* 2004; 98: 166-70.
26. Deliversha E. The role of alcohol involvement in maxillofacial trauma. *JIMAB Annu Proc Sci Pap*. 2012; 18(2): 147-9.
27. Kapoor P, Kalra N. A retrospective analysis of maxillofacial injuries in patients reporting to a tertiary care hospital in East Delhi. *Int J Crit Illn Inj Sci* 2012; 2: 6-10.
28. Saddki N, Suhaimi AA, Daud R. Maxillofacial injuries associated with intimate partner violence in women. *BMC Public Health* 2010; 10: 268.
29. Karim T, Khan AH, Ahmed SS. Trauma of facial skeleton in children: Indian perspective. *Indian J Surg* 2010; 72: 232-5.

30. Kumaraswamy SV, Madan N, Keerthi R, Singh DS, Pediatric injuries in maxillofacial trauma: a 5-year study. *J Maxillofac Oral Surg* 2009; 8: 150-3.
31. Collao- Gonzalez C, Carrasco- Labra A, Sung- Hsieh HH, Cortes- Araya J. Epidemiology of pediatric facial trauma in Chile: a retrospective study of 7, 617 cases in 3 years. *Med Oral Patol Oral Cir Bucal* 2014; 19: 99- 105.
32. Subhashraj K, Nandakumar N, Ravindran C. Review of maxillofacial injuries in Chennai, India: a study of 2748 cases. *Br J Oral Maxillofac Surg* 2007; 45: 637- 9.
33. Gray E, Dierks E, Homer L, Smith F, Potter B. Survey of trauma patients requiring maxillofacial intervention, ages 56 to 91 years, with length of stay analysis *J Oral Maxillofac Surg* 2002; 60: 1114-1125.
34. Mesgarzadeh AH, Shahamfar M, Azar SF, Shahamfar J. Analysis to the pattern of maxillofacial fractures in North Western of Iran. A retrospective study. *J Emergency Trauma Shock* 2011; 4: 48-52.
35. Alcala- Gabiano A, Arribas- Garcia IJ, Martin- Perez MA, Romance A, Montalvo- Morno JJ, Juneous JM. Pediatric facial fractures: children are not just small adults. *Radiographics* 2008; 28: 441-61; quiz 618.
36. King RE, Scianna JM, Petruzzelli GJ. Mandible fracture patterns: a suburban trauma center experience. *Am J Otolaryngol* 2004; 25: 301-307.
37. Thaller SR, Facial trauma. 2th ed., New York: Marcel Dekker; 2004. P. 11, 23.
38. Adebayo ET, Ajike OS, Adekeye EO. Analysis of the pattern of maxillofacial fractures in Kaduna, Nigeria. *Br J Oral Maxillofac Surg* 2003; 41: 396-400.
39. Van der Bergh B, Heymans MW, Duvekot F, Forouzanfer T. Treatment and complications of mandibular fractures: A 10-year analysis. *J Craniomaxillofac Surg* 2012; 40: e 108-11.
40. Ogundipe OK, Afababi AQ. Adebayo O. Maxillofacial fractures in Owa, south western Nigeria. A 4-year retrospective review of pattern and treatment outcome in dentistry, 2012; 2: 132-4.