



ORIGINAL RESEARCH

Epidemiology of Maxillofacial Fractures Among Patients Reporting to Emergency Room of a Tertiary Care Center In Pondicherry – A 3 Year Retrospective Study

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ABSTRACT BACKGROUND: Injuries resulting from trauma should not only be seen exclusively as a medical condition, but also as a social and economic problem, and to tackle such social problem a thorough understanding of the patterns and site of fractures is essential.

Aim and Objectives: The present study was undertaken to determine the prevalence and patterns of maxillofacial fractures among cases reporting to Emergency room of a tertiary care center in Pondicherry from January 2012 – December 2014

Method: Data was obtained through a 3 year retrospective review of patients admitted/ reported to emergency room of a Mahatma Gandhi Hospital and Research Institute, Pondicherry, India with maxillofacial trauma. Files with incomplete and unclear records were excluded from the present study. For each case, patient's gender and age, pattern of facial fractures, and side involved were recorded on a data sheet.

Result: Maxillofacial fractures accounted for 29.75 percent of the cases. Majority of cases (31%) belonged to 21 – 30 year age group. Mandible sustained 51 percent of the fractures. Isolated fractures were seen in zygomatic complex (32.5%) followed by parasymphysis (28.2%). About 45 percent of the cases reported with fractures of Middle third of the face. Left side of the face was more involved than the right side of the face.

Conclusion: The epidemiological study of facial trauma makes it possible to outline the risk situations, as well as the characteristics of individuals susceptible to this type of trauma.

Key words: Incidence, retrospective studies, maxillofacial injuries, fractures, epidemiologic studies

INTRODUCTION

Fracture is defined as “breach in the continuity of bone”.¹ Facial area is one of the most frequently injured areas of the body, accounting for 23–97% of all facial fractures.² Maxillofacial injuries represent one of the most important health problems worldwide³ and vary from country to country.⁴

The sheer pace of modern life with high-speed travel as well as an increasingly violent and intolerant society has made facial trauma a form of social disease from which no one is immune. Seemingly, divergent shifts in society may be responsible for recent changes in patterns of facial injuries, extent, clinical features, and so forth resulting in massed disfigurement of maxillofacial skeleton.⁵

The coordinated and sequential collection of information concerning demographic patterns of maxillofacial injuries may assist healthcare

providers to record details and data from facial traumas.³ Continuous long term collection of data or retrieving old data and analyzing the same will provide an insight into the patterns of maxillofacial fractures providing necessary information for the development and evaluation of preventive measures to reduce the incidence of maxillofacial injuries and resultant deformities.

Injuries resulting from trauma should not only be seen exclusively as a medical condition, but also as a social and economic problem, and to tackle such social problem a thorough understanding of the patterns and site of fractures is essential.

The present study was undertaken to determine the prevalence and patterns of maxillofacial fractures among cases reporting to Emergency room of a tertiary care center in Pondicherry from January 2012 – December 2014.

METHODOLOGY

The present retrospective study was carried out for the cases reported for maxillofacial fractures from January 2012 to December 2014. Permission to conduct the study was taken from the concerned authorities of the Indira Gandhi Institute of Dental Sciences (IGIDS) and from the Chief Casualty Medical Officer of the emergency room of Mahatma Gandhi Medical Hospital and Research Institute (MGMHRI). The Medical Records Department (MRD) was contacted to provide the total number of cases registered from the January 2012 to December 2014.

From the list obtained, all fractures cases relating to maxillofacial region were counted and a separate list was prepared. The list was further segregated according to patients' age, number of cases (patients), number of fractures, the site of fracture, the jaw affected, according to gender and unilateral or bilateral involvement. Fractures were also grouped according to single (isolated) fractures and combination fractures. All cases of sialoliths, soft tissue lesions, tumors affecting either of the jaws, and cases with incomplete data were not included in the study.

Patients age were grouped as 0-10, 11-20, 21-30, 31-40, 41-50, 51-60 and 61-70 years. Fractures of the facial skeleton were classified as: mandibular fractures and fractures of the middle third of the face. The data collected was entered into Microsoft Excel sheet 2010 and were analyzed using SPSS version 17 to be distributed into tables and graphs.

RESULTS

During the three year period (2012 – 2014), a total of 400 patients reported to the tertiary care hospital. Of the total about 29 percent (119) of them reported with 163 maxillofacial fractures (**Figure 1**).

Age and Gender Distribution

Of the 29.75 percent, males were more in number than females (**Figure 2**). The patients were distributed into seven age groups with the age range between 4 and 65 years. The mean age was found to be 32.34 years. The highest incidence was reported among 21 – 30 years (31.3 percent) age group followed by 31 – 40

years (20.9 percent) (**Figure 3**).

Yearly distribution

The proportion of cases reported was highest in 2014 followed by 2013 and 2012 (45.53, 33.6 and 21.9 percent, **Figure 4**). On an average the maxillofacial fracture cases reported was about 39 cases per year.

Anatomical Location of Maxillofacial Fractures

The middle third of the face sustained more fractures (45.3 %) than the mandible (39.5%) and both middle third with mandible sustained only 15.1 percent of the fractures (**Figure 5**). Zygomatic complex fractures (32.5 %) were predominant in middle third fractures followed by Lefort fractures (I, II & III) (**Figure 6**). Mandibular fractures consisted more of parasymphysis fractures (28.2%) followed by condylar and Sub-condylar fractures (**Figure 7**).

Overall on an individual basis, fractures were most commonly seen in the zygomatic complex amounting to 32.5 percent followed by 28.2 percent of parasymphysis fractures. Ranked immediately after this were Lefort fractures (8.9 percent), condylar fracture (7.7 percent), and fracture of body and angle of the mandible equally seen (7.1percent of cases each) (**Table 1**).

Distribution of fractures according to number of sites involved

According to site, about 66 percent of the fracture was seen at one site followed by 30.2 percent of fractures involving at least two sites of the maxillofacial skeleton. Fractures involving more than two sites accounted for 3.3 percent (**Table 2**).

Maxillofacial fractures patterns and combination

(**Table 3**) showsthepattern of fractures observed in middle third of the face where fracture at a single site accounted for 38.6 percent. The zygomatic complex sustained more fractures in the middle third of the face. There were 8 different middle third fractures combination involving more than one fracture. Only ZMC and Lefort II fractures were reported as occurring twice. Patterns and combination of mandibular fractures are shown in (**Table 4**) where Parasymphysis and condylar/sub-condylar fractures

accounted for 10.9 percent of the fractures and body of the mandible and parasymphysis constituted 8.5 percent of fractures. Parasymphysis region sustained more fractures in the mandible. Fractures occurring at more than 2 sites were seen more commonly in combined middle third and mandibular fractures (**Table 5**). About 31 percent of the fractures involved the right side and sufficient data was not available for about 20 percent of cases (**Figure 8**).

DISCUSSION

This study covered all the cases reported to the Emergency room of a Tertiary care center in the Union Territory of Pondicherry, India from 2012 to 2014. It was found that overall the prevalence of maxillofacial fractures accounted for 29.75 percent of the total cases in the defined period. There is an increasing pattern of reported cases of fractures from 2012 to 2014. The highest numbers of cases were reported in the year 2014, which clearly indicates the growing incidence of maxillofacial fractures among the general population. An alarming sign, which emphasizes the need to take appropriate measures before trauma cases can be called as a social problem.

The number of maxillofacial fractures occurred predominantly in the age group of 21 – 30 years (31.3 percent) followed by 31 – 40 years (20.9 percent). The literature reports similar findings in studies conducted by various authors.^{3,6-10} The increasing number of fracture in third decade could be due to the reason, that people belonging to this age group are active, energetic and take active participation in dangerous exercises and sports.⁶ The age group of 21 – 40 years also witnesses intense social interaction and higher rates of morbidity, making them more susceptible to transport accidents and interpersonal violence.³

It is often reported that children below the age of 10 years are under the guidance of their family and the incidence is generally less. The same holds true in our study since there was no case of fractures reported in the same age group. However, the literature does report a prevalence of 12 percent and 8.7 percent in patients below 10 years^{4,11}. People beyond 40 years of age often lead a calmer, peaceful, and disciplined life. Studies conducted by Bali et al

and Paes et al reported 10 percent and 11.8 percent of cases in 41 – 50 years age group, which is more when compared to our study which reported about nine percent of fractures in the same age group.^{6,9} Our study indicates a marginal decrease of fractures in the above mentioned age group.

Males were predominantly affected than females in the present study which is similar to results found in other studies.¹²⁻¹⁶ The male to female ratio in the present study was 18.8:1, indicating men sustaining more fractures than females. This can be explained by the fact that there are more male drivers on the roads, especially on highways;¹⁷ men are more likely to practice contact sports; men attend bars more often and consequently are more likely to use alcohol and other drugs prior to driving. Men are also more involved in outdoor activities and are also exposed to violent interaction as compared to females who are less exposed due to social and religious limitations.

On a broader scale, mandible sustained more fractures (51.1%) than the middle third of the face (48.9%). This can be explained by the fact that, it is the only mobile bone of the face, thus being more vulnerable to receiving strong impacts and subsequently fracturing.¹⁸ The increasing involvement of mandible in fractures has been well documented in literature. The findings in the present study are similar to two 4 year retrospective studies conducted by Klenk and Kovacs in 2003 and Al Ahamed in 2004 which provide slightly higher percentages of mandibular fractures in the maxillo-facial region.^{19,20} Despite differences in geographic location and cultural properties, our result also agrees with that of Maliska et al who found that mandibular fractures accounted for 54.6% of maxillofacial fractures in Brazil.²¹ Our result was slightly higher than those obtained in a 5 year retrospective study by Brasileiro and Passeri in Brazil (44.2%) and one year retrospective study by Chrcanovic et al in 2004 in a hospital in Belo Horizonte, Brazil (39.97%).^{3,22}

However, there is also an increase in the number of middle-third fractures of the face among patients who reported to various tertiary care centers. In the present study about 48 percent of the fractures affected the middle-third of the face. In contrast to our study a 10 year review in Austria by Gassner et al showed that

the most common facial injury site was the middle-third of the face.²³ Also the findings in our study are slightly more than the findings of Bali et al and Asconi G et al (24) who reported 29.8 percent and 39 percent of middle third fractures respectively.^{6,24}

In our study, about 66 percent were isolated (single) fractures of the skeleton of face which is comparatively more as compared to 63.8 percent reported by Ozkaya O et al in 2014 and slightly less when compared with 70.3 percent reported by Giuliano A et al in 2014.^{11,24} In the case of single fractures, the zygomatic complex sustained more fractures in the middle third of the face followed by Lefort I, II & III fractures. The results are similar to the findings of other studies conducted in Brazil, Iran and Pakistan.^{3,4,25} and contradictory to a study conducted by Ozkaya O et al in 2009 where Zygoma sustained more fractures.¹¹ The proportion of combination fractures differs from the reports due to the very similar proportion between skeleton of the middle third of face. The middle third of the face had more number of fractures at one site followed by middle third of face and mandible which sustained more combination fractures.

The most common site for single fractures in mandible in the present study was the parasymphysis region followed by condylar and sub-condylar region which is consistent with other studies.²⁶⁻²⁹ The literature however, provides varied patterns of mandibular fractures. Our findings are not similar to the findings of other studies in this regard which reported as angle and condyle of the mandible as the most common site.³⁰⁻³² The parasymphysis is probably the commonest site since the force per unit area developed is greater resulting in increased concentration of tensile strength leading to a fracture at the site of maximum convexity of the curvature. The most common combination fractures was parasymphysis and condylar/sub-condylar fracture which is similar to a study conducted by Subodh S et al in 2012.⁵ However in contrast, other studies have reported parasymphysis with angle and body with angle as combination fractures in the mandible.^{11,33,34}

Bilateral comparison indicated that right side had fracture distribution ratio of 31 percent and no such indication was provided for about 20 percent of the cases. The right side of the face sustained more

injuries resulting in fractures followed by left side. Le et al in 2001 reported that hemispherical cerebral dominance leads the victim to turn to the right in a reflexive manner to avoid being hurt, thus presenting the left side of the face to the injuring force. However, contrary to the statement, our study presented more fractures affecting the right side of the face than the left side.³⁵

Limitations of this study include, a lot of cases were not recorded properly, so they were excluded from the study. The present study did not make any attempt to determine the cause of trauma, hence our understanding of the main cause remains a mystery and this lack of knowledge may be an inhibitor for our decision making authorities to frame appropriate laws for road safety. The cases included were not cross checked using the radiographs for fracture lines, so the reliability was completely on the records.

Such epidemiological study enables us to outline the characteristics of individuals susceptible to different types of trauma. Moreover, understanding the patterns and complications may provide a more realistic and consistent interpretation of how to manage these patients. Paes et al rightly framed, that healthcare costs to treat victims, damage to property involved in the traumatic event, losses in wages, and permanent or transient disability often lead to difficulties in the reintegration of victims into society and their return to work.⁹

Representatives from both governmental and non-governmental organizations, must be engaged in promoting preventive measures and in educating users to be thoughtful and conscious in traffic and to have a responsible and civil attitude to avoid accidents.

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Figure 1

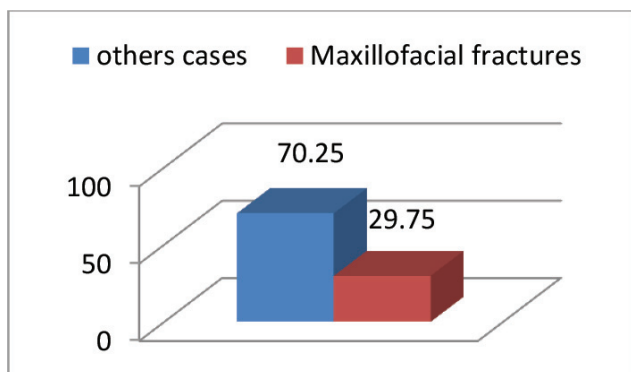


Figure 5

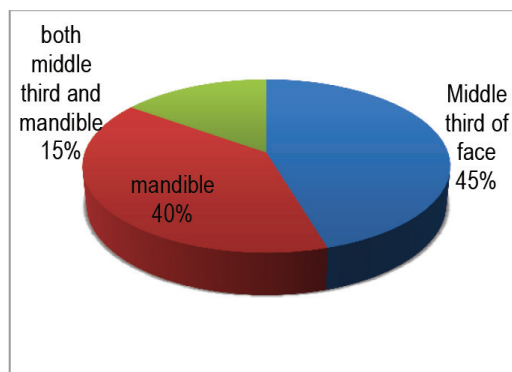


Figure 2

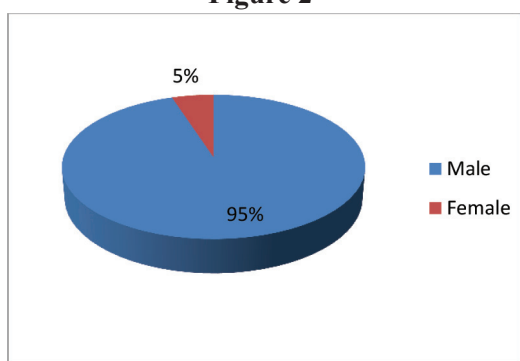


Figure 6

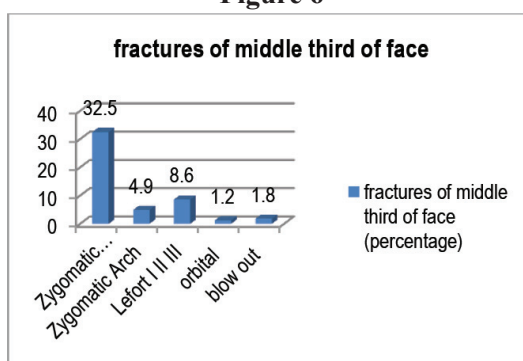


Figure 3

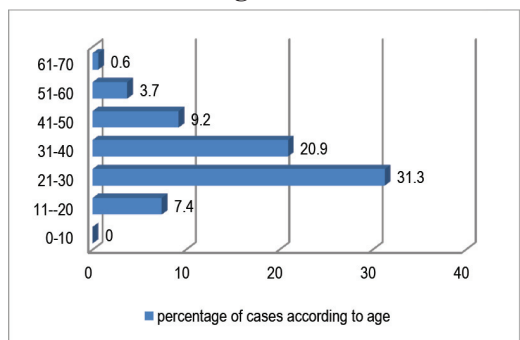


Figure 7

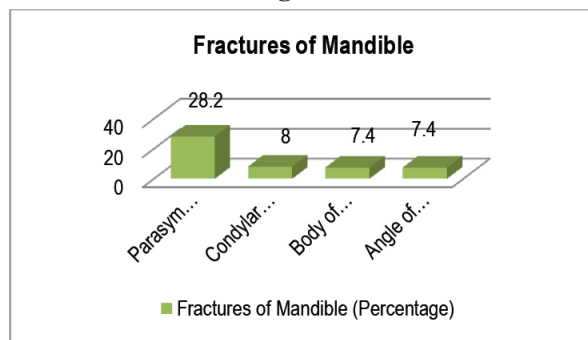


Figure 4

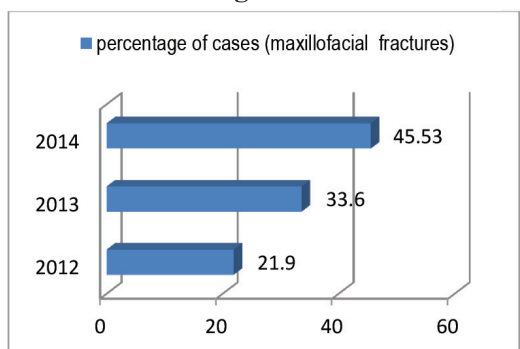


Figure 8

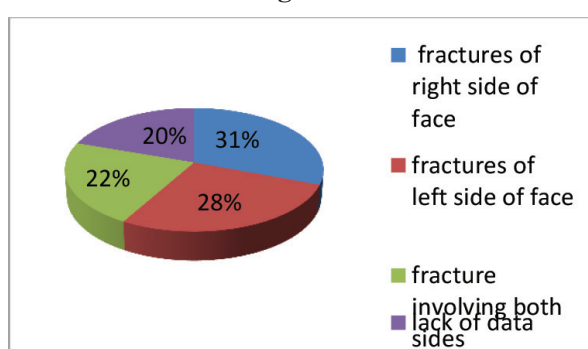


TABLE 1

Maxillofacial fractures	Number (percentages)	Total*
Middle third of the face	53 (32.5)	<u>80 (48.9)</u>
Zygomatic complex fractures	8 (4.9)	
Zygomatic arch	14 (8.5)	
Lefort I, II &III	3(1.8)	
Blow out fractures	2(1.2)	
Orbital fractures		
Mandible		
Parasymphysis	46 (28.2)	
Condylar and subcondylar	13 (8.1)	
Body of the mandible	12 (7.4)	<u>83 (51.1)</u>
Angle of the mandible	12 (7.4)	
Total		163 (100)

*Total number of fractures = 163

TABLE 2

	Fracture at one site only	Fractures at more than 2 sites	Fracture at atleast 2 site	Total*
Middle third	46 (38.6)	8 (6.7)	0	54 (45.3)
Mandible	33 (27.8)	13 (10.9)	1 (0.8)	47 (39.5)
Middle third and Mandible	0	15 (12.6)	3 (2.5)	18 (15.1)
Total	79 (66.4)	36 (30.2)	4 (3.3)	119 (100)

TABLE 3

Fracture percentages (N)	site
ZMC	68.51 (37)
Zygomatic arch	7.40 (4)
Lefort	5.55 (3)
Blow out	3.70 (2)
ZMC + Lefort II	3.70 (2)
ZMC + Lefort I, II III	1.85 (1)
ZMC + Lefort I	1.85 (1)
Lefort III +Lefort II	1.85 (1)
Lefort I II III + Blow-out	1.85 (1)
Lefort III +Naso orbital	1.85 (1)
Zygomatic arch + Infra orbital	1.85 (1)
Total	100 (54)

Number of cases (119)

TABLE 4

Fracture site	Percentages (N)
Parasymphysis	44.7 (21)
Angle of mandible	8.5 (4)
Body of Mandible	14.9 (7)
Sub-condylar and condylar	2.1 (1)
Parasymphysis Condylar/sub-condylar	10.6 (5)
Parasymphysis + Angle of mandible	4.2 (2)
Body of the mandible + Condyle	2.1 (1)
Parasymphysis + Condylar	2.1 (1)
Body of the mandible + Parasymphysis	8.5 (4)
Condylar + Parasymphysis + Body of mandible	2.1 (1)
Total	163 (100)

Number of cases (119)

TABLE 5

Middle third of face and Mandible (Combined) Percentage (Number)	
ZMC + Parasymphysis	27.7 (5)
ZMC+ Angle of Mandible	11.1 (2)
Lefort I +Parasymphysis	11.1 (2)
ZMC + Condylar	5.5 (1)
ZMC + Body of mandible	5.5 (1)
ZMC + Subcondylar	5.5 (1)
Zygomatic arch + Parasymphysis	5.5 (1)
Lefort II +Parasymphysis	5.5 (1)
Zygomatic arch + Condylar	5.5 (1)
ZMC + Parasymphysis + Subcondylar	5.5 (1)
ZMC + Angle of mandible + parasymphysis	5.5 (1)
ZMC + Parasymphysis + Body of Mandible	5.5 (1)
Total	100 (18)

Number of cases (119)

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