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Original Article Incidence and Etiology of Mid-facial Fractures : A 10 Year Retrospective Institutional Study

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Abstract

The aim of this study is to collect retrospective data regarding the patients reporting with midfacial fractures over the past 10 years and analyze the data, the results of which can be of further assistance in future clinical and research areas. The hospital records of 507 patients treated for maxillofacial trauma from January 2005 to December 2014, were obtained from the medical records department and dental records department and were reviewed and analyzed.

Male: Female ratio of 6.5:1 was noted. Dentoalveolar fracture was found to be present in 80 case (15.8%). Nasal bone fracture in 146 cases (28.8%). ZMC fracture in 212 cases (41.8%). Maxillary sinus wall fracture 186 cases (36.7%) Lefort I fracture 29 case (5.7%) Lefort II fracture in 6 case (1.2%) Isolated lefort III fracture in only a single case (0.2%). Fracture involving both ZMC and orbit were noted in 20 cases (3.9%) while 24 cases (4.7%) of orbital floor fracture were noted. RTA & Fall were two most common etiology.

The present study supports that regular epidemiologic evaluations of maxillofacial fractures allow a detailed analysis of these lesions, providing support to install clinical and research priorities, since risk factors and patterns of presentation can be identified.

Introduction

The mid-face is very important unit functionally and aesthetically. It plays an important role in interpersonal relationship and the perception of self-image. In addition it also plays a vital role in various normal day to day functions such as vocal resonance, ocular stability, olfactory, respiratory and digestive systems.

Hence, Injuries of the maxillofacial complex represent one of the most important health problems worldwide. Particular interest is created by the high incidence and diversity of facial lesions.¹⁻³ Moreover, maxillofacial fractures are often associated with severe morbidity, loss of function, disfigurement, and significant financial cost³⁻⁵ and psychological stigma to the patient.

The patterns of maxillofacial fracture presentation are consistently influenced by geographic area, socioeconomic status of the cohort, and the period of investigation.⁶⁻¹² According to reports of developing nations, traffic accidents are the main cause of maxillofacial fractures, ^{9, 13-16}

while data from developed countries pointed to assaults being considered the most frequent etiology of such fractures.¹⁷⁻²¹. With regard to the anatomical sites, mandibular and zygomatic complex fractures account for the majority of all facial fractures and their occurrence varies according to the mechanism of injury and demographic factors, particularly, gender and age.²²⁻²⁴

The coordinated and sequential collection of information concerning demographic patterns of maxillofacial injuries may assist health care providers and health policy makers to record detailed and regular data of facial trauma and design plans for injury prevention. Consequently, an understanding of the cause, severity, and temporal distribution of maxillofacial trauma permits clinical and research priorities to be established for effective treatment and prevention of those injuries.^{25,26}.

The aim of this study is to collect retrospective data regarding the patients reporting with mid-facial fractures over the past 10 years and analyze the data, the results of



which can be of further assistance in future clinical and research areas.

Materials and method

1. Data collection

All the patients with mid-face fractures reporting to the casualty of K. S. Hegde Charitable hospital, to the department of Oral and Maxillofacial surgery of A. B. Shetty memorial Institute of Dental Sciences and to the Department of ENT, K. S. Hegde Charitable hospital were included in the study.

The hospital and outpatient records of 507 patients treated for maxillofacial trauma from January 2005 to December 2014, were obtained from the medical records department and dental records department of the respective institutions and were reviewed and analyzed.

Data collected included gender, age, cause of injury, type of maxillofacial trauma, bones involved in fracture and treatment modality.

The maxillofacial fractures were subdivided into Zygomaticomaxillary fractures (fracture of the zygomatic complex or zygomatic arch), Dentoalveolar, orbitozygomatic, Le Fort I/II/III/IV fractures, fracture of the maxillary sinus walls, Nasal Bone fractures and multitrauma (combination of fractures).

2. Statistics

All the data collected was entered categorically in an excel sheet. Chi Square test was performed to know the association between various parameters. Results with p value <0.05 were considered significant.

3. Results

The incidence of Fractures were divided according to the "International Classification of Diseases" (ICD) into Malar and Maxillary, Multiple Fractures (Pan facial trauma), Nasal bone fractures, Orbital floor, other facial bones, Fractures involving skull. These broad categories were then sub divided into specific sites of fractures as Dentoalveolar fracture, Zygomaticomaxillary complex fracture, Nasal bone fracture, Lefort-I II III & IV fractures, Orbital floor

 $fracture\,and\,orbitozygomatic\,fracture.$

Site of Injury

In our 10 year retrospective analysis total of 507 mid-facial fractures cases were included. Among these, Incidence of malar and maxillary fractures was found to be most common followed by nasal bone fracture. (tab. 1, fig. 1)



Figure 1

Among the sub-categories ZMC fracture was found to be present most commonly followed by nasal bone fracture. Maxillary sinus wall fracture was commonly found to accompany ZMC fracture.

	Frequency	%
Malar & Maxillary	234	46.2%
Multiple Fractures	3	.6%
Nasal Bones	155	30.6%
Orbital Floor	12	2.4%
Other Facial Bones	92	18.1%
Skull And Facial Bones	11	2.2%
Total	507	100.0%

Table 1

Dentoalveolar fracture was found to be present in 80 case (15.8%). Nasal bone fracture was found to be present in 146 cases (28.8%). ZMC fracture was found to be present in 212 cases (41.8%). Maxillary sinus wall fracture was found to be present in 186 cases (36.7%) which was commonly seen along with ZMC fracture. Lefort I fracture was found to be present in 29 case (5.7%). Lefort II fracture was found to be present in 6 case (1.2%). Isolated lefort III fracture was noted only a single case (0.2%). Most commonly it was a part of pan facial trauma. Fracture involving both ZMC and orbit were noted in 20 cases (3.9%) while 24 cases (4.7%) of orbital floor fracture were noted. (tab.2, fig.2)



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Type of Fracture	Frequency	%
Zygomaticomaxillary Complex	212	41.8%
Dentoalveolar	80	15.8%
Nasal Bone	146	28.8%
Lefort I	29	5.7%
Lefort II	6	1.2%
Lefort III	1	0.2%
Lefort IV	2	0.4%
Orbitozygomatic	20	3.9%
Orbital Floor	24	4.7%
Maxillary Sinus wall	186	36.6%

Table 2



Figure 2

Cause of Injury Over the past 10 years. RTA has been the most commor

Cause of Iniury	Cause	Frequency	Percent	
	Adl	16	3.2%	
Over the past 10 years. RTA	Assault	53	10.5%	
has been the most common	Fall	196	38.7%	
etiology for the incidence of	RTA	242	47.7%	
Midfacial fracture closely	Total	507	100.0%	
ivilulaciai fracture closely	Tahlo 3			

Table 3 followed by fall from the

height. RTA was found to be the cause in 47.7% of cases, fall from height in 38.5% cases, assault in 10.5% and ADL in 3.2% cases. (tab. 3, fig. 3 fig. 4)



Figure 3



Yearly Distribution

Yearly distribution of fracture was quite consistent over the last 10 years with average of 51 case per year. A slight dip in the number of cases reported can be noticed in year 2008 and then in year 2014. (tab.4 fig.5)

Year	Frequency	Percent
2005.0	43	8.5
2006.0	45	8.9
2007.0	47	9.3
2008.0	34	6.7
2009.0	48	9.5
2010.0	65	12.8
2011.0	49	9.7
2012.0	43	8.5
2013.0	85	16.8
2014.0	48	9.5
Total	507	100.0

Table 4



Figure 5

Gender Distribution

13%
87%
■ female ■ male

Male: female ratio was found	to	be
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Gender	Frequency	Percent
Female	68	13.4%
Male	439	86.6%
Total	507	100.0%

Figure 6

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Table 5
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Age Distribution

The incidence of Midfacial fractures ranged from 2 years to 85 years with mean age of 34.27 years. Incidence of midfacial fractures was most commonly seen in 3rd and 4th decade of life regardless of gender. It was followed by 5th, 6th and 2nd decades in descending order. (tab.6 fig.7)



Figure 7

Discussion

The midfacial complex is constructed of a series of vertical pillars bilaterally that primarily provide protection from traumatic vertical forces. These vertical pillars are



Type of fracture * Age Cross tabulation										
Type of fracture Age cross tabulation										
	Age					Total				
		1 st Decade	2 nd Decade	3 rd Decade	4 th Decade	5 th Decade	6 th Decade	7 th Decade	8 th Decade	
malar & maxillary	Count	5	23	69	53	35	39	7	0	231
	% within	23.8%	46.0%	40.6%	49.1%	52.2%	55.7%	41.2%	0.0%	45.8%
multiple fractures	Count	0	1	2	0	0	0	0	0	3
	% within age	0.0%	2.0%	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%
nasal bones	Count	6	15	57	30	19	18	9	1	155
	% within age	28.6%	30.0%	33.5%	27.8%	28.4%	25.7%	52.9%	100.0%	30.8%
orbital floor	Count	1	0	6	2	0	3	0	0	12
	% within age	4.8%	0.0%	3.5%	1.9%	0.0%	4.3%	0.0%	0.0%	2.4%
other facial bones	Count	8	8	32	21	13	9	1	0	92
	% within age	38.1%	16.0%	18.8%	19.4%	19.4%	12.9%	5.9%	0.0%	18.3%
skull and facial bones	Count	1	3	4	2	0	1	0	0	11
	% within age	4.8%	6.0%	2.4%	1.9%	0.0%	1.4%	0.0%	0.0%	2.2%
Total	Count	21	50	170	108	67	70	17	1	504
	% within age	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 6

Nasomaxillary, Zygomaticomaxillary and Pterygomaxillary buttresses. These vertical buttresses are further supported by horizontal buttresses which are supraorbital or frontal rim, Infraorbital rims and zygomatic arches. In addition to these buttresses the midface also have support, although weak, from maxillary walls, nasal septum and lateral nasal wall. This framework results in a few anatomic sites of weakness, resulting in fairly predictable pattern of fractures.

Among various midfacial fractures, zygomatic fractures are one of the most commonly encountered fractures, second in frequency after nasal bone fractures. The high incidences of these fractures probably relates to their prominent position within the facial skeleton, which frequently primarily exposes them to the traumatic forces first, compared to the other bones of facial skeleton. However the incidence of these fractures, cause, age, and gender predilection vary depending largely on social, economic, political, routine daily life and educational status of the population being studied.

Thus our study is aimed to consider age, sex, various etiology and pattern of Midfacial fractures.

In our study peak incidence of Midfacial fracture was seen in 3^{rd} decade of life i.e. 21-30 years followed by 4^{th} decade and 6^{th} decade and then 5^{th} decade, 2^{nd} decade, 1^{st} decade 7th and 8th decade in decreasing order of frequency. This finding is in accordance with other previous studies which indicate that young people are more prone to traumatic injuries. (Hill et al 1984; Guven, 1988; Dimitroulis and Eyre 1991; Moshy et al 1996; Oji 1999.)^{13, 28-30}. This age distribution holds true for both male and female cases.

Gender distribution of incidence of Midfacial revealed there is male preponderance where 86.6% cases were male while only 13.4% were female patients, thus in the ratio of 6.5:1 M/F ratio. This can be attributed to the fact that most of these injuries occur from activities where men are more commonly involved such as RTA, work related accidents and assault. Huang et al 1998; Zarchariades et al 1990^{31,32} found similar results in their study.

The results of our study suggests that the incidence of Zygomaticomaxillary complex (ZMC) fracture is most common among the Midfacial fractures followed by nasal bone fractures, lefort fractures, orbital floor fracture, orbitozygomatic fracture in decreasing order. Contrary to this in female patients there is a higher incidence of Nasal bone fractures compared to ZMC fracture.

Similar previous studies indicates that RTA are the main cause of traumatic injuries in the developing countries such Nigeria, Jordan, Austria, India etc. while in country such as Zimbabwe assault has been shown as the main cause of



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maxillofacial injury. Whereas few studies done in developed countries show that increasing interpersonal violence are main cause of maxillofacial injuries closely followed by RTA.

In our study, road traffic accidents are the leading cause for the midfacial fractures. The reasons for this high frequency are difficult to ascertain it may be one or combination of the reasons mentioned here. Inadequate road safety awareness, unsuitable road conditions without expansion of the road breadth of narrow roads, violation of speed limits, old vehicles without safety features, failure to wear seat belts or helmets, entry in to opposite traf?c lane, violation of the highway code, use of alcohol or other intoxicating agents.

When analyzed closely our institutional data does coincide with Government policies on strict implementation of Traffic rules and compulsory helmet in year 2008 and from last year i.e. 2014 with subsequent decrease in the number of cases reported especially due to Road Traffic accidents.

In contrast to this, the most common cause of nasal bone fracture is fall followed closely by RTA and then assault and ADL. This can be attributed to the fact that nasal bone are

References

- Haug RH, Prather J, Indresano T. An epidemiologic survey of facial fractures and concomitant injuries. J Oral MaxillofacSurg 1990; 48:926-32.
- 2. Koorey AJ, Marshall SW, Treasure ET, Langley JD. Incidence of facial fractures resulting in hospitalization in New Zealand from 1979 to 1988. Int J Oral MaxillofacSurg 1992; 21:77-9.
- Down KE, Boot DA, Gorman DF. Maxillofacial and associated injuries in severely traumatized patients: implications of a regional survey. Int J Oral MaxillofacSurg 1995; 24:409-12.
- 4. Qudah MA, Bataineh AB. A retrospective study of selected oral and maxillofacial fractures in a group of Jordanian children. Oral Surg Oral Med Oral Pathol Oral RadiolEndod 2002; 94:310-4.
- Kieser J, Stephenson S, Liston PN, Tong DC, Langley JD. Serious facial fractures in New Zealand from 1979 to 1998. Int J Oral MaxillofacSurg 2002; 31:206-9.
- 6. Ellis E III, El-Attar A, Moos KF. An analysis of 2,067 cases of zygomaticorbital fractures. J Oral MaxillofacSurg 1985; 43:417-28.
- Iida S, Matsuya T. Pediatric maxillofacial fractures: their etiological characters and fracture patterns. J CraniomaxillofacSurg 2002; 30:237-41.
- 8. Torgersen S, Tornes K. Maxillofacial fractures in a Norwegian district. Int J Oral MaxillofacSurg 1992; 21:335-8.
- Ansari MH. Maxillofacial fractures in Hamedan province, Iran: a retrospective study (1987-2001). J CraniomaxillofacSurg 2004; 32:28-34.
- 10. Ahmed HEA, Jaber MA, Fanas SHA, Karas M. The pattern of maxillofacial fractures in Sharjah, United Arab Emirates: a re- view of

most prone to fracture in case of fall. Although this may again depend on the site of impact of fall, terminal velocity and mass of the subject.

Another aspect which can be noticed is the gradual increase in assault case over the last few years. This is an alarming trend and poses a grave concern for the society.

Conclusion

The present study supports that regular epidemiologic evaluations of maxillofacial fractures allow a detailed analysis of these lesions, providing important support to install clinical and research priorities, since risk factors and patterns of presentation can be identified.

According to these data it seems reasonable to assume that road traffic legislation enforcement and continuous public education toward the use of restraining devices such as helmet wear and seat belts should be encouraged. Widespread public awareness regarding prevention of these traumatic injuries is very important aspect that should be focused on. Thus this survey could be really helpful in deciding of Government policies in future and can be of further assistance in future clinical and research areas.

230 cases. Oral Surg Oral Med Oral Pathol Oral RadiolEndod 2004; 98:166-70.

- 11. Hachl O, Tuli T, Schwabegger A, Gassner R. Maxillofacial trauma due to work-related accidents. Int J Oral MaxillofacSurg 2002; 31:90-3.
- 12. Bamjee Y, Lownie JF, Cleaton-Jones PE, Lownie MA. Maxillofacial injuries in a group of South Africans under 18 years of age. Br J Oral MaxillofacSurg 1996; 34:298-302.
- 13. Oji C. Jaw fractures in Enugu, Nigeria, 1985-95. Br J Oral MaxillofacSurg 1999; 37:106-9.
- 14. Fasola AO, Nyako EA, Obiechina AE, Arotiba JT. Trends in the characteristics of maxillofacial fractures in Nigeria. J Oral Maxillofacial Surg 2003; 61:1140-3.
- 15. Karyouti SM. Maxillofacial injuries at Jordan University Hospital. Int J Oral MaxillofacSurg 1987; 16:262-5.
- Adebayo ET, Ajike OS, Adekeye EO. Analysis of the pattern of maxillofacial fractures in Kaduna, Nigeria. Br J Oral MaxillofacSurg 2003; 41:396-400.
- 17. Afzelius L, Rose ´n C. Facial fractures. Int J Oral Surg 1980; 9:25-32.
- Iida S, Hassfeld S, Reuther T, Schweigert H, Haag C, Klein J, et al. Maxillofacial fractures resulting from falls. J CraniomaxillofacSurg 2003; 31:278-83.
- 19. Laski R, Ziccardi VB, Broder H, Janal M. Facial trauma: a recurrent disease? The potential role of disease prevention. J Oral MaxillofacSurg 2004; 62:685-8.
- Iida S, Kogo M, Sugiura T, Mima T, Matsuya T. Retrospective analysis of 1502 patients with facial fractures. Int J Oral MaxillofacSurg 2001; 30:286-90.



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- 21. Fridrich KL, Pena-Velasco G, Olson RAJ. Changing trends with mandibular fractures. J Oral MaxillofacSurg 1992; 50:586-9.
- 22. Thorn JJ, Mogeltoft M, Hansen PK. Incidence and etiological pattern of jaw fractures in Greenland. Int J Oral MaxillofacSurg 1986; 15:372-9.
- Lindqvist C, Sorsa S, Hyrkas T, Santavirta S. Maxillofacial fractures sustained in bicycle accidents. Int J Oral Maxillofacial Surg 1986;15:12-8.
- 24.Brook IM, Wood N. Etiology and incidence of facial fractures in adults. Int J Oral Surg 1983; 12:293-8.
- 25. Gassner R, Tuli T, Hachl O, Rudisch A, Ulmer H. Craniomaxillofacial trauma: a 10 year review of 9543 cases with 21067 in- juries. J CranioMaxillofacSurg 2003; 31:51-61.
- 26. Gassner R, Tuli T, Hachl O, Moreira R, Ulmer H. Craniomaxillofacial trauma in children: a review of 3,385 cases with 6,060 injuries in 10 years. J Oral MaxillofacSurg 2004; 62:399-407.
- 27. Fonseca RJ, Walker RV. Oral and maxillofacial trauma. 2nd ed.

Philadelphia: W.B. Saunders Company; 1997.

- 28. Guven O: Self-curing acrylic in the treatment of unstable zygomatic arch fracture. J Nihon UnivSch Dent 30(2): 141-144, 1988
- 29. Dimitroulis G, Eyre J: A 7-year review of maxillofacial trauma in a central London hospital. Br Dent J 170(8): 300-302, 1991
- 30. Moshy J, Mosha HJ, and Lema PA: Prevalence of maxillomandibular fractures in mainland Tanzania. East Afr Med J 73(3): 172-175, 1996
- Zachariades N, Koumoura F, Konsolaki-Agouridaki E: Facial trauma in women resulting from violence by men. J Oral MaxillofacSurg 48(12): 1250-1253, 1990
- 32. Zachariades N, Papavassiliou D: The pattern and etiology of maxillofacial injuries in Greece. A retrospective study of 25 years and a comparison with other countries. J CraniomaxillofacSurg 18(6): 251-254, 1990

