

Aetiology, Prevalence, Fracture Site and Management of Maxillofacial Trauma: A Retrospective Study

AbdAllah Ibrahim Mudawi*, Eltayeb Mohammed Alhassan**, Mohammad A. Albanghali***, Alsayed Abdulkarem Mehana****, Salem Mohammed Hassan Alharthi*****

ABSTRACT

Maxillofacial fractures are frequently associated with severe morbidity, functional impairment, facial disfigurement, and substantial economic burden. This study aims to evaluate the etiology, fracture patterns, and treatment modalities of maxillofacial trauma cases managed at the Department of Oral and Maxillofacial Surgery, King Fahad Hospital, Al-Baha Province, Saudi Arabia. By retrospectively analyzing clinical records, the study seeks to contribute to the growing body of evidence that informs preventive strategies, facilitates early diagnosis, and optimizes surgical management. This retrospective study analyzed the medical records of 238 patients who presented maxillofacial trauma to the Department of Oral and Maxillofacial Surgery at King Fahad Hospital, Al-Baha, between January 2020 and December 2024. Extracted data included demographic details (age and sex), etiology of trauma, anatomical site of fractures, and treatment approaches. The majority of patients were males under the age of 20 years. Road traffic accidents (RTAs) were the leading cause of injury, accounting for 56.3% of cases. Mandibular fractures were the most prevalent, representing 64.9% of all recorded fractures. Open reduction and internal fixation (ORIF) were the primary treatment modalities, utilized in 55.5% of cases. RTAs emerged as the predominant cause of maxillofacial trauma in this cohort, particularly affecting young male patients. Mandibular fractures were the most common type observed. More than half of all maxillofacial fractures were managed using ORIF. The high incidence may be attributed to poor adherence to traffic laws, particularly among inexperienced drivers, and specific sociocultural driving behaviors.

INTRODUCTION

Maxillofacial trauma involves injuries to the facial skeleton—including the mandible, maxilla, zygomatic complex, and nasal bones—often resulting from high-impact forces such as road traffic accidents (RTAs), which remain the leading cause in developing countries¹. The anatomical complexity of this region and its vital roles in breathing, speech, and mastication make management particularly challenging for surgeons.

Globally, the incidence of maxillofacial injuries has increased, especially in developing regions, due to rising RTAs, urban violence, workplace accidents, and sports-related trauma²⁻⁶. RTAs continue to dominate as the primary cause because of rapid urbanization, poor road conditions, and inadequate enforcement of traffic regulations³.

Fracture patterns are influenced by factors such as the mechanism of injury, age, sex, and socioeconomic background. Mandibular fractures are often associated with interpersonal violence, whereas midfacial fractures—such as zygomaticomaxillary complex and Le Fort types—are commonly linked to high-velocity trauma^{7,8}.

Effective management requires a multidisciplinary approach focused on restoring both function and aesthetics, using treatments ranging

from conservative methods to open reduction and internal fixation (ORIF) with titanium or resorbable plates⁹⁻¹¹.

METHODOLOGY

This study was conducted as a retrospective descriptive and analytical investigation to examine the etiology, prevalence, anatomical fracture sites, and management strategies of maxillofacial trauma within a defined time frame. Records of patients with maxillofacial injuries who presented to the Department of Oral and Maxillofacial Surgery at King Fahad Hospital in Albaha Province, KSA, between January 2020 and December 2024 were retrospectively retrieved and analyzed. Data were collected from hospital records, including case files, radiographs (CT/OPG), operative notes, and discharge summaries. Variables such as age, sex, etiology, anatomical fracture sites, and treatment methods were evaluated.

Criteria for Inclusion

- Individuals of all ages and genders presenting with maxillofacial trauma.
- Confirmed diagnosis of one or more facial bone fractures through radiographic imaging.
- Patients who were admitted or received treatment within the designated study period.

* Corresponding author, Department of Oral & Dental Health, Faculty of Applied Medical Sciences, Al-Baha University, Al Baha 65779, Saudi Arabia, amudawi@bu.edu.sa

** Department of Oral & Dental Health, Faculty of Applied Medical Sciences, Al-Baha University, Al Baha 65779, Saudi Arabia, emohamed@bu.edu.sa.

*** Department of Public Health, Faculty of Applied Medical Sciences, Al-Baha University, Al Baha 65779, Saudi Arabia, mohammad.aref@bu.edu.sa.

**** Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Al Azhar University, Cairo, Egypt, alsayedmehana@gmail.com.

***** Resident Maxillofacial surgery at King Fahad Hospital, Al Baha 65779, s.m.a1414al@hotmail.com

- Complete medical records available, including diagnosis, treatment details, and follow-up information.

Criteria for exclusion

- Cases with incomplete or inadequate patient records.
- Injuries confined to soft tissues without accompanying bone fractures.
- Fractures caused by pathological conditions such as tumors or osteomyelitis.

Ethical Approval: This study was approved by the Scientific Research Committee at Academic affairs and Training at Al-Baha Health Cluster (Approval number: KFH/IRB0901202024/3). The requirement for informed consent was waived.

RESULT

A total of 238 patients were analyzed—214 males (90%) and 24 females (10%)—yielding a 9:1 male-to-female ratio, with males predominating in accident-related injuries. The highest incidence occurred in patients under 20 years (42%), followed by 21–40 years (34.9%), 41–60 years (18.5%), and over 60 years (4.6%) (Table 1).

Road traffic accidents (RTAs) were the leading cause of facial trauma (56.3%), followed by falls (33.6%), assaults (2.5%), and sports injuries (7.6%). Falls involved slips from motorcycles or bicycles, play-related injuries in children, and accidental falls in the elderly (Table 2).

A total of 394 fractures were documented. Mandibular fractures were most common (64.9%), followed by zygomaticomaxillary complex (47%), maxillary dentoalveolar (32.8%), and nasal/ethmoidal fractures (12.2%). Le Fort I, II, and III patterns represented 2.5%, 4.2%, and 1.7% of cases, respectively. Among mandibular fractures, the condylar region was most affected (30%), while no coronoid process fractures were observed (Table 3).

Conservative management, including wound care, was used in 87 patients (32.8%), whereas 132 (55.5%) underwent open reduction and internal fixation (ORIF). ORIF was indicated for displaced or maloccluded fractures and relied on the availability of fixation hardware. Dentoalveolar injuries (13.4%) were treated by splinting or intraoral wiring; none received closed reduction with intermaxillary fixation (Table 4).

DISCUSSION

The maxillofacial region contains vital structures essential for respiration, speech, mastication, vision, and smell, making facial trauma assessment critical and necessitating adherence to Advanced Trauma Life Support® (ATLS) principles during initial evaluation¹. In 2020, only 16 cases were reported, largely due to COVID-19–related traffic restrictions. Epidemiological data on maxillofacial trauma reveal how geography, socioeconomic factors, traffic conditions, and social behavior influence injury patterns¹. Maxillofacial fractures constitute

Table 1. Sociodemographic and Anthropometric Characteristics of the Study Population

	Frequency	Percentage
Sex		
Male	214	90
Female	24	10
Age (in years)		
< 20	100	42
21 – 40	83	34.9
41 – 60	44	18.5
> 60	11	4.6
Nationality		
Saudi	213	89.5
Non-Saudi	25	10.5
Years		
2020	16	6.7
2021	30	12.6
2022	50	21
2023	29	12.2
2024	113	47.5
Cause of trauma	Frequency	Percentage
Assault, interpersonal violence	6	2.5
Miscellaneous (Fall down)	80	33.6
Sporting accident	18	7.6
Vehicle Accident	134	56.3

Table 2. Comparison of the cause of the trauma Across Different Age Groups in Maxillofacial Trauma Cases

Count		Age				Total
		Less than 20 years	21-40 years	41- 60 years	More than 60years	
Etiology of injury	Vehicle Accident	41	62	25	6	134
	Assault, interpersonal violence	1	5	0	0	6
	Sporting accident	13	5	0	0	18
	Miscellaneous (Fall down)	45	11	19	5	80
Total		100	83	44	11	238

Table 3. Anatomical Distribution of Fracture Sites in Patients Presenting with Maxillofacial Injuries

Anatomical Site of Fracture	Frequency	Percentage
Mandibular dentoalveolar	12	5
Mandibular symphysis region	2	0.8
Right para-symphysis of the mandible	6	2.5
Left para-symphysis of the mandible	9	3.8
Right body of the mandible	10	4.2
Left body of the mandible	20	8.4
Right angle of the mandible	16	6.7
Left angle of the mandible	19	8
Right mandibular condyle	17	7
Left mandibular condyle	31	13
Right sub-condylar region	4	1.7
Left sub-condylar region	9	3.8
Right coronoid process	0	0
Left coronoid process	0	0
Maxillary dentoalveolar	78	32.8
Le Fort I type midfacial	6	2.5
Le Fort II type midfacial	10	4.2
Le Fort III type midfacial	4	1.7
Zygomaticomaxillary complex	112	47
Nasal and ethmoidal	29	12.2

Table 4. Comparison of Treatment Modalities Across Different Age Groups in Maxillofacial Trauma Cases

Treatment Modality	Age (in years)				p-value
	< 20	21 – 40	41 – 60	> 60	
Application of Splinting and Intraoral Wiring	21 (65.6%)	4 (12.5%)	7 (21.9%)	0 (0.0%)	0.008
Closed Reduction Technique Applied	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	-
Open Reduction and Internal Fixation (ORIF) Performed	33 (25%)	64 (48.5%)	30 (22.7%)	5 (3.8%)	<0.0001
Non-Operative (Conservative) Management Utilized	47 (60.3%)	17 (21.8%)	9 (11.5%)	5 (6.4%)	<0.0001

Table 5. Comparison of the cause of the trauma Across Different sex in Maxillofacial Trauma Cases

Count		GENDER		Total
		Male	Female	
Etiology of injury	Vehicle Accident	122	12	134
	Assault, interpersonal violence	5	1	6
	Sporting accident	18	0	18
	Miscellaneous (Fall down)	69	11	80
Total		214	24	238

approximately 7.4–8.7% of emergency medical cases¹². A consistent finding across studies is the predominance of such injuries among males^{1,12-17} (Table 5).

In the present study, the highest incidence occurred in patients under 20 years of age, differing from previous reports. This pattern is attributed to the greater activity levels and risk exposure of younger individuals¹⁸⁻²³. In Saudi Arabia, road traffic accidents (RTAs) remain the leading cause of maxillofacial injuries, followed by falls, assaults, and sports-related trauma. Regional studies consistently confirm RTAs as the primary etiology—for instance, research in Jeddah reported that 73.1% of maxillofacial fractures resulted from RTAs²⁴. In our study, road traffic accidents (RTAs) emerged as the predominant cause of maxillofacial fractures, representing 56.3% of all cases.

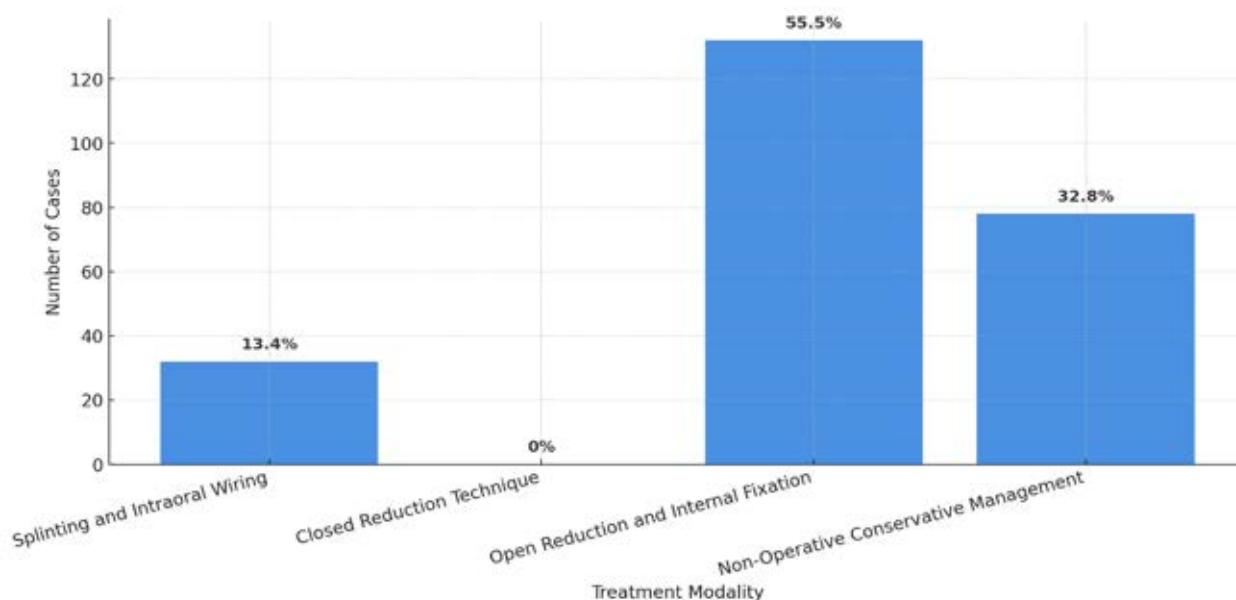
This finding is consistent with studies from other developing countries, which also identify road traffic accidents (RTAs) as the leading cause of maxillofacial injuries². Within the RTA category, motorcycle

and bicycle crashes, as well as collisions involving light and heavy vehicles, were major contributors. Falls represented the second most common cause, accounting for 33.6% of cases. Unlike RTAs, fall-related trauma typically results from direct impact with stationary objects of varying sizes and densities. These injuries showed a distinct age-related pattern, peaking among individuals under 20 years of age. In this group, males were more frequently affected, while in older age groups, females exhibited a higher incidence of fractures.

Interpersonal violence accounted for 2.5% of maxillofacial trauma cases, while sports-related injuries represented 7.6%. Although the term (battery) technically refers to physical attack, (assault) is widely used to describe such incidents. In developed nations, assault is often the leading cause of facial fractures²³. Zygomatic fractures were the most common midfacial fractures, consistent with previous literature¹⁶. In this study, 47% of fractures involved the zygomatic complex, while mandibular fractures were most frequent overall, comprising 64.9% of all cases.

Table 6. Distribution of Maxillofacial Trauma Cases by Treatment Modality.

Treatment Modality	Frequency	Percentage
Application of Splinting and Intraoral Wiring	32	13.4
Closed Reduction Technique Applied	0	0
Open Reduction and Internal Fixation (ORIF) Performed	132	55.5
Non-Operative (Conservative) Management Utilized	78	32.8

**Figure 1.** Distribution of Maxillofacial Trauma Cases by Treatment Modality

This finding is consistent with multiple previous studies¹⁵ and is likely due to the mandible's prominent anatomical position within the facial structure. While some studies have identified the midface as the most common fracture site²¹, our results differ from those of Adebayo et al., who reported body fractures as the most prevalent (51%)⁸. Conversely, our study found the highest frequency of fractures in the condylar region. These observations also contrast with findings from Gaddipati et al.¹². The elevated rate of symphysis and parasymphysis fractures caused by RTAs on Indian roads may be linked to young adults wearing half helmets, which leave the anterior mandible unprotected.

Management

Over the past 15 years, plate osteosynthesis has gained popularity in managing facial fractures, particularly mandibular fractures. However, despite its clear benefits, the use of open reduction and internal fixation (ORIF) remains limited in many developing countries due to the requirement for general anesthesia in most cases, which carries financial constraints (Table 6 and Figure 1).

In our series, more than half (55%) of maxillofacial fractures were treated with ORIF. These patients were typically placed in intermaxillary fixation only during surgery, which was released afterward in all cases except those with associated condylar fractures, where conservative treatment with arch bars and intermaxillary fixation was planned. At the Department of Oral and Maxillofacial Surgery, King Fahad Hospital in Albaha province, KSA, ORIF using miniplates is the preferred method for treating maxillofacial fractures.

CONCLUSIONS

This study has shown that road traffic accidents (RTAs) are the leading cause of maxillofacial injuries among patients admitted to the Department of Oral and Maxillofacial Surgery, King Fahad

Hospital. The group most affected were males under 20 years of age. Mandibular fractures were the most common type of maxillofacial injury, accounting for 64.9% of all fractures observed.

More than half (55.5%) of the maxillofacial fractures in our series were managed with open reduction and internal fixation (ORIF), while 32.8% received conservative treatment. The high incidence of these injuries may be attributed to factors such as insufficient road safety awareness—including failure to use seatbelts and helmets—frequent violations of traffic laws, particularly by inexperienced young drivers, and certain sociocultural behaviors among drivers.

Authorship Contribution: All authors share equal effort contribution towards (1) substantial contributions to conception and design, acquisition, analysis and interpretation of data; (2) drafting the article and revising it critically for important intellectual content; and (3) final approval of the manuscript version to be published. Yes.

Potential Conflicts of Interest: None

Competing Interest: None

Acceptance Date: 19 December 2025

REFERENCE

1. Al Ahmed HE JM, Abu Fanas SH, Karas M. The pattern of maxillofacial fractures in Sharjah, United Arab Emirates: a review of 230 cases. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2004;198:166–70.
2. Singaram M GS, Udhayakumar RK. Prevalence, pattern, etiology, and management of maxillofacial trauma in a developing country: a retrospective study. *J Korean Assoc Oral Maxillofac Surg* 2016;42: 174–81.

3. Adeleke AI HM, Makhunga S, Ginindza TG. Epidemiology of maxillofacial injury among adults in sub Saharan Africa: a scoping review. *Inj Epidemiol*. 2023;10:58.
4. Chandra Shekar BR RC. A five year retrospective statistical analysis of maxillofacial injuries in patients admitted and treated at two hospitals of Mysore city. *Indian J Dent Res* 2008;19(4):304–8.
5. Team. M. The global burden of maxillofacial trauma in critical care. *Medicina (Kaunas)* 2023;61(5):915.
6. Jimenez Murat Y FCK, Fukumoto Inukai KA, Martínez Wagner R. [Epub ahead of print]. Severe facial trauma secondary to aircraft propeller injury: the art of facial reconstruction. *Case Reports Plast Surg Hand Surg* 2024. .
7. Brasileiro BF PL. Epidemiological analysis of maxillofacial fractures in Brazil: a 5-year prospective study. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2006;102(1):28–34.
8. Gassner R TT, Hächl O, Rudisch A, et al. Craniomaxillofacial trauma: a 10-year review of 9,543 cases with 21,067 injuries. *J Oral Maxillofac Surg*. 2003;61(5):512–21.
9. Bormann KH WS, Gellrich NC, Kokemüller H, et al. Five-year retrospective study of mandibular fractures in Freiburg, Germany: incidence, etiology, treatment, and complications. *J Oral Maxillofac Surg* 2009;67(6):1251–5.
10. Kim MK KB. Clinical analysis of facial bone fractures: a 12-year retrospective study. *J Korean Assoc Oral Maxillofac Surg*. 2012;38(2):88–92.
11. Roccia F BP, Bianchi FA, Zavattero E. Characteristics of maxillofacial trauma in females: a retrospective analysis of 367 patients. *J Craniomaxillofac Surg*. 2010;38(4):314–9.
12. Carvalho TB CL, Marques CG, et al. Six years of facial trauma care: an epidemiological analysis of 355 cases. *Braz J Otorhinolaryngo*. 2010;76: :565–74.
13. AB. B. Etiology and incidence of maxillofacial fractures in the north of Jordan. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1998;86:31–5.
14. Cheema SA AF. Incidence and causes of maxillofacial skeletal injuries at the Mayo Hospital in Lahore, Pakistan. *Br J Oral Maxillofac Surg*. 2006;44:232–4.
15. Erol B TR, Görgün B. Analysis of demographic distribution and treatment in 2901 patients (25-year experience). *J Craniomaxillofac Surg*. 2004;32:308–13.
16. Leite Cavalcanti A MBP, Moraes de Oliveira D, Granville-Garcia AF. Maxillofacial injuries and dental trauma in patients aged 19–80 years, Recife, Brazil. *Rev Esp Cir Oral Maxillofac* 2010;32:11–6.
17. Subhashraj K RS, Ravindran C. Pattern of mandibular fractures in Chennai, India. *Br J Oral Maxillofac Surg*. 2008;46:126–7.
18. Adebayo ET AO, Adekeye EO. Analysis of the pattern of maxillofacial fractures in Kaduna, Nigeria. *Br J Oral Maxillofac Surg*. 2003;41:396–400.
19. MH. A. Maxillofacial fractures in Hamedan province, Iran: a retrospective study (1987–2001). *J Craniomaxillofac Surg*. 2004;32: 28–34.
20. de Macedo JL dCL, de Almeida PF, Rosa SC. Epidemiology of facial trauma of patients admitted to a public hospital emergency department. *Rev Col Bras Cir*. 2008;35:9–13.
21. Elhammali N BA, Rustemeyer J. Demographical and clinical aspects of sports-related maxillofacial and skull base fractures in hospitalized patients. *Int J Oral Maxillofac Surg* 2010;39:857–62.
22. Gaddipati R RS, Vura N et al. Analysis of 1,545 fractures of facial region – a retrospective study. *Craniomaxillofac Trauma Reconstr*. 2015 Dec;8:307–14.
23. Lee KH SL, Steenberg LJ, Worthington J. Comparison between interpersonal violence and motor vehicle accidents in the aetiology of maxillofacial fractures. *ANZ J Surg* 2007; 77:695–8.
24. S Alghamdi RA, S Alsalmi. The epidemiology, incidence and patterns of maxillofacial fractures in Jeddah city, Saudi Arabia. *Int J Oral Maxillofac Surg*. 2017;46:255.