

## An epidemiological study of zygomatic complex and zygomatic arch fractures in a tertiary hospital- A retrospective study

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### Abstract

**Introduction:** Zygomatic complex fractures remain one of the most common maxillofacial injuries. They can occur as isolated fracture or associated with other maxillofacial injuries. The aim of this descriptive, analytical study was to analyze the epidemiological characteristics of patients treated for zygomatic complex and zygomatic arch fractures at our institution.

**Patients and Method:** A retrospective study involving 60 patients admitted and treated for zygomatic complex and zygomatic arch fractures at the Dept. of dentistry, Sri Manakula Vinayagar medical college and hospital, Pondicherry, India from June 2011 to June 2016 was done. The data collection protocol included: age, sex, cause of injury, anatomical site, associated maxillofacial injuries and treatment modality.

**Results:** 91.7% were males and 8.3% females. Most patients (46.7%) were aged 21-30 years and road traffic accidents (73.3%) was the most common etiology of fracture. Left side (51.7%) was involved a little more than right side (46.3%). The most common fracture site was zygomatic buttress (70%). A total of 51.7% patients had two process fractures, 26.7% had single process fracture and 21.7% had tripod fractures. Mandible fracture (28.6%) was most common associated maxillofacial injury. Surgery was performed with a closed reduction in 13.3% and open reduction in 86.7% of patients.

**Conclusion:** The study concludes that road traffic accidents are responsible for most zygomatic complex and zygomatic arch fractures. Male patients, aged 21 to 40 years, more often sustained fractures.

**Keywords:** Zygomatic complex fracture, Maxillofacial injuries, Road traffic accident.

### Introduction

The zygomatic bone occupies a prominent and important position in the facial skeleton and takes part in a significant portion of the orbital floor, lateral wall of the orbit and the zygomatic arch, the malar eminence. The prominence of zygomatic bone predisposes it to bear the brunt of facial injuries and so the zygomatic fractures are second most common fractures of the facial skeleton after nasal bones.<sup>(1-3)</sup> Zygomatic bone has four bony attachments to the skull through its process, which if fractured all together called Tetrapod fracture, or can occur as isolated process fracture. Fractures of zygomatic complex are most common in young adult males.<sup>(1,4,5)</sup> They can occur as isolated fractures or associated with other maxillofacial injuries.<sup>(6)</sup> The etiology of zygomatic complex fracture includes Road traffic accidents (RTA), assault, fall, sport related injuries, work related mishaps, but the most frequent cause varies widely between different countries due to the differences in geographical, cultural, socioeconomic and lifestyle factors.<sup>(7,8,9,10)</sup> Fractures of the zygomatic complex may cause deformity of the midface, sensory disturbances, malocclusion and disrupts mandibular and ocular function.<sup>(11,12)</sup> The present study is a descriptive and analytical retrospective study of all zygomatic complex fractures treated at the Dept. of dentistry, Sri Manakula Vinayagar medical college and hospital, Pondicherry, India from June 2011 to June 2016.

### Patients and Method

The present study was conducted on patients with zygomatic complex fractures and zygomatic arch fractures treated at the Department of dentistry, Sri Manakula Vinayagar medical college and hospital, Pondicherry, India from June 2011 to June 2016. Data on the patients were collected from the medical records, and were analyzed for demographics, cause of injury, the site and severity of the injury, associated maxillofacial injuries and treatment modality. Patients were divided into six age groups: 0 to 10 year group, 11 to 20 year group, 21 to 30 year group, 31 to 40 year group, 41 to 50 year group and 51 < year group.

### Results

A total of 60 patients with zygomatic complex fractures and zygomatic arch fractures were evaluated. In this study 55 (91.7%) were male and 5 (8.3%) were female, with a male to female ratio of 11:1. This study showed that zygomatic complex and zygomatic arch fractures occur over a wide age ranging from 16 to 55 years with mean age of 29.8 years. Most of the cases (49/60, 81.7%) in this study were found in 21 to 40 years, with the peak incidence of fractures were observed in 21 to 30 years (28/60, 46.7%) followed by 31 to 40 years (21/60, 35%) Table 1. The causes of injury are in Fig. 1. The most common cause of fracture was road traffic accidents, which consisting of (44/60, 73.3%) followed by assault (7/60, 11.7%), fall (7/60, 11.7%) and other causes (2/60, 3.3%). Thirty one (51.7%) had a fracture on the left side and twenty nine

(46.3%) had a right sided fracture. The most common associated facial fractures were mandible (10, 28.6%), maxillary (8, 22.9%) and Lefort III (4, 11.4%) Table 2. In this study zygomatic bone was fractured at single process in 26.7% patients and 73.3% patient's more than one process was involved. Two process fractures were found in 51.7% and tripod fracture was seen in 21.7% cases. The most common fracture area of the zygomatic complex was zygomatic buttress (42, 70%). In patient with single process fracture, zygomatic buttress 8(13.3%) and zygomatic arch 8(13.3%) was observed. In patients with two process fractures, frontozygomatic and zygomatic buttress involvement was most common accounting 12(20%), followed by frontozygomatic and infraorbital rim 10(16.7%) and infraorbital and zygomatic buttress 6(10%). In tripod fractures, the most common combination was frontozygomatic, infraorbital and zygomatic buttress accounting 8(13.3%) followed by zygomatic buttress, zygomatic arch and infraorbital 5(8.3%) Table 3. Out of the total patients, 86.7% patients were treated by open reduction and internal fixation (ORIF) with miniplates and screws. Closed reduction constituted a percentage of 13.3%.

**Table 1: Distribution of fractures by age and gender**

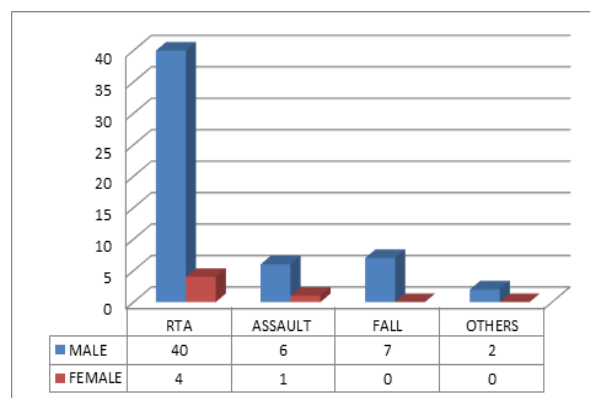
Age Group	Male	Female	Total	Percentage
0-10	0	0	0	0
11-20	3	2	5	8.3
21-30	27	1	28	46.7
31-40	19	2	21	35
41-50	3	0	3	5
51<	3	0	3	5
Total	55	5	60	100

**Table 2: Distribution of associated maxillofacial fractures**

Anatomical Site	Number	Percentage
Mandible	10	28.6%
Maxilla	8	22.9%
Lefort III	4	11.4%
Lefort II	3	8.6%
Palate	3	8.6%
Dentoalveolar	3	8.6%
Lefort I	2	5.7%
Nasal	1	2.8%
Frontal	1	2.8%
Total	35	100%

**Table 3: Sites of Fracture**

Site of Fracture	Number	Percentage
Frontozygomatic process+Zygomatic buttress	12	20%
Frontozygomatic process+ Infraorbital rim	10	16.7%
Zygomatic buttress	8	13.3%
Frontozygomatic process+ Infraorbital rim+ Zygomatic buttress	8	13.3%
Zygomatic arch	8	13.3%
Infraorbital rim+ Zygomatic buttress	6	10%
Zygomatic buttress+ Zygomatic arch+ Infraorbital rim	5	8.3%
Zygomatic buttress+ Zygomatic arch	3	5%
Total	60	100%



**Fig. 1: Etiology of fracture based on gender**

## Discussion

Zygomatic bone plays a vital role in the structure, function and aesthetic appearance of the facial skeleton. Zygomatic bone functions as a major buttress for the face and, because of its prominence, is most frequently involved in facial trauma.<sup>(1-3)</sup> The epidemiological study of the causes and incidence of zygomatic complex fractures vary by geographic region, socioeconomic status, cultural and environmental factors. Male to female ratio in our study was 11:1. The predominance of male in this study is relatively consistent finding in most studies.<sup>(7-10)</sup> The reason for the male predominance could be the greater social and economic involvement. The age group of 21 to 30 years (46.7%) was most commonly involved followed by 31 to 40 years (35%). About 81.7% of patient's sustained zygomatic complex fractures in this study were between ages of 21 to 40 years. This finding were

similar with other studies.<sup>(1-5,9-11)</sup> The lowest incidence was found in 41 to 50 years (5%) and 51 < years (5%), no cases reported in below 10 years in this study.

The main causes of zygomatic complex fractures worldwide are RTA, assault, fall, sports related injuries and work related mishaps. In our study RTA (73.3%) remains the leading cause of fracture followed by assault (11.7%), fall (11.7%). In countries such as Brazil,<sup>(5)</sup> Nigeria,<sup>(4)</sup> Pakistan,<sup>(1,4)</sup> Japan,<sup>(6)</sup> China,<sup>(13)</sup> Netherlands<sup>(14)</sup> and India<sup>(2,15-17)</sup> showed RTA remains the main cause of fracture, whereas assault related injury was found to be the main cause in countries such as Lithuania,<sup>(7)</sup> Turkey.<sup>(10)</sup> Left side zygomatic complex fracture was observed in 51.7% and 48.3% had a right sided fracture in this study. Similar findings were reported by Rehman et al,<sup>(1)</sup> Adam et al.<sup>(13)</sup> The incidence of associated maxillofacial fractures in the present study shown, mandible (28.6%) are more frequently reported followed by maxillary (22.9%) and Lefort III (11.4%). The findings from studies reported Gomes et al,<sup>(18)</sup> Obuekwe et al<sup>(4)</sup> showed mandibular fractures were most frequently associated with zygomatic complex fracture, which is in accordance with our study. The study showed isolated zygomatic process fracture in 26.7%, two process fracture in 51.7% and tripod fracture in 21.7%. Rehman et al<sup>(1)</sup> in their study reported single process fracture in 28.38%, two process fracture in 44.4% and tripod fracture in 27.15% which is similar to this study. Most frequently fractured site was zygomatic buttress (70%) in our study, which is similar to the study by Obuekwe et al.<sup>(4)</sup> In patients with isolated fracture, zygomatic buttress (13.3%) and zygomatic arch (13.3%) was observed in our study. Isolated zygomatic arch fracture reported in the study by Obuekwe et al<sup>(4)</sup> (8.25%) and Gomes et al<sup>(18)</sup> (10.5%) were similar to our study, whereas Rehman et al<sup>(1)</sup> reported no isolated zygomatic arch fracture in their study. In our study combination of frontozygomatic and zygomaticomaxillary buttress fracture (20%) was most commonly reported, which is similar to the study by Obuekwe et al.<sup>(4)</sup> Tripod fracture in our study were observed in 21.7% as compared to study by Rehman et al<sup>(1)</sup> who reported tripod fractures in 27.2% of patients.

Treatment of zygomatic complex range from nonintervention and observation to ORIF.<sup>(19)</sup> The decision to intervene should be based on signs, symptoms, and functional impairment. The zygomatic complex fracture is perhaps the least understood and most frequently mistreated facial bone fracture. Much of the difficulty in treating such fractures stems from the complex and multiple anatomic relationships that the zygomatic bone maintains within the facial skeleton.<sup>(20)</sup> There has been a paradigm shift in management of zygomatic complex fractures from nonintervention to surgical intervention in the last few decades. This has been due to the development of more rigid miniplates that are low profile and not easily

palpable in the midface region. The most preferred method for treatment of zygomatic complex fracture in our institution is rigid internal fixation using miniplates and screws. The result of the present study reveal that 86.7% patients were treated with ORIF. Eight patients (13.3%) underwent only reduction of the fractured bone.

### Conclusion

Zygomatic complex fractures remain one of the most common maxillofacial injuries and showed varieties of features in terms of the site and severity and associated injuries. This study has shown that the main cause of fracture was RTA and a marked male predominance of patients aged 21 to 40 years was observed.

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