

Causes, Patterns, and Management of Maxillofacial Fractures in Patients Presenting to the Dental Department of PAHS

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ABSTRACT

Objective: The objective of this study was to determine the etiology, fracture patterns, and modes of management of maxillofacial injuries in patients presenting to a tertiary care center at Dental Department in Patan Academy of Health Sciences, Nepal

Methodology: This retrospective study was conducted over a period of two years and six months, from January 2020 to June 2024. A total of 214 consecutive patients presenting to the indoor, outdoor, and emergency departments with maxillofacial injuries were included. Data regarding patient demographics, etiology of injury, occupation, socioeconomic status, and patterns of maxillofacial fractures were collected and analyzed.

Results: The mandible was the most frequently fractured bone, accounting for 106 cases (49.5%). This was followed by panfacial (full-house) fractures (15.4%) and zygomatic complex fractures (15.4%). Associated midface fractures were observed in 12.6% of cases, while isolated nasal bone fractures were noted in 1.5%. Road traffic accidents (RTAs) were the most common cause of injury (58.4%), followed by falls (24%), firearm injuries (6.1%), interpersonal violence (2.8%), and sports-related and other injuries (8.4%). Employees (49.5%) and students (31.3%) in the 20–40-year age group were most commonly affected by RTAs, whereas falls (14.4%) were more prevalent in patients under 20 years of age. The primary modes of treatment included open reduction and internal fixation (ORIF) alone in 43.9% of cases, maxillomandibular fixation (MMF) with or without suspension in 38.8%, and ORIF combined with MMF in 14.5%.

Conclusion: The mandible was the most commonly fractured facial bone in this study. Road traffic accidents—particularly involving motorcycles and chingchi rickshaws—were the leading etiological factor. The findings suggest that personal behavior and occupational environment may significantly influence the occurrence of maxillofacial injuries.

Keywords: Maxillofacial Injuries, Mandibular Fractures, Road Traffic Accidents, Panfacial Trauma.

Introduction

Maxillofacial trauma is a significant cause of morbidity and mortality worldwide. It commonly presents in hospital accident and emergency departments either as an isolated injury or as part of polytrauma [1]. In Pakistan, maxillofacial trauma is a frequent occurrence and is associated with a high incidence of facial fractures occurring in various combinations. Such injuries may range from superficial lacerations and abrasions to severe trauma involving the chest, head, cervical spine, abdomen, or extremities. In addition to functional impairment, maxillofacial

injuries often result in significant psychological distress and cosmetic deformities [2].

Some of the most severe maxillofacial injuries are caused by road traffic accidents; however, a substantial number also result from industrial accidents, sports-related injuries, domestic accidents, and firearm or missile injuries. ² the face is particularly vulnerable to trauma due to its prominent anatomical position and minimal protective coverage, which contributes to the high frequency of facial injuries [3].

The management of maxillofacial trauma is generally carried out in three phases. The primary phase focuses on patient

survival, emphasizing the maintenance of airway patency and hemodynamic stability. The intermediate phase involves supportive care, including antibiotic prophylaxis, infection control, hemorrhage management, and tissue debridement. The final phase is the reconstructive phase, which aims to restore both soft and hard tissues through reduction and fixation of fractured bone segments, use of grafts, when necessary, reconstruction of the nasolacrimal system, release of scar tissue, and correction of sensory and motor nerve dysfunction [4].

Epidemiological studies of maxillofacial trauma have consistently demonstrated that young adult males constitute the predominant affected population [5]. Maxillofacial injuries are also not uncommon in Nepal [6]. Inadequate application of essential treatment principles may result in compromised cosmetic, functional, and psychological outcomes [7]. The etiology and incidence of maxillofacial trauma vary considerably across countries due to differences in social, cultural, and environmental factors [8-12].

Road traffic accidents (RTAs) have been reported as the leading cause of mandibular fractures in many developing countries, whereas interpersonal violence is the predominant cause in developed nations [13-18]. These variations reflect disparities in traffic safety measures, including inadequate enforcement of seat belt and helmet laws, lack of airbags in vehicles, poor road infrastructure in developing countries, and higher rates of alcohol abuse in developed regions [16-18].

The rapid mechanization of society in recent years, coupled with the poor condition of road infrastructure, has led to a disproportionate increase in the incidence of maxillofacial trauma. High-speed impacts have significantly altered both the nature and pattern of facial injuries.

The aim of this study was to determine the relative frequency of various etiological factors and the patterns of maxillofacial fractures among patients presenting to the Department of Oral and Maxillofacial Surgery, Dental Department, PAHS.

Methodology

This study was conducted on 214 patients presenting with maxillofacial fractures at the Department of Oral and Maxillofacial Surgery, PAHS, over a period of four years from January 2020 to June 2024. Patients of both genders with radiologically confirmed facial fractures were included in the study, while those presenting with isolated soft tissue facial lacerations were excluded.

Initial management of emergency cases was carried out in the Emergency Department in accordance with Advanced Trauma Life Support (ATLS) protocols. Wounds were repaired or dressed following achievement of hemostasis, and selected mandibular or other open fractures were temporarily stabilized using wiring techniques. Patients were assessed by neurosurgery, orthopedics, ophthalmology, or other relevant specialties when indicated.

Following initial stabilization, patients were admitted to the Oral and Maxillofacial Surgery ward. They were allowed a liquid or semi-solid diet supplemented with nutritional support. Appropriate antibiotics, analgesics, and oral rinses were prescribed. A comprehensive clinical and radiological evaluation

was performed using orthopantomograms (OPG), and computed tomography (CT) scans with or without three-dimensional reconstruction.

Informed consent was obtained from all patients prior to surgical intervention. Surgical management was performed under general anesthesia or local anesthesia using nerve blocks with or without intravenous sedation. Fractures were approached through standard intraoral and extraoral incisions such as gingivobuccal, coronal, blepharoplasty, transconjunctival, preauricular, retromandibular, and orbital rim incisions, or through existing lacerations where appropriate. Nasogastric intubation was maintained for 48–72 hours postoperatively in most patients with panfacial fractures to facilitate enteral feeding. The management of polytrauma patients was carried out through a multidisciplinary approach involving relevant specialties. All patients were followed up for a minimum period of six months.

Results

A total of 214 patients with maxillofacial fractures were treated during the study period from January 2010 to June 2012. The majority of patients were male ($n = 190$, 88.8%), with a male-to-female ratio of 7.9:1. The most commonly affected age group was 20–29 years, comprising 73 patients (34.1%) (Table 1).

Table 1: Age Distribution of Patients with Maxillofacial Trauma/ Fractures

Age groups	Frequency	Percent	Valid Percent	Cumulative Percent
0-9	29	13.6	13.6	13.6
10-19	36	16.8	16.8	30.4
20-29	73	34.1	34.1	64.5
30-39	40	18.7	18.7	83.2
40-49	16	7.5	7.5	90.7
50-59	11	5.1	5.1	95.8
60-69	6	2.8	2.8	98.6
70 above	3	1.4	1.4	100.0
Total	214	100.0	100.0	

Employees ($n = 106$, 49.5%) and students ($n = 67$, 31.3%) were predominantly affected by road traffic accidents (RTAs), which accounted for 78.4% of injuries in these groups. Accidental falls were more frequent among patients younger than 20 years, accounting for 88.3% of injuries in this age group.

The mandible was the most frequently fractured facial bone, identified in 106 patients (49.5%). This was followed by panfacial fractures in 33 patients (15.4%) and zygomatic complex fractures in 33 patients (15.4%). Combined midface fractures were observed in 27 patients (12.6%), while isolated nasal bone fractures were found in 3 patients (1.4%).

Road traffic accidents were the leading cause of maxillofacial injuries, accounting for 125 cases (58.4%), followed by accidental falls in 52 cases (24.3%). Firearm injuries were responsible for 13 cases (6.1%), interpersonal violence for 6 cases (2.8%), and sports-related or other causes for 18 cases (8.4%).

Regarding treatment modalities, open reduction and internal fixation (ORIF) alone was performed in 94 patients (43.9%). ORIF combined with maxillomandibular fixation (MMF) was carried out in 31 patients (14.5%), while MMF with or without suspension was used in 83 patients (38.8%).

Discussion

Maxillofacial injuries are common in Nepal and south asia [3-6]. the face is particularly vulnerable to trauma due to its prominent position and minimal protective coverage, which contributes to the high frequency of facial injuries. A distinctive aspect of facial trauma is that restoration of appearance often becomes a primary indication for treatment [19].

Patients with maxillofacial trauma commonly present to the Emergency Department, either with isolated facial injuries or as part of polytrauma. Such injuries may range from superficial lacerations and abrasions to severe trauma involving the chest, head, spine, abdomen, or extremities [3]. Maxillofacial trauma not only impairs essential functions, such as mastication and speech, but also leads to significant psychological distress and cosmetic deformities [4]. Some of the most severe injuries result from automobile accidents, sports-related incidents, domestic accidents, and firearm or missile injuries [4].

Table 2: Association of Profession with Maxillofacial Trauma

Profession of patients	Frequency	Percent	Valid Percent	Cumulative Percent
Working person	106	49.5	49.5	49.5
Non-working person	25	11.7	11.7	61.2
Housewife	8	3.7	3.7	65.0
Student	67	31.3	31.3	96.3
Working person + student	8	3.7	3.7	100.0
Total	214	100.0	100.0	

Table 3: Type of Fracture

Type of fractures	Frequency	Percent	Valid Percent	Cumulative Percent
# Mandible	106	49.5	49.5	49.5
# Zaygoma bone	33	15.4	15.4	65.0
# Maxilla	7	3.3	3.3	68.2
Nasal bone	3	1.4	1.4	69.6
Frontal bone	1	.5	.5	70.1
# NOE	1	.5	.5	70.6
# Zaygoma arch	3	1.4	1.4	72.0
Combined mid #	27	12.6	12.6	84.6
Panfacial #	33	15.4	15.4	100.0
Total	214	100.0	100.0	

Table 4: Cause of Maxillofacial Fractures

Causes of fractures	Frequency	Percent	Valid Percent	Cumulative Percent
FAI	13	6.1	6.1	6.1

Falls	52	24.3	24.3	30.4
RTA	125	58.4	58.4	88.8
Interpersonal voilance	6	2.8	2.8	91.6
Other	18	8.4	8.4	100.0
Total	214	100.0	100.0	

Table 5: Type of Treatment Given

Type of treatment	Frequency	Percent	Valid Percent	Cumulative Percent
ORIF	94	43.9	43.9	43.9
MMF	83	38.8	38.8	82.7
ORIF+MMF	31	14.5	14.5	97.2
Arch bar/ Elastics	6	2.8	2.8	100.0
Total	214	100.0	100.0	

Table 6: Associated Injutes

Frequency		Percent	V a l i d Percent	Cumulative Percent
Valid	facial Laceration	48	22.4	22.4
	nasal bone	8	3.7	26.2
	chest/abdomial innjuries	2	.9	27.1
	Cervical spine injuries	3	1.4	28.5
	not associated	153	71.5	100.0
	Total	214	100.0	

Facial injuries are particularly vulnerable due to minimal protective coverage [3]. A unique aspect of these injuries is that restoration of appearance is often the primary indication for treatment [3]. Epidemiological studies have consistently shown that young adult males are the predominant victims of facial trauma [5-8]. The etiology, type, and site of facial fractures vary according to multiple factors, including mechanism of injury, anatomical features, and socio-environmental conditions [9]. Maxillofacial injuries range from soft tissue lacerations to complex fractures of the facial skeleton. The mandible is more frequently fractured than the well-supported middle third of the face, due to its anatomical position, shape, and the forces involved in injury [6-8].

The incidence of facial fractures varies with age, geographic region, time period, climatic conditions, socioeconomic status, traffic volume, and preventive measures implemented in different countries [10-13]. in male-dominant societies, men are more likely to work outdoors, rendering them more susceptible to accidents, a pattern also noted in other studies [14-18].

In the present study, road traffic accidents (RTAs) were the most common cause of facial fractures (58.4%), particularly involving motorcycles and Chingchi rickshaws. This finding aligns with previous studies conducted both in Nepal and south asia and internationally [5-8,15-19]. the high incidence of RTAs in our context is largely attributed to socio-economic conditions and widespread violations of traffic regulations, whereas in

developed countries, accidents are often associated with alcohol intoxication [5].

A majority of patients in this study presented with associated injuries, which were managed concurrently. Patients with head injuries were closely monitored and treated with the active involvement of the neurosurgery department. Facial lacerations were primarily closed, and intraoral surgical approaches were preferred whenever feasible. This approach minimized residual scarring and improved postoperative aesthetic outcomes.

Management and Outcomes

Most fractures in this study were managed using open reduction and internal fixation (ORIF), employing titanium miniplates, reconstruction plates, and resorbable miniplates, with or without maxillomandibular fixation (MMF). Fractures involving the maxilla and temporomandibular joint (TMJ), particularly in pediatric patients, were primarily managed with MMF. Mandibular and zygomatic fractures were predominantly treated with ORIF ± MMF.

The mandible was the most frequently fractured bone, accounting for 59.4% of cases, consistent with observations reported in previous studies [5-7,15-16,18]. Among mandibular fractures, 86% were managed by open reduction, while 14% were treated with closed reduction using MMF. Various fixation options included microplates, miniplates, resorbable plates, reconstruction plates, and transosseous wiring.

Maxillary fractures were managed by closed reduction in 57% of cases using circumzygomatic wires, and by open reduction in 43% of cases using microplates and miniplates. Orbital fractures were stabilized with miniplates, microplates, titanium mesh, or interosseous wiring. Care was taken to provide adequate soft tissue coverage to prevent palpable implants postoperatively, and every effort was made to minimize external incisions.

The majority of mandibular fractures (98.6%) were approached intraorally, as were most maxillary (88.9%) and zygomatic fractures (62.5%). Orbital fractures, however, were approached via external incisions. Overall, 33.3% of fractures required an extraoral approach.

Patients treated with MMF alone required a longer period of immobilization (5–6 weeks) compared to those treated with ORIF ± MMF (1–2 weeks), as the latter allowed earlier jaw mobilization. Dental elastic bands were applied along with arch bars after MMF wire removal to encourage early mouth opening.

Complications in this study were minimal and largely related to the initial injury. Pain was the most common postoperative complaint (16.7%). Malocclusion occurred in 7.3% of patients, with 4.2% presenting with a slight overbite. One case of reconstruction plate breakage was noted. Lower lip paraesthesia occurred in 4% of mandibular fracture patients due to direct injury to the mental nerves. Only two cases of implant infection were observed, both following external wound fixation; no infections occurred with intraoral approaches.

Due to financial constraints and limited availability, stainless steel implants were used instead of titanium, and resorbable/

biodegradable implants were not employed. While resorbable implants offer advantages such as reduced risk of infection and elimination of the need for secondary removal, they were not utilized in this cohort [20-22].

Conclusion

Facial fractures can lead to significant cosmetic and functional deformities. The mandible is the most commonly fractured facial bone. Early intervention, including timely reduction and stabilization of fractures, as well as bone or cartilage grafting, when necessary, is essential to achieve optimal functional and aesthetic outcomes. Public awareness of traffic laws and strict enforcement of helmet and seat belt use are critical measures to prevent severe maxillofacial injuries.

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