

Faciomaxillary fractures in a Semi-urban South Indian Teaching Hospital: A retrospective analysis of 638 cases

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Abstract

Background and Objective: The incidence of maxillofacial trauma is increasing at a very fast pace in developing countries like India and poses a major health burden. Hence, the epidemiological data of maxillofacial trauma during a 6 year period, was analyzed to study the characteristics, factors predisposing, and aid in advocating strict guidelines to prevent the same. **Materials and Methods:** Data related to 638 cases with maxillofacial trauma, from January 2008 to December 2014 were reviewed retrospectively and the data regarding gender, age, etiology, anatomic location of fracture, alcohol consumption, associated head and other injuries, modality of treatment rendered and associated complications were analyzed with descriptive statistics. **Results:** A total of 638 patients presenting with 869 maxillofacial fractures were analyzed. Most of them [344 (53.9%)] were young adults aged 18-40, whereas, 123 (19.2%) were 11 to 17 years, and 97(15.2%) adults. Men (79.4%) were more affected than women. Road traffic accidents remain the main etiology causing fractures in 470 (73.6%), whereas 397 (62.2%) had history of consumption of alcohol. Those with alcohol intoxication had multiple injuries. Mandible was more frequently involved with 360 (41.4%) fractures, and condyle being the most common site. A total of 374 (58.6%) underwent open reduction with internal fixation under general anesthesia. Prevalence of other injuries was noted in 207 (32.4%) and complications of fracture treatment in 41(6.4%) cases. **Conclusion:** Road traffic accidents under alcohol influence were most commonly associated with comminuted facial fractures with head injuries, frequently leading to death. Mandible was the most commonly fractured facial bone followed by zygoma.

Keywords: Facial fractures, maxillofacial injuries, road traffic accidents

Introduction

Maxillofacial injuries represent one of the most life-threatening problems in developing and developed nations representing 7.4–8.7% of the emergency medical care.^[1,2] These injuries are often associated with severe morbidity due to their close proximity to vital organs such as brain and cervical vertebrae causing loss of function and death. Literature search reveals that 16,000 people die each day due to trauma in the world.^[3] Since the face is the most exposed and unprotected part of the skeleton, particular interest to addresses maxillofacial fractures is deemed necessary and important to rehabilitate the patient. Fractures of the maxillofacial skeleton alone are

rarely fatal, but concomitant injuries to other organs can be a complicating factor. High-velocity trauma is usually seen in urban and semi-urban areas while low-velocity trauma is seen in rural areas. The pattern of maxillofacial fractures varies with geographical area, socioeconomic condition, enforcements of law and order of a country. Of the published data, road traffic accidents are the main cause of maxillofacial fractures in developing nations followed by interpersonal conflicts, assaults, and sports injuries in developed nations.^[4-6] In rural areas, occupational hazards are also found to be one of the main contributing etiologies associated to facial trauma. India is a nation which is fast developing and getting urbanized with the influence of Western culture. During this transformation, facial injuries are often associated with the changes in lifestyle and socioeconomic status.

The coordinated and systematic collection of the available data from a particular geographical area concerning about the anatomical patterns of maxillofacial injuries will help the healthcare providers to record these data and understand the

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Access this article online	
Quick Response Code: 	Website: www.contempclindent.org
	DOI: 10.4103/0976-237X.169847

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How to cite this article: Gali R, Devireddy SK, Kishore Kumar RV, Kanubaddy SR, Nemaly C, Akheel M. Faciomaxillary fractures in a Semi-urban South Indian Teaching Hospital: A retrospective analysis of 638 cases. *Contemp Clin Dent* 2015;6:539-43.

cause and severity to prevent these injuries. Several studies have been conducted to investigate the epidemiology of these facial fractures in Nigeria,^[7] South Africa,^[8] England,^[9] the United Arab Emirates,^[10] however, no study on maxillofacial fractures from South India has analyzed and published. After the advent of mini plates by Champy *et al.* in 1978,^[11] it is now possible for oral and maxillofacial surgeons to establish the anatomical facial form and function and rehabilitate the patient as soon as possible. Because of high morbidity of maxillofacial trauma, an epidemiological analysis of these fractures was necessary to implement strict protocols and conduct prevention programs for public health awareness. Comparison of results with similar studies in other regions of the world is also discussed.

Objectives

This retrospective analysis aims to report an epidemiological data of 638 patients with maxillofacial trauma seen by oral and maxillofacial surgeons with other medical specialists in our Trauma Care Centre from January 2008 to December 2014.

Materials and Methods

This is a retrospective analysis from a historical longitudinal cohort, for which the data of 638 patients from January 2008 to December 2014 who had maxillofacial fractures were collected from the registers with the permission of medical registrar of 2480 bedded Narayana Superspeciality Teaching Hospital, Nellore, which is the only Tertiary Care Hospital with fully equipped trauma unit located on the national highway-5 of India. It is an established hospital that provides healthcare facility to the semi-urban and rural population around Nellore and greater part of Southern Andhra Pradesh, India.

Of 638 fractures, 374 patients underwent open reduction with internal fixation, 173 patients with closed reduction with or without intermaxillary fixation, 54 patients were referred to higher centers/against medical action due to underlying comorbidities, and 37 patients had undisplaced fractures and did not require any treatment. Data regarding patient's age, gender, socioeconomic status, alcohol consumption, pattern and anatomical location of maxillofacial injury, type of head injury, and associated injuries of the body were obtained. Etiology of these fractures was classified as road traffic accident due to bike or automobile, fall, interpersonal conflicts, and animal heading. Age groups were divided into childhood (2–10 years), adolescence (11–17 years), young adults (18–40 years), adult (41–65 years), and elderly (>65 years). Socioeconomic status was divided based on the occupation of the patients. They included economically active and not economically active.

Anatomical distribution of the maxillofacial fractures was classified as mandibular and midface fractures (central thirds and lateral thirds). Mandibular fractures included symphysis, parasymphysis, body, angle, ramus, and condyle. In midface fractures, the central thirds included fractures of nasal bones,

naso-orbito-ethmoidal complex, Lefort I, II, III, and maxillary palate fractures. The lateral, third fractures were zygomatic complex fractures. There were associated head injuries (epidural and subdural hemorrhage, edema, contusions, etc.).

Treatment modalities included closed and open reduction. This was planned based on the pattern, displacement of fracture segments, and occlusion of teeth. Fixation of fractures was done under general anesthesia with miniplates with/or transosseous wiring after reduction of the segments with arch bars. Closed reduction was done with arch bars and intermaxillary fixation with elastics/stainless steel wires under local anesthesia. Complications included infection, plate exposure, sialocele, malocclusion, and marginal mandibular nerve palsy. All these data were obtained, and systematic statistical analysis was done.

Results

During January 2008 to December 2014, a total of 638 patients were affected with 869 maxillofacial fractures. Of these, 507 (79.4%) patients were men and 131 (20.5%) were women with 344 (53.9%) patients in an age group of 18–40 years, and 123 (19.2%) patients in 11 to 17 years [Table 1]. These show that young adults or young aggressors are the most commonly affected by facial trauma. Male to female ratio of facial fractures according to our analysis was 4:1.

Table 2 shows distribution of fractures based on gender and etiology. Road traffic accidents represent the most significant etiological factor for craniofacial trauma. Bike accidents were seen in 349 (54.7%) patients with 309 males and 40 females. Automobile (four wheeler) accidents were seen in 110 (17.2%) patients. The second most common etiologic factor was interpersonal conflicts which were seen in 75 (11.7%) patients predominantly among men in an age group of 18–40 years. Falls during sports activities or during work were seen in 33 (5.1%) patients. Animal heading is a common problem in rural areas. It represents 5.7% of patients having facial fractures. Occupational hazards were a factor seen in 22 (4.5%) patients due excess manual work done in unequipped industries in semi-urban areas. Alcohol consumption was the most common factor in these rural and semi-urban areas. It represented as a contributing factor to facial injuries in 62.2% of patients. Most of these patients were associated with panfacial fractures with head injuries. Occupational distribution of patients is shown in Table 3. Three hundred and seventy-nine (59.4%) patients were economically active, independent and had a professional occupation. Of the noneconomically active, 138 (21.6%) were students, 70 (10.9%) were unemployed, and 51 (7.9%) were dependent. This reveals that fractures are more commonly seen in economically active individuals.

Table 4 shows the anatomical sites of maxillofacial fractures. Of these fractures, mandible was the most common bone

Table 1: Distribution of fractures according to age and gender

Age groups (years)	Male	Female	Total (%)
Childhood (2-10)	36	15	51 (7.9)
Adolescence (11-17)	86	37	123 (19.2)
Young adults (18-40)	291	53	344 (53.9)
Adult (41-65)	79	18	97 (15.2)
Elderly (>65)	15	8	23 (3.6)
Total (%)	507 (79.4)	131 (20.5)	638 (100.0)

Table 2: Distribution of fractures according to etiology and gender

Etiology	Male	Female	Total (%)
Automobile (4 wheeler)	91	19	110 (17.2)
Bike	309	51	360 (56.4)
Falls/play	21	11	33 (5.1)
Interpersonal conflicts	45	30	75 (11.7)
Animal heading	20	9	29 (5.7)
Occupational hazards	21	11	22 (4.5)
Alcohol	397	-	397 (62.2)
Total	507	131	638 (100.0)

Table 3: Occupation distribution of 1257 patients with maxillofacial fractures

Occupation	Number of patients		
	Men	Women	Total (%)
Economically active	323	97	379 (59.4)
Not economically active			
Student	96	42	138 (21.6)
Unemployed	50	20	70 (10.9)
Dependent	38	13	51 (7.9)
Total (%)	507 (79.4)	131 (20.5)	638 (100.0)

with 360 (41.4%) fractures due to its prominent position in maxillofacial skeleton. There were 101 (11.6%) fractures of condyle which was the most common site, followed by 86 (9.8%) fractures of angle. Only two (0.2%) coronoid fractures were seen, and 41 (4.7%) dentoalveolar fractures of mandible were seen. Central thirds of the facial skeleton fractures represented 31.9% of all facial fractures with 92 (10.5%) Lefort I fractures, 55 (6.3%) Lefort II fractures, and 14 (1.6%) Lefort III fractures were seen. Seventeen (1.9%) Naso-Orbito-Ethmoidal fractures and 27 (3.1%) nasal bone fractures were seen. Dentoalveolar fractures in maxilla represented 5.8% of all the central thirds fractures. There were 231 (26.5%) lateral, third fractures of which 51 (5.8%) were zygomatic body fractures, 20 (2.3%) were zygomatic arch fractures and 160 (18.4%) were zygomatic complex fractures. Total of 869 fractures were treated. Table 5 shows the treatment modalities of the patients. Open reduction with miniplates

Table 4: Distribution of anatomical sites of maxillofacial fractures

Site of fracture	Number of fractures
Central third of maxillofacial skeleton	
Nasal bones	27
Naso-orbito-ethmoid	17
Maxilla	
Lefort I	92
Lefort II	55
Lefort III	14
Palate	22
Dentoalveolar	51
Subtotal (%)	278 (31.9)
Lateral third of maxillofacial skeleton	
Zygomatic body	51
Zygomatic arch	20
Zygomatic body + arch	160
Subtotal (%)	231 (26.5)
Mandibular fractures	
Condyle	101
Ramus	4
Coronoid	2
Angle	86
Body	70
Parasymphysis	50
Symphysis	41
Dentoalveolar	6
Subtotal (%)	360 (41.4)
Total number of fractures (%)	869 (100.0)

Table 5: Distribution of fractures according to fixation methods

Treatment	Number of patients (%)
Closed reduction with intermaxillary fixation	173 (27.1)
ORIF	374 (58.6)
Referred to higher centers/ against medical action	54 (8.4)
Not requiring ORIF/closed treatment (undisplaced fractures)	37 (5.7)
Total	638

ORIF: Open reduction and internal fixation

fixation were done in 374 (58.6%) patients under general anesthesia and closed reduction were done in 173 (27.1%) patients under local anesthesia. Stainless steel or titanium miniplates were used for rigid fixation. Some patients had other injuries such as head injuries, limb fractures, and extensive soft tissue lacerations. Fifty-four patients were referred to higher centers/against medical action due to

underlying comorbidities. Undisplaced fractures were present in 37 patients that did not require any treatment. Other injuries that were present in is shown in Table 6. Head injuries included hemorrhage, edema, and limb fractures. Table 7 shows complications associated with treatment. Forty-one (6.4%) patients had postoperative complications which were insignificant. Infection was seen in 13 (2.0%) patients in whom plate removal was done. Malocclusion was seen in six (0.9%) patients, occlusal grinding of high points was done to get a good occlusion. Marginal mandibular nerve palsy was seen in 21 (3.2%) patients who recovered in 6 months duration. Malunion of fracture segments was seen in one (0.1%) patient.

Discussion

The results of epidemiological surveys will vary with geographic region, socioeconomic status, and population. This study was conducted in 6 years period in semi-urban region called Nellore, India covering a population of 5.1 lacs (according to census 2012) inhabitants and around 10 lacs inhabitants in rural areas around Nellore. Being a semi-urban region, strict road traffic regulations, use of restraints such as helmets and seatbelts, speed limits of below 50 kmph, and restrictions of drinking and driving are not being reinforced. Although a variety of other causes has been mentioned in literature with regard to maxillofacial fractures, the results of this study show that 73.6% of the cases were due to road traffic accidents. This figure is similar with the results of other studies. Within the traffic accidents, bike accidents represent 56.4% and automobile (four wheeler) in 17.2%. Interpersonal conflicts represent 11.7% of the etiological factors. Demographic data of maxillofacial fractures in this

region indicated that they were prevalent in men than women with a ratio of 4:1. In countries such as the United Arab Emirates, Austria, and Finland, this ratio was higher toward women due to active participation in social activities.^[10] More recently, Adebayo *et al.* reported increased injuries occurring in women from 8% to 18% between 1978 and 1991 showing that they were forced to involve in social activities due to certain economic conditions.^[12] The most affected age group was young adults of 18–40 years of age. They may also be called as aggressors and are frequently involved in dangerous exercises, sports, and alcohol consumptions. Alcohol consumption has become a daily habit of the every third individual in the country. There is a direct correlation between the amount of alcohol drunk and the degree of accidents, on its most varied ways which caused facial trauma in all culture and societies. This stays one of the most important causative factors predisposing to severe maxillofacial and other injuries sometimes inevitably leading to death. In the present analysis based on occupation, economically active men and women of 22–40 years are associated to carry out intense activities of daily life and support the family and hence are more frequently involved in the accidents. Iida *et al.*, reported more number of maxillofacial fracture cases in older age groups.^[13]

Among maxillofacial fractures, mandible was more commonly fractured (41.4%). According to literature, assaults are usually responsible for mandible body and mandible angle fractures, automobile accidents are responsible for condyle fractures and mandibular body or problems on the condyle and symphysis and, the accidents with motorcycles, most of the times without wearing helmets, are responsible for fractures in the body, symphysis, parasymphysis, and condyle.^[14,15] The results from the present study are in agreement with literature, considering the most prevalent fractures on condyle, angle, and body, arising from this three facial trauma causing mechanisms, which, in the present study, were also the ones which happened more often. Zygomatic fractures were seen with 26.5%. The left side of mandible and zygomatic fractures were more common than the right side with a ratio of 2.3:1. This may be due to a reason that most of the people are right handed, and interpersonal aggressors target mandible first and then zygoma. Central thirds of facial fractures represent around 31.9%. They are most commonly seen in the bike and automobile accidents. In past 20 years, there have been advancements in maxillofacial trauma management which have led to segment stability, early recovery with immediate rehabilitation of the patient. The introduction of miniplates has led to its universal use due to its biocompatibility and feasibility. However, reports from the United Arab Emirates and Nigeria reports that open reduction and internal fixation of facial fractures have not become popular in most developing nations.^[10] On the other hand, Torgersen and Tornes reported miniplate osteosynthesis has become more standard procedure in their department being used 4 times more frequently than wire in open reduction and internal fixation.^[16] We have placed mini plates in 374 patients. Head

Table 6: Patients with head and other injuries

Other injuries	Number of patients
Head injuries	
Epidural hemorrhage	20
Subdural hemorrhage	9
Cerebral edema	11
Cranial vault fractures	31
Others	40
Limb fractures	196
Soft tissue lacerations	421

Table 7: Post-operative complications

Complications	Number of patients
Infection	13
Malocclusion	6
Nerve palsy	21
Malunion	1
Total (%)	41 (6.4)

injuries were seen in helmetless patients. Mild complications such as infection, malocclusion, nerve palsy, and malunion were present which were managed accordingly.

The present study supports that regular epidemiologic study of maxillofacial fractures allow a detailed and systematic analysis of these fractures providing important support to install clinical and research priorities, since etiologies and patterns of presentation can be identified. According to these data, it seems important to assume that road traffic legislation enforcement and continuous public education toward the use of restraining devices should be encouraged among public. Multispecialty trauma care centers have to be established on highways to manage patients with road traffic accidents. A polytrauma patient needs a multidisciplinary team approach. Hence, every trauma center must be fully equipped with all amenities and have specialists of all departments to render a complete care to a patient. In addition, it should be emphasized that these patients need proper postoperative care and assistance, and they should be closely followed particularly with cranial injuries.

Conclusion

Maxillofacial trauma most commonly occurs in young adults, especially in men arising from road traffic accidents and interpersonal violence. The most common affected site was mandible, zygomatic complex associated with soft tissue injuries of face. The use of illegal drugs or alcohol, drunken driving, was the most contributing associated factor for these comminuted traumatic injuries. There has to be strict rules and regulations installed by the government by conducting preventive camps in schools and colleges regarding road safety and reduce the intake of alcoholic beverages which in turn may reduce the incidence of facial trauma. The epidemiological data of every hospital is important to analyze the etiological factors of accidents and implement strict rules to prevent them and to help the government to create new guidelines to prevent these injuries.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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