

ORIGINAL RESEARCH ARTICLE

SPECTRUM OF ZYGOMATIC COMPLEX FRACTURE AT A TERTIARY CARE CENTER OF NEPAL

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ABSTRACT

Background: Zygomatic bone is complex bilaterally located bone of face contributing to aesthetic and function. Zygomatic complex fracture is common type of facial bone fracture in young male with periorbital ecchymosis, flattening of cheek being common clinical presentation and Road Traffic Accident (RTA) being common etiology. Its treatment depends upon various factors like demographics, clinical findings, socioeconomic, fracture type and available resources. Present study is aimed to evaluate various clinical and other preoperative spectrums of ZMC fracture.

Methods: This was a descriptive cross-sectional study conducted at Department of Oral and Maxillofacial Surgery in a tertiary center for 1 year, after taking consent in 86 patients. Convenience sampling was used after confirmation of ZMC fracture by CT scan. Data was collected, assembled, analyzed by SPSS and presented in table and graphs.

Results: Mostly male 74(86%) of age group 20-39 years 42(48.8%) were involved in ZMC fracture. RTA was most common etiology accounting for 68.6%. Common presentations were subconjunctival hemorrhage, periorbital hematoma, trismus, flattening of cheek and orofacial laceration accounting for 90.1%, 84.9%, 54%, and 58.1% respectively. Nasal fracture was associated in 33.7% cases and extremity fracture in 20.9% cases. 84.9% cases were of displaced type and 48.8% were of tetrapodal fracture.

Conclusions: This study in different preoperative parameters of ZMC fracture would be helpful in educating society regarding etiologies and precautions to be taken, for policy makers to make and enforce regulations to minimize incidences and for health workers to evaluate, diagnose and better multidisciplinary management.

INTRODUCTION

Zygomatic bone is complex bilateral pyramidal bone of maxillofacial skeleton having aesthetic role in mid face contouring. Functionally it forms floor and lateral wall of orbit, protects eyeball, gives origin to muscles of face, guard's temporal bone, lodges nerves responsible for sensory innervations to face and temporal region and protects maxillary sinus.

Zygomatic bone fracture also termed as Zygomatic complex (ZMC) fracture is second most common fracture of facial bone after nasal bone fractures, ranging 20-25% due to its prominence.^{1,2} These fractures accompany other facial fractures, sometime exist isolated and also with systemic injuries.³ Etiology includes Road Traffic Accident (RTA), physical assault, sports injury, industrial injury, war.¹⁻⁴

ZMC fracture is common in young male, commonly presents with pain, periorbital ecchymosis, trismus, flattening of cheek, epistaxis.⁵ Its diagnosis is confirmed by CT scan of maxillofacial region. Delayed management might lead to deformed face resulting in poor aesthetic and function of maxillofacial region

which carries psychological significance; hence it needs proper diagnosis and timely management.^{1,5}

Management strategies differs according to surgeon ranging from conservative treatment to open reduction and multiple point fixation which depends on factors like age, sex, clinical findings, associated regional and systemic condition, type of fracture, socio-economic status of patients.^{2-4,6}

The purpose of this study was to evaluate various clinical and other preoperative spectrums of ZMC fracture which might aware different level of readers for developing strategies in prevention and management.

METHODS

A descriptive, cross-sectional study was conducted over a period of 1 year (February 2022 to February 2023) in Department of Oral and Maxillofacial Surgery of Chitwan Medical College after taking ethical approval from institutional board. Sampling method used was convenience sampling. Eighty-six patient attending departments of oral and maxillofacial surgery and

emergency with zygomatic complex fractures were included in study after clinical examination and radiological confirmation by CT scan. The study objectives were explained to the patient and informed written consent was taken. A scientific data collection sheet was made in which socio demographic, histories, clinical and radiological details were collected. The fracture was recorded according to Zing et al as: Type A1: arch only, Type A2: separation at fronto-zygomatic suture, Type A3: separation at infra-orbital rim, Type B: complete mono-fragment and Type C: multi-fragment.⁷

The data was collected in Excel sheet and then transferred into SPSS version 21. Descriptive statistical tests were employed and finally the results were presented in form of table and graph.

RESULTS

This study was carried out in 86 patients of which 74(86%) were male, 11(12.8%) were female and 1(1.2%) was transgender. Age range of patient was from 6 to 74 years, mean age was 38.13±16.15 years and mostly involved age group was 20-39 years 42(48%). Isolated Right ZMC fracture 45(52.3%) was most common followed by left and bilateral. Other general characteristics of patient are shown in table 1.

Table 1: General characteristics of patient

Characteristics		n (%)
Age range	<20 years	8 (9.3%)
	20-39 years	42 (48.8%)
	40-59 years	24 (27.9%)
	≥60 years	12 (14%)
Side involved	Right	45 (52.3%)
	Left	38 (44.2%)
	Bilateral	3 (3.5%)

The most common etiology was RTA, noted in 59(68.6%) cases followed by assault in 10(11.6%) cases and other etiological pattern is shown in figure 1.

While evaluating clinical presentation subconjunctival hemorrhage was most common in 78(90.1%) patients followed by periorbital hematoma in 73(84.9%), trismus in 54(62.8 %) study population, flattening of malar prominence and orofacial laceration in 50(58.1%) cases were also evident. Other presentations are shown in table 2.

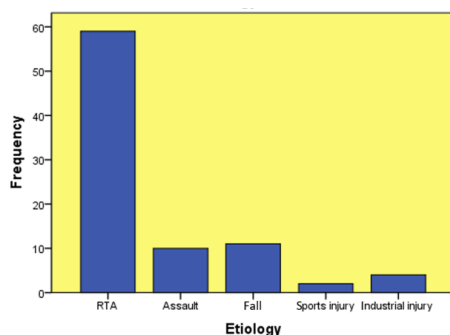


Figure 1: Bar diagram showing etiological distribution of sample population

Table 2: Clinical features of zygomatic complex fracture

Clinical features	n (%)
Flattening of malar prominence	50 (58.1)
Subconjunctival hemorrhage	78 (90.1)
Trismus	54 (62.8)
Periorbital hematoma	73 (84.9)
Occlusal changes	7 (8.1)
Orofacial lacerations	50 (58.1)
Vision disturbances	1 (1.2)
Disturbed ocular motility	7 (8.1)
Epistaxis	34 (39.5)

While evaluating cases associated loco-regional injuries 29(33.7%) nasal fracture, 25(29.1%) mid facial fracture, 22(25.6%) mandible fracture, 21(24.4%) orbital injuries, 15(17.4%) each head and dentoalveolar injuries and 9(10.5%) neck injuries were noted as mentioned in table 3.

Table 3: Distribution of associated loco-regional injuries

Type of injury	n (%)
Nasal fractures	29 (33.7)
Midface fractures	25 (29.1)
Dentoalveolar injuries	15 (17.4)
Mandible fractures	22 (25.6)
Neck injuries	9 (10.5)
Head injuries	15 (17.4)
Orbital injuries	21 (24.4)

On systemic evaluation extremity injuries were noted in 18(20.9%) cases followed by spine and abdominal injuries each in 5(5.8%) cases and 3,2 cases were with chest and multisystem injuries respectively as shown in table 4.

Table 4: Distribution of associated systemic injuries

Type of injury	n (%)
Spine injuries	5 (5.8)
Extremity injuries	18 (20.9)
Chest injuries	3 (3.5)
Abdominal injuries	5 (5.8)
Muti system injuries	2 (2.4)

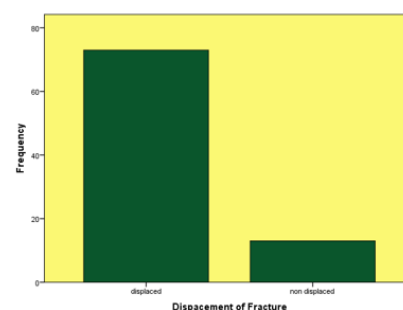


Figure 2: Distribution of fracture according to displacement

All study population underwent CT scan for final diagnosis where displace fracture was noted in 73(84.9%) cases,

13(15.1%) cases were none displaced as mentioned in graph in figure 2. Zing et al classification was used to classify ZMC fracture and 10(11.6%), 7(8.1%), 11(12.8), 42(48.8%) and 16(18.6%) cases of A1, A2, A3, B and C were noted respectively. As shown in table 5.

Table 5: Distribution according to Zing's classification

Type	n (%)
A1	10 (11.6)
A2	7 (8.1)
A3	11 (12.8)
B	42 (48.8)
C	16 (18.6)
Total	86 (100)

DISCUSSION

Zygomatic bone is complex quadrangular bone and is lateral component of midface. It contributes in facial contour, esthetic, function and protection of delicate structures like eye and maxillary sinus. Being prominent and exposed lateral component of midface, it is vulnerable to trauma and is second most common bone to get fractured after nasal bone.⁸⁻¹⁰

In this study ZMC fracture was dominant in male accounting 86% followed by female 12.8% and 1(1.2%) case was transgender. Various studies revealed higher incidence of ZMC fracture in male population ranging from 65- 95%.^{1-4,11} This may be due to involvement of male in outdoor activities related to jobs, sports, violence and substance abuse etc. Majority of cases in our study belong to age group of 20-39 years accounting 48.8%, Charles et al. (63.3%), Mohajerani et al. (62.2%) in their study found high incidence of ZMC fracture in this age group.¹⁻⁴

In our study frequency of right ZMC fracture was more in comparison to left side, Hanif et al. in their study had similar result where 49.3% were with right ZMC fracture followed by 48.9% on left and 8.6% cases presented with bilateral ZMC fracture.⁵

RTA was most common etiology of ZMC fracture in present Study. Similar high rate of RTA was reported by Mohajerani et al. (63.3%), Rohit et al. (57.1%), Obuekwe et al. (82.1%), Dawood et al. (72.2%), Tripathi et al. (74.43%) in their study, which might be due to over speeding, non-enforcement of traffic laws, unplanned urbanization, not wearing protective gear.^{1,4,6,11,12} Shapiro et al. in their study found decrease in facial injury after using seatbelts, helmets and protective gears.¹³ Violence is second major cause of fracture in young male which might be due to alcohol consumption that impairs judgment and brings aggression and might end up with RTA too.^{12,14,15}

Most common clinical presentation in our study was subconjunctival hemorrhage followed by periorbital hematoma, trismus, flattening of malar prominence, orofacial lacerations, epistaxis and others which is similar to previous studies.^{3,4,8,12} Orbital features are more common as zygomatic bone has major contribution in lateral and inferior wall of

orbit, in our study 24.4% cases were with orbital injuries. Fracture of zygoma leads to collection of blood in potential spaces leading periorbital hematoma and subconjunctival hemorrhage. These features are self-limiting but sometime need surgical innervations. Disturbed vision and ocular motility are also evident so thorough ophthalmological evaluation is mandatory in cases of ZMC fracture.^{1,11,16} Flattening of cheek was found in 58.1% case which is commonly found in medially displaced tripod fracture.^{4,17}

Epistaxis is mainly due to nasal injury which is most common associated loco regional injury in this study and nasal bone fracture is most common facial bone fracture followed by ZMC fracture.^{2,6,9,18,19} Epistaxis may also result from sinus bleeding for which proper evaluation and management is needed.

Other mid face fractures like lefort, naso orbito ethmoidal fracture was also common in our study. Mandible fractures were noted in 22(25.6%) cases. Head injury was also evident in 15 cases. Similarly, associated loco-regional injuries in various range was found in various studies which suggest loco-regional evaluation is mandatory to prioritize treatment of life threatening condition leading to compromised airway, bleeding, head injuries etc.^{1,3,4,8,11} While evaluating systemic injury extremity fracture was most frequent in ZMC fracture cases. Spine, chest abdomen and multisystem injuries were also evident in this study which suggest timely and systematically management of cases of trauma is needed.

In our study CT scan was used to diagnosis ZMC fracture as it is most reliable to locate bony and small fracture lines.¹⁰ Minimal displacement and small fractured fragments might go unnoticed on plain radiographs which results improper diagnosis leading improper planning and inadequate treatment which might result in unfavorable aesthetic and functional outcome.^{8,20,21} In this study 73(84.9%) cases were of displaced ZMC fracture and rest were undisplaced. Zygomatic bone has its articulation with frontal, temporal, maxillary bone and abutment with sphenoid bone making it tetrapod.^{7,22,23} In our study Zing et al classification was used to diagnose type of ZMC fracture as it is based on anatomy and from treatment point of view anatomic reduction is needed for better aesthetic and functional outcome.⁷ In this study type B (tetrapod fracture) was noted in majority of cases 42(48%) followed by type C 16(18.6%) which is similar to study done by zing et al where majority 57% were of type B and 35.02% was of type C. Displacement and anatomical location of fracture is crucial factor in planning treatment which ranges from conservative treatment, close reduction, to open reduction and internal fixation in various fractured anatomic location.^{6,19,24-26} Also treatment depends upon various factors like age, sex, associated injuries, systemic disease, economic status, health care setup, clinician's practice and available resources.^{1,8}

Limitations of this study were single centric study which covers limited geographic region. Larger number of variables might have been studied with larger sample size in long time frame of study.

CONCLUSION

ZMC fracture is one of the common injuries of maxillofacial skeleton and various factors are responsible for it with various presentation. RTA was common etiology with involvement of young males and has various clinical presentations and is associated with other locoregional and systemic injuries. This study would be helpful in educating society regarding etiologies

and precautions to be taken, policy makers to make and enforce regulations to minimize incidences and health workers to evaluate, diagnose and multidisciplinary management for better outcome of cases.

CONFLICT OF INTEREST: None

FINANCIAL DISCLOSURE: None

REFERENCES:

1. Mohajerani H, Sadeghi N, Montazemi T, Montazemi A. Zygomatic Fractures: A 10-year retrospective epidemiological study. *Avicenna Journal of Dental Research*. 2017 Jun 30;9(3):e607051-7. [\[DOI\]](#)
2. Naseem SB, Farooq S, Iqbal Z, Ashar F, Mehood H, Mahood A. Frequency and etiology of zygomatic complex fractures in oral and maxillofacial trauma patients in tertiary care hospital Karachi. *Pakistan Journal of Medical & Health Sciences*. 2022;16(11):687-9. [\[DOI\]](#)
3. Charles EA, Birch DS. The clinical presentation and management of zygomatic complex fractures in a Nigeria Teaching Hospital. *Nigerian Journal of Medicine*. 2012;21(3):308-12. [\[LINK\]](#)
4. Obuekwe O, Owotade F, Osaiyiwu O. Etiology and pattern of zygomatic complex fractures: a retrospective study. *Journal of the National Medical Association*. 2005 Jul;97(7):992. [\[PMC\]](#)
5. Hanif S, Riaz N, Haq ME, Younas S, Ahmad Z, Iqbal A. Frequency, etiology and presenting complaints associated with zygomatic complex fractures. *Pakistan Journal of Medical and Health Sciences*. 2022;16(1):53-5. [\[DOI\]](#)
6. Rohit, Vishal, Prajapati VK, Shahi AK, Prakash O, Ekram S. Etiology, Modalities of zygomaticomaxillary complex fracture, open reduction and fixation. *J Clin Exp Dent*. 2021 Mar 1;13(3):e215-e220. [\[DOI\]](#)
7. Zingg M, Laedrach K, Chen J, Chowdhury K, Vuillemin T, Sutter F, Raveh J. Classification and treatment of zygomatic fractures: a review of 1,025 cases. *Journal of oral and maxillofacial surgery*. 1992 Aug 1;50(8):778-90. [\[DOI\]](#)
8. Kambalimath DH, Kambalimath HV, MVV S, V AK, TG R, Deepak RM. Retrospective analysis of management of zygomatic complex fractures. *The Traumatologia*. 2023 May 23;26323273231172739. [\[DOI\]](#)
9. Albeshri H, Ahsan B, Samman M, Abusalama A, Waheed S. Pattern and significance of ocular injuries associated with orbito-zygomatic fractures. *Cosmetol & Oro Facial Surg*. 2018;4(132):2. [\[LINK\]](#)
10. Lelli GJ, Liotta D, Levine B, Kacker A. zygomatic-maxillary complex fractures. In: Schmidt-Erfurth U, Kohnen T. (eds) *Encyclopedia of ophthalmology*. Springer, Berlin, Heidelberg; 2016, 1-3. [\[DOI\]](#)
11. Dawood A, Ramat BR, Al-Hakim I. Associated maxillofacial bone fractures with zygomatic complex fracture: experience from a tertiary referral hospital in Riyadh, Kingdom of Saudi Arabia. *The Egyptian Journal of Surgery*. 2018 Apr 1;37(2):244-7. [\[DOI\]](#)
12. Tripathi GM, Sharma D, Gaharwar AP, Gupta R, Shukla D, Shukla V. Analysis of Prevalence and Pattern of Zygomatic Complex Fractures in North-Eastern Part of Madhya Pradesh, India. *Int J Contemp Med Res*. 2016 Jul;3(7):1878-81. [\[LINK\]](#)
13. Shapiro AJ, Johnson RM, Miller SF, McCarthy MC. Facial fractures in a level I trauma centre: the importance of protective devices and alcohol abuse. *Injury*. 2001 Jun 1;32(5):353-6. [\[DOI\]](#)
14. Laverick S, Patel N, Jones DC. Maxillofacial trauma and the role of alcohol. *British journal of oral and maxillofacial surgery*. 2008 Oct 1;46(7):542-6. [\[DOI\]](#)
15. El-Maaytah M, Smith SF, Jerjes W, Upile T, Petrie A, Kalavrezos N, Ayliffe P, Newman L, Hopper C, Lloyd T. The effect of the new "24 hour alcohol licensing law" on the incidence of facial trauma in London. *British journal of oral and maxillofacial surgery*. 2008 Sep 1;46(6):460-3. [\[DOI\]](#)
16. Ceallaigh PÓ, Ekanayake K, Beirne CJ, Patton DW. Diagnosis and management of common maxillofacial injuries in the emergency department. Part 3: Orbitozygomatic complex and zygomatic arch fractures. *EMJ*; 2007 Feb 1;24(2):120-122. [\[DOI\]](#)
17. Banks P, Brown A. *Fractures of the facial skeleton*. 1st ed. Oxford: Butterworth-Heinemann. 2001.
18. Ai-Ourainy IA, Dutton GN, Stassen LF, Moos KF, Ei-Attar A. The characteristics of midfacial fractures and the association with ocular injury: a prospective study. *British journal of oral and maxillofacial surgery*. 1991 Oct 1;29(5):291-301. [\[DOI\]](#)
19. Shanmugam D, Thanasekaran V, Biradar N, Purushothaman A, Sridhar D, Shanmugam D. Management of Zygomaticomaxillary complex fractures with two-point fixation-A retrospective study for 5 years. *Asian Journal of Medical Sciences*. 2021 Jan 1;12(1). [\[DOI\]](#)
20. Juncar RI, Tent PA, Juncar M, Arghir IA, Arghir OC, Ravis M. Interrelation between facial soft tissue lesions, underlying fracture patterns and treatment of zygomatic bone trauma: a 10 year retrospective study. *Head & Face Medicine*. 2020 Dec;16(1):1-9. [\[DOI\]](#)
21. Salentijn EG, Boffano P, Boverhoff J, Van den Bergh B, Forouzanfar T. The epidemiological characteristics of zygomatic complex fractures: A comparison between the surgically and non-surgically treated patients. *National journal of maxillofacial surgery*. 2013 Jul;4(2):214. [\[DOI\]](#)
22. Eisele DW, Duckert LG. Single-point stabilization of zygomatic fractures with the minicompression plate. *Archives of Otolaryngology-Head & Neck Surgery*. 1987 Mar 1;113(3):267-70. [\[DOI\]](#)
23. Karlan MS, Cassisi NJ. Fractures of the zygoma: A geometric, biomechanical, and surgical analysis. *Archives of Otolaryngology*. 1979 Jun 1;105(6):320-7. [\[DOI\]](#)
24. Lee EI, Mohan K, Koshy JC, Hollier LH Jr. Optimizing the surgical management of zygomaticomaxillary complex fractures. *Semin Plast Surg*. 2010 Nov;24(4):389-97. [\[DOI\]](#)
25. Bradley D, Leung B, Saxena S, Dungarwalla M, Chapireau D, Fan K. Surgical management of zygomatic complex fractures in a major trauma centre. *Plastic and Aesthetic Research*. 2019 May 24;6. [\[DOI\]](#)
26. Uda H, Kamochi H, Sugawara Y, Sarukawa S, Sunaga A. The concept and method of closed reduction and internal fixation: a new approach for the treatment of simple zygoma fractures. *Plastic and reconstructive surgery*. 2013 Nov 1;132(5):1231-40. [\[DOI\]](#)