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Research Article

Retrospective Analysis On Changing Norms in Zygomatic Maxillary Complex Fractures.

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Abstract: The zygomaticomaxillary complex fracture is unique and difficult to treat fracture, mostly because of its pentapod anatomic form which may necessitate a patient-specific treatment approach. This retrospective study aims at evaluating the changing trends in ZMC fractures. A total of 245 cases were included in this retrospective study, treated either surgically or conservatively, for ZMC fractures in the time period of 3 years (2017-2019). All the patients were assessed and compared based on these parameters- gender, age, aetiology, anatomic site of the fracture and type of treatment given and associated maxillofacial fractures. Fracture aetiology was segregated into: motorised road traffic accidents, road traffic accidents under the influence of alcohol, interpersonal violence, domestic violence, sports injury and self falls. 94.3% of the 245 study participants were men, while 5.7% were women. The most common age group was 21 to 40 years (60.8%). In our study, the most common cause of Zygomatic fracture was road traffic accidents with or without the influence of alcohol (41.6%). ORIF - 3 point fixation (32.7%) was the most commonly used treatment, followed by 4 point fixation (27.3%). The Maxillary buttress region was the most frequent site of fracture (93.5%), followed by the other sites. Due to the shifting patterns of injuries, most surgeons no longer see conventional fracture lines. Instead, patients have unusual and hybrid fracture lines, which necessitate more fixations due to the injury's complexity. The tendency is now shifting toward tailoring treatment choices for individual patients.

Keywords: Zygoma, Maxilla Fracture, Patterns, Pentapod Structure,

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1. INTRODUCTION

The zygomatic maxillary complex (ZMC) fracture has long been a unique and difficult to treat fracture. Mostly because of its pentapod anatomic form and the severe aesthetic and functional difficulties that accompany with ZMC fractures.This anatomic structure is responsible for both facial projection and width. Multiple articulations further show that ZMC can deform in a variety of planes[1]. The zygoma is a bone that articulates with several bones of the craniofacial skeleton and contributes significantly to the structure and aesthetic of the midface. The zygomaticomaxillary complex is made up of the zygoma and its articulations (ZMC). Fractures of the zygomatic arch (ZA) or any of its bony articulations can have serious functional and cosmetic consequences. Patient-specific management of zygomatic arch and ZMC fractures should range from simple observation to open reduction with internal fixation. The zygomaticomaxillary complex acts as an important buttress for the face and is primarily involved in facial trauma due to its prominent curved shape. Tripod, tetrapod, quadripod, pentapod, malar, and trimalar fractures are all names for ZMC fractures. They account for 15% to 23.5% of maxillofacial fractures. Road traffic accidents (RTA), violent assaults, falls, and sports injuries are the most common causes of zygomatic complex fractures. After nasal bone fractures, they are the second most common type of facial fracture. Men are more likely than women to suffer 3-6 ZMC fractures, which most commonly occur in the third decade of life[2]. ZMC is especially susceptible to fractures, either alone or in combination with other midface components, due to its prominent anatomical position in the facial skeleton The mandible is the most common fracture location, according to a few writers, and the central region of the face is well supported. Others say that the most common region of maxillofacial fracture is the zygoma or maxilla[3] The aetiology of fracture patterns is inextricably linked to the evolution of fracture patterns. The aetiology of fractures has gotten even more diversified[4] and complex as a result of industrialization and rapid mechanisation in society. Several more surgeons have endorsed different methods for the correction of zygomatico complex fractures, with focus on the method of incision, techniques of fixation, and, at occasions, reconstruction. Various intraoral and extraoral methods are used to handle fractured zygomatic complexes. Extraoral approaches provide direct exposure for clear fixation at the frontozygomatic, zygomatic maxillary sutures, and the intraoral techniques offer additional access to the zygomatic buttress[4]. With the introduction of fracture patterns that do not follow any regular pattern, the traditional classification is no longer adequate to include all the patterns seen. As a result of these characteristics, fractures are difficult to manage and may necessitate a patient-specific treatment approach. This retrospective study aims at evaluating the changing trends in zygomatic maxillary complex fractures.

2. PATIENTS AND METHODS

2.1 ***Study design and sampling***.

This retrospective cohort cross sectional study was performed at Indira Gandhi Institute of Dental Sciences, Sri Balaji Vidyapeeth, Pondicherry. The study to retrieve the records were explained to the administration and the relevant permission was obtained

2.2 ***Ethical concerns and record retrieval***

The institutional review board provided the necessary ethical clearance required for the study (approval no: IGIDSIEC2021NRP45PGTNOMS). The study involved patients in the age group 15 to 80 years, who were treated, either surgically or conservatively, for zygomaticomaxillary complex fractures in the time period of three years from 2017 to 2019. The clinical information system was searched for patients who had ZMC fractures and who underwent surgical or conservative treatment during the 3-year period from 2017 to 2019. A total of 245 patient cases were included in this study.

2.3 Inclusion and exclusion criteria

Patients between the age group of 15 to 80 with ZMC fractures (with or without zygomatic arch fracture) were included in this study. Only the patients with ASA score I, II and III were included. Radiological records including X-rays and computerized tomographic scans were retrieved and patient charts were reviewed to exclude any subjects with prior documentation of previous surgery due to facial trauma, any gunshot injuries, projectile injuries or animal injuries. Patients with ASA score IV and V were excluded. Pregnant women and lactating mothers were also in the exclusion criteria.

2.4 Data retrieval

All the patients were assessed and compared based on various parameters.Data on gender, age, cause of trauma, anatomic site of the fracture and type of treatment given were analysed and compared. Associated maxillofacial fractures such as mandibular, LeFort I, LeFort II / III, nasal and orbital fractures were also assessed. Fractures aetiology was segregated into: motorised road traffic accidents, road traffic accidents under the influence of alcohol, interpersonal violence, domestic violence, sports injury and self falls.

3. STATISTICAL ANALYSIS

Data were analysed using SPSS Version 25.0 software version (IBM; SPSS Inc., Chicago, IL). Descriptive statistics [frequency and percentage] was obtained. The comparison between the categorical variables was done using the Chi-square test. The ANOVA tests were used for analysing The statistical significance level was set at a p-value less than 0.05.

4. RESULTS

Out of 245 study participants, 94.3% of males and 5.7% of females have participated in our study. Among the age group, 21 to 40 years were more than the other age groups of about 60.8% (Figure 1).

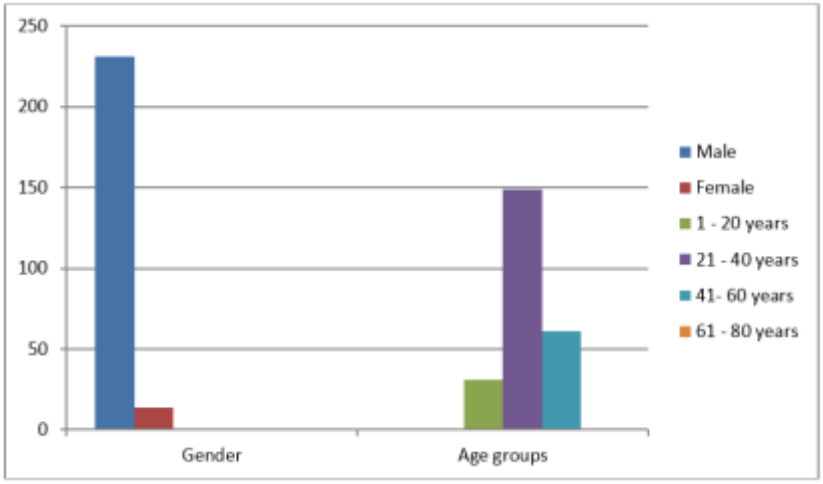


Fig 1 showing age gender statistics

The most common etiology for Zygomatic fracture in our study was road traffic accident with and without the influence of alcohol of about 41.6% respectively. Followed by, the other causes for ZMC fracture such as sports injury of 6.1%, self-fall of 3.7%, interpersonal violence of 3.3% and domestic abuse of 3.7% (Figure 3). The prevalence of ZMC fracture was most seen on the right side ZMC of about 54.7% when compared to the left side of about 42.4%. The bilateral ZMC fracture was found to be about 2.9%. Regarding the treatment modalities, the most commonly done treatment was ORIF - 3-point fixation of 32.7% followed by ORIF - 4 point fixation, ORIF - 2 point fixation, ORIF - 1 point fixation and Conservative management of about 27.3%, 22.4%, 14.7% and 2.9% respectively (Table 1).

Table 1 showing frequency with demographics

Variables	Options	Frequency	Percent
Gender	Male	231	94.3
	Female	14	5.7
	Total	245	100.0
Age group	1 - 20 years	31	12.7
	21 - 40 years	149	60.8
	41- 60 years	61	24.9
	61 - 80 years	4	1.6
	Total	245	100.0
Etiology	Sports injury	15	6.1
	Self-fall	9	3.7
	RTA	102	41.6
	Interpersonal violence	8	3.3
	Domestic abuse	9	3.7
	RTA under the influence of alcohol	102	41.6
	Total	245	100.0
Fracture side	Right ZMC	134	54.7
	Left ZMC	104	42.4
	B/L ZMC	7	2.9
	Total	245	100.0
Treatment done	ORIF - 1 point	36	14.7
	ORIF - 2 point	55	22.4
	ORIF - 3 point	80	32.7
	ORIF - 4 point	67	27.3
	Conservative management	7	2.9
	Total	245	100.0

The site of fracture was mostly seen in the Maxillary buttress region of about 93.5% followed by the other sites such as Frontozygomatic suture (78.8%),Zygomatic body (77.1%), Infraorbital rim (71.8%), Zygomaticotemporal suture (27.3%) and Spheno zygomatic suture (15.1%) (Table 2)

Table 2 : Frequency distribution of site of fracture			
Fracture site		**Frequency**	**Percent**
Frontozygomatic suture	Present	193	78.8
	Absent	52	21.2
Infra orbital rim	Present	176	71.8
	Absent	69	28.2
Maxillary buttress	Present	229	93.5
	Absent	16	6.5
Zygomaticotemporal suture	Present	67	27.3
	Absent	178	72.7
Sphenozygomatic suture	Present	37	15.1
	Absent	208	84.9
Zygomatic body	Present	189	77.1
	Absent	56	22.9

Among the study participants, 28.6% of the patients reported some associated fractures in various sites of ZMC and 71.4% of them had no such fractures. The fracture of the right parasymphysis was the most commonly seen when compared with other associated fractures of about 2.9%. The number of associated fractures is around 71.4 % .When comparing the side of fracture with the age groups, left ZMC fracture was most commonly seen in 1 – 20 years (7.8%) and the right ZMC fracture was seen more in number among the other age groups such as 21 - 40 years, 41- 60 years and61 - 80 years of about 36.3% , 13.1% and 0.8% respectively. The bilateral ZMC fracture was more common among 41- 60 years age group of about 1.2% and the result was statistically significant results with the p-value of 0.019 Regarding the gender, the right ZMC fracture was common in both the gender and the males had a higher incidence of getting the right (51%), left and bilateral ZMC fractured, 40.4% and 2.9% respectively when compared to females but the results were not statistically significant.The most common etiology for the right ZMC fracture observed was RTA under the influence of alcohol (24.5%), RTA (22.4%), Sports injury (3.3%) and domestic abuse (2%). The left ZMC fracture was seen during self-fall (2%) and interpersonal violence (2%). The bilateral ZMC fracture was seen during self fall (0.4%), RTA (1.2%), RTA under the influence of alcohol (1.2%) and the results were not statistically significant. (fig1)

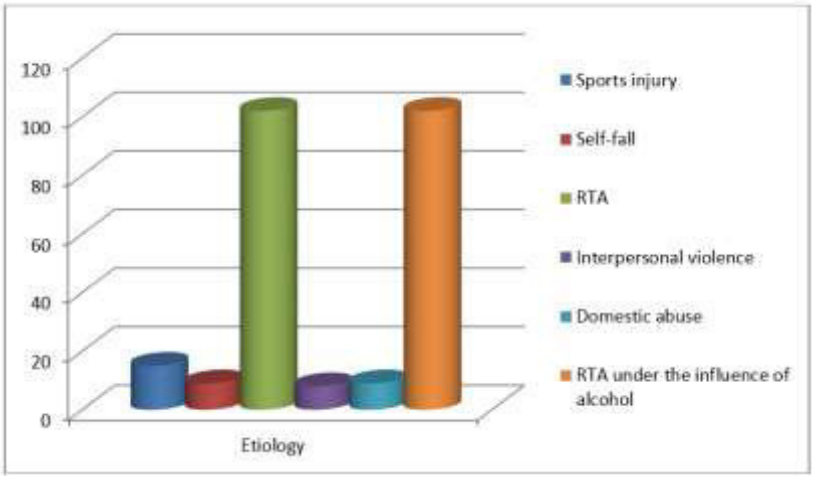
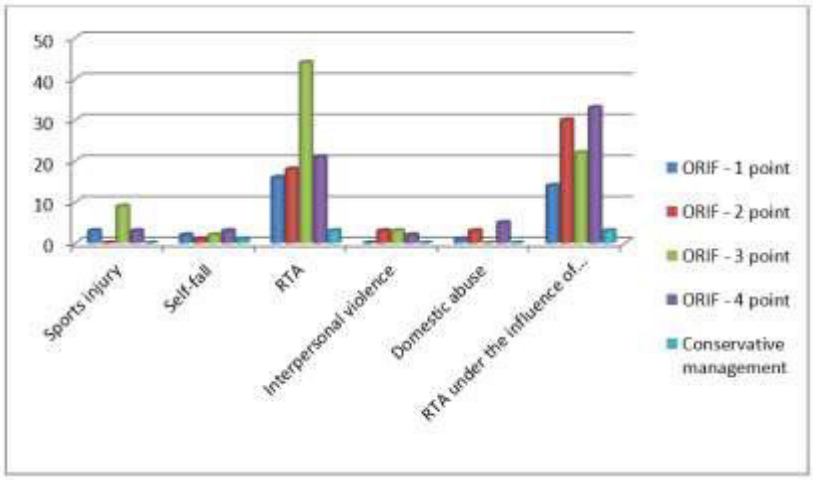


Fig 1 – aetiology of fractures

The most commonly performed treatment for ZMC fracture was ORIF – 4 point fixation for the age groups 21 - 40 years and 61 - 80 years of about 18% and 0.8% respectively. The ORIF – 3 point fixation was done more in 1 - 20 years (6.1%) and 41- 60 years (9%) age groups. The ORIF – 2 point fixation (13.5%), ORIF – 1 point fixation (10.2%) and conservative management (1.6%) was most commonly done for the age group of 21 - 40 years. But, the result was statistically insignificant. On assessing the gender, ORIF – 3 point fixation was most commonly done for males and ORIF – 4 point fixation was more for females of about 31.4% and 2.9% respectively. In comparison with the etiology, ORIF – 4 point fixation was carried out during self-fall (1.2%), domestic abuse (2%) and RTA under the influence of alcohol (13.5%). The ORIF – 3 point fixation was most commonly performed for sports injury (3.7%), RTA (18%), and interpersonal violence (1.2%). The ORIF – 2 point fixation was

done more for interpersonal violence and RTA under the influence of alcohol of about 1.2% and 12.2% respectively. The ORIF – 1 point fixation was done mostly for RTA and conservative management was done commonly for RTA with or without the influence of alcohol. This shows a statistically significant result with a p-value of 0.032. (Figure 2)



The age gender, side and the cause vs the overall incidence of ZMC fracture is tabled below.

Fig 2 showing a comparison of etiology with management

Table 3 showing demographic variables and the etiology Vs the incidence of fracture.

Variables	Options		Fracture side			p-value
			Right ZMC	Left ZMC	B/L ZMC	
Age groups	1 - 20 years	N	11	**19**	1	**0.019***
		%	4.5%	**7.8%**	.4%	
	21 - 40 years	N	**89**	58	2	
		%	**36.3%**	23.7%	.8%	
	41- 60 years	N	**32**	26	3	
		%	**13.1%**	10.6%	1.2%	
	61 - 80 years	N	**2**	1	1	
		%	**.8%**	.4%	.4%	
Gender	Male	N	**125**	99	7	0.659
		%	**51.0%**	40.4%	2.9%	
	Female	N	**9**	5	0	
		%	**3.7%**	2.0%	.0%	
Etiology	Sports injury	N	**8**	7	0	0.797
		%	**3.3%**	2.9%	.0%	
	Self-fall	N	3	**5**	1	
		%	1.2%	**2.0%**	.4%	
	RTA	N	**55**	44	3	
		%	**22.4%**	18.0%	1.2%	
	Interpersonal violence	N	3	**5**	0	
		%	1.2%	**2.0%**	.0%	
	Domestic abuse	N	**5**	4	0	
		%	**2.0%**	1.6%	.0%	
	RTA under the influence of alcohol	N	**60**	39	3	
		%	**24.5%**	15.9%	1.2%	

The frontozygomatic suture fracture was more prevalent for the age group of 21 - 40 years of about 47.8%. It was most commonly seen among males (74.3%) when compared to females. It occurs majorly through RTA and RTA under the influence of alcohol of 32.7% and 32.2% respectively. The most commonly administered treatment for the frontozygomatic suture fracture was ORIF – 3-point fixation of 32.7% followed by 4 point, 2 point, 1 point and conservative management of about 27.3%, 16.3%, 0.8% and 1.6 % respectively and the result shows significant with the p-value of 0.000. (Table 4)

Table 4 showing frontozygomatic suture fracture and the other variables.					
Variables	**Options**		**FZ**		**p-value**
			Present	**Absent**	
Age group	**1 - 20 years**	N	25	6	0.739
		%	10.2%	2.4%	
	21 - 40 years	N	**117**	32	
		%	**47.8%**	13.1%	
	41- 60 years	N	47	14	
		%	19.2%	5.7%	
	61 - 80 years	N	4	0	
		%	1.6%	.0%	
Gender	**Male**	N	**182**	49	0. 985
		%	**74.3%**	20.0%	
	Female	N	11	3	
		%	4.5%	1.2%	
Etiology	**Sports injury**	N	12	3	0.807
		%	4.9%	1.2%	
	Self-fall	N	7	2	
		%	2.9%	.8%	
	RTA	N	**80**	22	
		%	**32.7%**	9.0%	
	Interpersonal violence	N	8	0	
		%	3.3%	.0%	
	Domestic abuse	N	7	2	
		%	2.9%	.8%	
	RTA under the influence of alcohol	N	79	23	
		%	32.2%	9.4%	
Treatment done	**ORIF - 1 point**	N	2	34	**0.000***
		%	.8%	13.9%	
	ORIF - 2 point	N	40	15	
		%	16.3%	6.1%	
	ORIF - 3 point	N	**80**	0	
		%	**32.7%**	.0%	
	ORIF - 4 point	N	67	0	
		%	27.3%	.0%	
	Conservative management	N	4	3	
		%	1.6%	1.2%	

- statistically significant

The infraorbital rim fracture was most commonly present among 21 - 40 years of 41.2%. Males were most commonly affected of about 66.9% and RTA was the most common etiology for this fracture of 32.7%. The ORIF – 3-point fixation was most frequently done for this fracture of 32.7% and the result was statistically significant with the p-value of 0.000. (Table 5)

Table 5 showing infraorbital rim fracture with other variables.					
Variables	**Options**		**Infra orbital rim fracture**		**p-value**
			Present	**Absent**	
Age group	**1 - 20 years**	N	23	8	0.149
		%	9.4%	3.3%	
	21 - 40 years	N	**101**	48	
		%	**41.2%**	19.6%	
	41- 60 years	N	50	11	
		%	20.4%	4.5%	
	61 - 80 years	N	2	2	

		%	.8%	.8%	
Gender	**Male**	N	**164**	67	0.234
		%	**66.9%**	27.3%	
	Female	N	12	2	
		%	4.9%	.8%	
Etiology	**Sports injury**	N	12	3	0. 250
		%	4.9%	1.2%	
	Self-fall	N	5	4	
		%	2.0%	1.6%	
	RTA	N	**80**	22	
		%	**32.7%**	9.0%	
	Interpersonal violence	N	6	2	
		%	2.4%	.8%	
	Domestic abuse	N	7	2	
		%	2.9%	.8%	
	RTA under the influence of alcohol	N	66	36	
		%	26.9%	14.7%	
Treatment done	**ORIF - 1 point**	N	3	33	**0.000***
		%	1.2%	13.5%	
	ORIF - 2 point	N	25	30	
		%	10.2%	12.2%	
	ORIF - 3 point	N	**80**	0	
		%	**32.7%**	.0%	
	ORIF - 4 point	N	67	0	
		%	27.3%	.0%	
	Conservative management	N	1	6	

- statistically significant

The majority of maxillary buttress fracture was seen among the age group of 21- 40 years of about 57.1%. The comparison with the gender shows that the males were having a higher prevalence of this fracture of 88.2% when compared to females. RTA with or without the influence of alcohol is the most common etiology for the maxillary buttress fracture of about 39.6% and 38.4% respectively. The majority of the maxillary buttress fractures were treated with ORIF – 3 point fixation of 32.7% followed by other treatment modalities and there is a statistically significant result with a p-value of 0.000. (Table 6)

Table 6 showing Comparison between the Maxillary buttress fracture with age groups, gender, etiology and treatment done.

Variables	Options		Maxillary buttress fracture		p-value
			Present	Absent	
Age group	**1 - 20 years**	N	30	1	0.373
		%	12.2%	.4%	
	21 - 40 years	N	**140**	9	
		%	**57.1%**	3.7%	
	41- 60 years	N	56	5	
		%	22.9%	2.0%	
	61 - 80 years	N	3	1	
		%	1.2%	.4%	
Gender	**Male**	N	**216**	15	0.924
		%	**88.2%**	6.1%	
	Female	N	13	1	
		%	5.3%	.4%	
Etiology	**Sports injury**	N	15	0	0. 721
		%	6.1%	.0%	
	Self-fall	N	8	1	
		%	3.3%	.4%	
	RTA	N	94	8	

		%	38.4%	3.3%	
	Interpersonal violence	N	7	1	
		%	2.9%	.4%	
	Domestic abuse	N	8	1	
		%	3.3%	.4%	
	RTA under the influence of alcohol	N	**97**	5	
		%	**39.6%**	2.0%	
Treatment done	**ORIF - 1 point**	N	31	5	**0.000***
		%	12.7%	2.0%	
	ORIF - 2 point	N	45	10	
		%	18.4%	4.1%	
	ORIF - 3 point	N	**80**	0	
		%	**32.7%**	.0%	
	ORIF - 4 point	N	67	0	
		%	27.3%	.0%	
	Conservative management	N	6	1	
		%	2.4%	.4%	

Among the age groups, 21- 40 years were having a higher chance of getting the Zygomaticotemporal suture fracture of about 18% when compared to other groups. The majority of males were affected with this fracture of 24.5% than females. RTA under the influence of alcohol was the most common etiology for the Zygomaticotemporal suture fracture of about 13.5%. The ORIF – 4 point fixation was the only treatment carried out for all Zygomaticotemporal suture fracture of 27.3% and the statistically significant result with the p-value of 0.000. (Table 7)

Table 7- Comparison between the Zygomaticotemporal suture fracture with age groups, gender,etiology and treatment done.

Variables	Options		Zygomaticotemporal suture fracture		p-value
			Present	Absent	
Age group	**1 - 20 years**	N	6	25	0.454
		%	2.4%	10.2%	
	21 - 40 years	N	**44**	105	
		%	**18.0%**	42.9%	
	41- 60 years	N	15	46	
		%	6.1%	18.8%	
	61 - 80 years	N	2	2	
		%	.8%	.8%	
Gender	**Male**	N	**60**	171	0.050
		%	**24.5%**	69.8%	
	Female	N	7	7	
		%	2.9%	2.9%	
Etiology	**Sports injury**	N	3	12	0.166
		%	1.2%	4.9%	
	Self-fall	N	3	6	
		%	1.2%	2.4%	
	RTA	N	21	81	
		%	8.6%	33.1%	
	Interpersonal violence	N	2	6	
		%	.8%	2.4%	
	Domestic abuse	N	5	4	
		%	2.0%	1.6%	
	RTA under the influence of alcohol	N	**33**	69	
		%	**13.5%**	28.2%	
Treatment done	**ORIF - 1 point**	N	0	36	**0.000***
		%	.0%	14.7%	
	ORIF - 2 point	N	0	55	

		%	.0%	22.4%
	ORIF - 3 point	N	0	80
		%	.0%	32.7%
	ORIF - 4 point	N	**67**	0
		%	**27.3%**	.0%
	Conservative management	N	0	7
		%	.0%	2.9%

The Sphenozygomatic suture fracture was prevalent among the 21 - 40 years age groups (9%) and commonly occurs in males (15%) than females. The most common etiology for the Sphenozygomatic suture fracture was RTA of about 6.9%. The most commonly performed treatment was ORIF – 2 point fixation of 6.5% when compared to other treatment modalities and the result was also statistically significant with the p-value of 0.00 (see table 8)

Table 8 Comparison between the Spenozygomatic suture fracture with age groups, gender, etiology and treatment done.

Variables	Options		Spenozygomatic suture fracture		p-value
			Present	Absent	
Age group	**1 - 20 years**	N	8	23	0.221
		%	3.3%	9.4%	
	21 - 40 years	N	**22**	127	
		%	**9.0%**	51.8%	
	41- 60 years	N	6	55	
		%	2.4%	22.4%	
	61 - 80 years	N	1	3	
		%	.4%	1.2%	
Gender	**Male**	N	**37**	194	0.104
		%	**15.1%**	79.2%	
	Female	N	0	14	
		%	.0%	5.7%	
Etiology	**Sports injury**	N	3	12	0.308
		%	1.2%	4.9%	
	Self-fall	N	3	6	
		%	1.2%	2.4%	
	RTA	N	**17**	85	
		%	**6.9%**	34.7%	
	Interpersonal violence	N	0	8	
		%	.0%	3.3%	
	Domestic abuse	N	0	9	
		%	.0%	3.7%	
	RTA under the influence of alcohol	N	14	88	
		%	5.7%	35.9%	
Treatment done	**ORIF - 1 point**	N	3	33	**0.018***
		%	1.2%	13.5%	
	ORIF - 2 point	N	**16**	39	
		%	**6.5%**	15.9%	
	ORIF - 3 point	N	10	70	
		%	4.1%	28.6%	
	ORIF - 4 point	N	8	59	
		%	3.3%	24.1%	
	Conservative management	N	0	7	
		%	.0%	2.9%	

Considering the zygomatic body fracture, the treatment done is statistically significant
See table 9 below

Table 9 showing Comparison between the zygomatic body fracture with age groups, gender, etiology and treatment done.					
Variables	**Options**		**Zygomatic body fracture**		**p-value**
			Present	**Absent**	
Age group	**1 - 20 years**	N	25	6	0.572
		%	10.2%	2.4%	
	21 - 40 years	N	**114**	35	
		%	**46.5%**	14.3%	
	41- 60 years	N	48	13	
		%	19.6%	5.3%	
	61 - 80 years	N	2	2	
		%	.8%	.8%	
Gender	**Male**	N	**181**	50	0.066
		%	**73.9%**	20.4%	
	Female	N	8	6	
		%	3.3%	2.4%	
Etiology	**Sports injury**	N	12	3	0.467
		%	4.9%	1.2%	
	Self-fall	N	5	4	
		%	2.0%	1.6%	
	RTA	N	79	23	
		%	32.2%	9.4%	
	Interpersonal violence	N	5	3	
		%	2.0%	1.2%	
	Domestic abuse	N	6	3	
		%	2.4%	1.2%	
	RTA under the influence of alcohol	N	**82**	20	
		%	**33.5%**	8.2%	
Treatment done	**ORIF - 1 point**	N	25	11	**0.000***
		%	10.2%	4.5%	
	ORIF - 2 point	N	47	8	
		%	19.2%	3.3%	
	ORIF - 3 point	N	**72**	8	
		%	**29.4%**	3.3%	
	ORIF - 4 point	N	40	27	
		%	16.3%	11.0%	
	Conservative management	N	5	2	
		%	2.0%	.8%	

The types of radiological investigations and their percentage . All cases had computerized tomographic scan of the craniofacial bones (Table 8)

Table 8 showing the percentage of radiological investigations	
XRays or CT scan	Percentage
Modified PA projection	75%
Waters view	20%
Submental view	5%
CT scan	100%

5. DISCUSSION

In this study, patients with zygomaticomaxillary complex fractures who visited the emergency or Oral and maxillofacial surgery departments in Indira Gandhi Institute of Dental Sciences, Sri Balaji Vidyapeeth , Pondicherry, within the last 3 years were retrospectively analyzed based on the patients' medical records and radiological imaging. We aimed to bring up to date the most recent information on zygomaticomaxillary complex fractures in the South Indian population and use it to formulate an algorithm for future treatment planning. Out of 245 study participants, majority were men among the age group of

21 to 40 years of age. This finding is consistent with other studies and is explained by the high activity levels in this decade by different authors from different countries[5-8] Males are more likely than women to work in manual employment (such as construction labourer or farmer) and to engage in physically violent behaviour (particularly among younger men), which is the most likely explanation for the gender distribution of ZMC fractures. The most common etiology for Zygomatic fracture in our study was road traffic accident with and without the influence of alcohol. Followed by, the other causes for ZMC fracture such as sports injury, self-fall, interpersonal violence and domestic abuse. This is not in accordance with certain recent studies; emphasizing that assault has replaced traffic accidents as a major cause of maxillofacial fracture and overspeed as a cause of RTA. Most countries approach traffic planning and road design from a multidisciplinary perspective. It is carried out by psychologists, engineers, doctors, sociologists, and vehicle experts, among others. Road traffic is still a construction related issue in India. Conclusions can be learnt from the distinguished guidelines and good practises for good road behaviour practised in developed countries in which citizens are instilled with safety, lawfulness, and discipline no matter what[9]. Maxillofacial fractures have a variety of etiological origins, which are influenced by socioeconomic, cultural, and environmental factors. Road traffic accidents were found to be the most prevailing cause of zygomaticomaxillary complex fractures in developing countries. The results show that alcohol use is an important cause of road traffic accidents. Out of the 204 patients with a history of road traffic accident, almost half of the patients treated for ZMC in our department admitted alcohol consumption before injury. There are several studies which strongly emphasize that alcohol use is an important cause of motor vehicle injuries[10-12]. In our study, the prevalence of ZMC fracture was most commonly seen on the right side when compared to the left side. The bilateral ZMC fracture was found in about 2.9% of the cases and was seen to be more common among 41- 60 years age group.Several others have reported the findings similar to us. [13, 14] The primary aim of this study is to highlight the changing trends in the treatment plan with the arrival of new patterns of ZMC fractures that cannot be categorized using established classification systems, posing a surgical problem for the treating physician when deciding on a treatment approach. Proper reduction, appropriate fixation, and stability are perhaps the three most critical aspects in treating ZMC fractures. ZMC fractures are treated using a variety of treatment methods. In this study, it was found that the most commonly done treatment was ORIF - 3 point fixation, followed by ORIF - 4 point fixation, ORIF - 2 point fixation, ORIF - 1 point fixation and Conservative management. In our study, out of 245 patients, only 2.9% patients were managed conservatively without any surgical intervention while all the other patients required surgical intervention. The amount of fixation required to avoid post-reduction displacement of the fractured ZMC is one of the most controversial topics in maxillofacial trauma. Fixing recommendations have ranged from no fixation to the implantation of three or four bone plates in various sites. The reasons for this discrepancy are multifaceted and include numerous intangibles such as the surgeon's experience and beliefs. The type of injury being treated, such as simple versus communited fractures, substantially displaced versus minimally displaced fractures, and so on, are tangible variables. Because of the shifting patterns of injuries, most surgeons no longer see conventional fracture lines. Instead, patients have unusual and hybrid fracture lines. In comparison to the aetiology, ORIF – 4 point fixation was performed during RTA while intoxicated, followed by self-fall and domestic abuse. These data suggested that RTA will more likely result in atypical fractures, which will necessitate more fixations due to the injury's complexity. The reason for this is that RTA frequently involves a collision between two speeding vehicles with resultant high relative velocity. As a result, a greater number of force vectors act from various directions over the facial framework, resulting in atypical fractures involving natural lines of weakness as well as areas of natural strength[15] The site of fracture was mostly seen in the Maxillary buttress region of about 93.5% followed by the other sites such as Frontozygomatic suture, Zygomatic body, Infraorbital rim, Zygomaticotemporal suture and Spenozygomatic suture. Among the study participants, few of the patients reported some associated fractures in which the fracture of the right parasymphysis was the most commonly seen. *O'Hara et al, 1996* determined that rigid fixation of the zygomaticomaxillary buttress[16] is of paramount importance in addressing the biophysical forces within the ZMC complex. They found this to be attributable to the antagonistic forces secondary to the pull of the masseter muscle. However, there must be equilibrium between proper stabilisation and facial skeleton exposure, and no clear consensus on the ideal fixation approach has yet been obtained. Our results illustrate 3-point fixation being used for majority of the cases. The one-point fixing method[18] for tripodal ZMC fractures is as efficacious as the two-point fixation method, and it has the benefits of scarless surgery, shorter operating time, lower incidence of complications and lower cost. But we state that such conclusions are difficult to make in such complex fractures There has been little agreement on a simple, effective, and universal fracture classification scheme to date. The great variety in ZMC fracture patterns and displacement dimensions constitutes a significant constraint in proper treatment planning without an agreed-upon classification scheme [17]. There are a variety of treatment options for ZMC fractures, but the best option should be chosen based on the type of fracture and the patient's characteristics.

6. CONCLUSION

Trauma to the midface can result in fractures involving only one component of the zygomaticomaxillary complex's pentapod structure or all of the buttresses. Like in most developing nations, road traffic accidents are the leading cause of ZMC injuries in South India. High velocity vehicles, alcohol abuse and lack of stringent road laws are more likely to result in atypical fractures. Due to these shifting patterns of injuries, most surgeons no longer encounter conventional fracture lines. Instead, patients have unusual and hybrid fracture lines, which necessitate more fixations due to the injury's complexity. The tendency is now shifting toward tailoring treatment choices for individual patients.

7. AUTHOR CONTRIBUTION STATEMENT

Raja Sethupathy Cheeman has done manuscript preparation and communication. Concept, design and data collection done by Tejaswini Nerkar, R. Sathyanarayanan, Raghu Kumaravelu, R.

Sailesh Kumar V.Venugopalan .Raja Sethupathy Cheeman . Analyses, and data collection done by Priyanka Ganeshan, and Raymond Joseph Periera

8. CONFLICT OF INTEREST

Conflict of interest declared none.

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