Mandibular Fractures: A Five-Year Retrospective Review

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Abstract

Background: Mandibular fractures are among the most common maxillofacial injuries, often resulting from road traffic accidents (RTAs), assaults, falls, and sports-related incidents (SRIs). **Aim**: This retrospective study examined the relationship between demographic and etiological factors associated with mandibular fractures. **Materials and Methods**: Records of patients with maxillofacial trauma treated at the Department of Oral and Maxillofacial Surgery, King Fahad Hospital, Albaha Province, KSA, from January 2020 to December 2024 were reviewed. **Results**: Of 238 trauma patients, 90 (37.8%) sustained mandibular fractures involving 155 fracture sites. The majority were male (n=83), with a male-to-female ratio of 12:1. RTAs were the predominant cause, followed by falls, sports injuries, and assaults. Among females, RTAs also predominated (72.7%), followed by assaults and falls (7.2%). **Conclusion**: Mandibular fractures in Albaha Province are strongly linked to RTAs, with males disproportionately affected. These findings highlight the need for targeted prevention strategies, particularly road safety measures, and provide clinicians with insights that may guide diagnosis and management when patient histories are limited.

Keywords: Mandibular Fractures, Retrospective

Introduction

Mandibular fractures rank among the most common injuries in maxillofacial trauma and are frequently caused by road traffic accidents (RTAs), assaults, falls, and sports-related incidents(**Gassner (2003)**). As the largest and strongest facial bone, the mandible is particularly vulnerable due to its prominent position and thin cross-sectional areas at sites such as the condyle, angle, and symphysis(**Boffano (2015)**). Understanding the patterns and causes of mandibular fractures is crucial for accurate diagnosis, effective treatment planning, and improving patient outcomes.

Epidemiological studies show that the incidence and etiology of mandibular fractures vary depending on geographical location, socio-economic status, and local regulations related to traffic safety and violence**(van den Bergh (2012)).** In developing countries, RTAs remain the leading cause of mandibular injuries due to poor road infrastructure and low compliance with traffic laws (**Subhashraj (2007)**), whereas interpersonal violence is more commonly reported in developed nations **(Lee (2008)).**

This retrospective study aims to evaluate the prevalence, patterns, and causes of mandibular fractures over a five-year period at the Department of Oral and Maxillofacial Surgery, King Fahad Hospital, located in the Albaha Province of Saudi Arabia.

By evaluating demographic data, fracture site distribution, and associated injuries, the study seeks to provide insight into the trends that may help guide preventive strategies and optimize management protocols in the region.

Mandibular fractures account for a significant proportion of facial bone injuries, second only to nasal bone fractures **(Lee (2008)).** The mandible's prominent and mobile position makes it particularly susceptible to trauma. Patterns of mandibular fractures and their etiologies differ across geographical regions due to variations in socioeconomic status, local infrastructure, cultural behaviors, and safety regulations**(Boffano (2015)).**

Etiology and Demographics

A significant difference exists in the etiology of mandibular fractures between developed and developing countries.

Numerous studies have identified road traffic accidents (RTAs) as the leading cause of mandibular fractures in developing countries, a trend attributed to poor traffic law enforcement, high vehicle density, and inadequate use of protective equipment such as seatbelts and helmets **(Al Ahmed (2004), Fatu (2005), Subhashraj (2007)).**

In contrast, interpersonal violence has been identified as the primary cause in developed nations such as the USA and parts of Europe, particularly among young adult males**(Gassner (2003), van den Bergh (2012)).**

Demographically, mandibular fractures are significantly more common in males, with reported male-to-female ratios ranging from 4:1 to 9:1, often peaking in the 20–40-year age group **(Al Ahmed (2004), Ellis (1985)). This pattern is** likely due to males' higher exposure to risk-related behaviors and occupations.

Anatomical Distribution of Fractures

The anatomical distribution of mandibular fractures varies by mechanism of injury. The condyle, angle, and parasymphysis are most frequently involved **(Ellis (1985), Bormann (2009)).** The condylar region is particularly vulnerable during falls and posteriorly directed forces, while the angle is frequently fractured during physical assaults or lateral impacts **(Kim (2013).).**

Multiple site fractures are also commonly reported, particularly in high-energy trauma scenarios. These include combinations such as parasymphysis with angle, or condyle with body fractures **(Miller (1965)).**

Diagnostic Methods and Treatment Approaches

Radiographic imaging, especially orthopantomograms (OPG) and cone-beam computed tomography (CBCT), plays a pivotal role in the diagnosis of mandibular fractures (**Alaeddini (2015).)**. Treatment decisions are influenced by fracture site, displacement, occlusion, patient age, and associated injuries.

The treatment of mandibular fractures has evolved considerably. Closed reduction with intermaxillary fixation (IMF) was traditionally preferred, but open reduction and internal fixation (ORIF) has become the standard for displaced or unstable fractures, providing early mobilization and improved outcomes **(Lee (2008), Kim (2013).).**

Global and Regional Trends

Recent multicenter studies in Europe and Asia have highlighted the need for localized trauma management guidelines due to variations in fracture patterns and etiological factors (**Boffano (2015)**). Regional studies, such as those conducted in Saudi Arabia and India, have consistently reported RTAs as the dominant cause and confirmed the global demographic trends **(Al Ahmed (2004), Subhashraj (2007))**.

These findings emphasize the importance of public health policies tailored to regional trauma patterns. Preventive strategies such as road safety enforcement, helmet use, and alcohol regulation are crucial in reducing the incidence of maxillofacial injuries.

Methodology

This retrospective, descriptive, and analytical study was carried out to investigate the etiology, prevalence, anatomical fracture sites, and management approaches of maxillofacial trauma over a specified time period.

The medical records of patients with maxillofacial injuries who presented to the Department of Oral and Maxillofacial Surgery at King Fahad Hospital, Albaha Province, KSA, between January 2020 and December 2024 were retrospectively reviewed and analyzed.

The collected records were reviewed and classified based on several parameters, including age, sex, cause of fracture, and anatomical site according to the Dingman and Natvig classification**(Dingman (1964).).** Additionally, laterality, fracture pattern, and treatment methods (open or closed reduction) were also evaluated.

Data were sourced from hospital archives, including patient case files, radiographic images (CT/OPG), operative notes, and discharge summaries

Data on age, sex, etiology, anatomical fracture site, and treatment modality were analyzed.

Inclusion Criteria:

- Patients of any age or gender presenting with maxillofacial trauma.
- Radiographically confirmed mandibular fractures.
- Patients admitted or treated during the specified study period.
- Availability of complete medical records, including diagnosis, treatment, and follow-up information.

Exclusion Criteria:

- Incomplete or insufficient patient records.
- Injuries confined to soft tissues without associated bone fractures.
- Fractures resulting from pathological conditions such as tumors or osteomyelitis.

The study aims to investigate the etiological factors contributing to mandibular fractures among patients treated at King Fahad Hospital, Albaha Province, between 2020 and 2024. It also seeks to examine variations in mandibular fractures with respect to patient demographics, particularly age and gender, and to explore potential correlations between fracture etiology (e.g., RTAs, falls, sports injuries, assaults) and the anatomical pattern or distribution of fracture sites.

Management

The primary goals in the management of mandibular fractures are to achieve stable occlusion, maintain the natural mandibular arch form, restore functional mandibular movement, preserve facial symmetry, and prevent the development of long-term complications or deformities. Treatment approaches vary depending on several factors, including the type, number, and location of the fracture, surgeon preference, and patient-specific characteristics such as age, dental condition, and treatment choice.

Several treatment modalities are available, including intermaxillary fixation, open reduction and internal fixation (ORIF), closed treatment with external fixation, and Kirschner wire techniques. In this study, 74 patients were treated with ORIF, utilizing miniplates, monocortical screws, transosseous wiring, or a combination of these methods. Conservative management was applied in 16 patients using arch bars and Ivy loops for splinting. No cases were managed with closed reduction.

Results

Out of 238 maxillofacial trauma patients, 90 cases (37.8%) involved mandibular fractures, accounting for a total of 155 distinct fracture sites.

Demographic data of patients

Of 90 patients, 83 males (92.2%) and 7 females (7.8%). The ratio of males to females was determined to be 12:1. Males were significantly more affected, particularly in relation to accident-related maxillofacial injuries.

Etiology

The most common cause of mandibular fractures was road traffic accidents (70%), followed by fall (23.3%), sports (4.4%), and assault (2.2%).

In males, road traffic accidents were the most frequent etiology (64.4%), followed by fall (22.2%), Sporting accident (4.4%) and assault (1.1%). Among females, road traffic accidents were the predominant cause (72.7%), followed by assault and falls, each accounting for 7.2%. Table (1)

Table (1)

Comparison of the cause of the trauma According to gender in mandibular fracture Cases				
		GENDER		Total
		Female	Male	
Cause of injury	Assault, interpersonal violence	1	1	2
	Miscellaneous (Fall down)	1	20	21
	Sporting accident	0	4	4
	Vehicle Accident	5	58	63
Total		7	83	90

Road traffic accidents were the most common etiology in patients with the age 21-40 years. Table (2)

Table 2 Comparison of the cause of the trauma Across Different Age Groups in mandibular fracture Cases						
		Age				Total
		Less than 20 years	21-40 years	41- 60 years	More than 60years	
Etiology of injury	Vehicle Accident	1	0	1	0	2
	Assault, interpersonal violence	4	8	9	0	21
	Sporting accident	3	0	1	0	4
	Miscellaneous (Fall down)	30	11	20	2	63
Total		38	19	31	2	90

Anatomical distribution

The series of fracture site from most common to least common was condyle (30.9%), angle (22.6%), body (19.4%), parasymphysis (9.7%), ramus region (8.4%), dentoalveolar fractures (7.7%), and ultimately symphysis (1.3%). No coronoid fracture was seen in our study

Discussion

Etiology

A significant disparity exists in the etiology of mandibular fractures between developed and developing countries. In developing countries, road traffic accidents are the primary cause of mandibular fractures.**(Rangaswamy G 2016, Krishnaraj S 2007, Chrcanovic BR 2012, Subhashraj (2007)).** In our study, road traffic accidents accounted for 70% of cases, making them the most common cause—consistent with findings reported in previous studies.**(Natu SS 2012, Vyas A 2014, Manodh P 2016, Rangaswamy G 2016)**

This could be attributed to factors such as reckless driving, overspeeding, poorly maintained roads, lack of adherence to safety measures like helmets and seatbelts, weak enforcement of traffic regulations, driving under the influence of alcohol, increased vehicle use by underage drivers, and inadequate vehicle maintenance.**(Natu SS 2012, Rangaswamy G 2016, Krishnaraj S 2007, Chrcanovic BR 2012)**

Among patients aged 21-40 years, road traffic accidents are a common cause, often linked to irresponsible or aggressive driving behavior, and in some cases, a desire to show off or engage in risky driving practices. [Table 2].

Falls were the second most common cause, accounting for 23.3% of cases. This may be attributed to factors such as working at heights, hazardous working conditions, or slipping on wet, uneven, or slippery surfaces, including stairs and bathrooms. In some patients, falls may result from underlying medical conditions, reduced road travel, limited geriatric care, or age-related cognitive decline. Additionally, in elderly individuals, increased bone fragility makes them more prone to fractures even from minor falls.**(Manodh P 2016)** This condition is further exacerbated by diminished muscle control and slower physical response. The third most common cause was sports-related injuries, accounting for 4.4% of cases

Incidents of drunk driving and alcohol-related assaults are relatively uncommon in the Kingdom of Saudi Arabia, likely due to strict government enforcement of alcohol prohibition laws.(**Weihsin H 2014)**

Patients often hesitate to report instances of physical abuse, making it difficult for treating surgeons to obtain an accurate history. This lack of disclosure can pose challenges in the future, particularly in relation to medicolegal cases.

The findings of this retrospective study align with existing literature regarding the prevalence, etiology, and anatomical distribution of mandibular fractures. A clear predominance of male patients was observed, with a male-to-female ratio of approximately 12:1. This finding is higher compared to previous studies conducted in both developing and developed countries. **(Ellis (1985), Gassner (2003))** The higher incidence among males is often attributed to increased exposure to risk factors such as driving, outdoor activities, and interpersonal violence.

The 21–40-year age group accounted for the highest number of cases, highlighting that mandibular trauma predominantly affects individuals during their most active and productive years. Similar age-related trends have been documented in studies from India, the Middle East, and **Europe (Subhashraj (2007), Boffano (2015)),** reflecting the lifestyle and occupational hazards of this demographic.

In terms of etiology, road traffic accidents (RTAs) emerged as the most common cause, accounting for 70% of cases. This result is in line with reports from other developing nations where traffic regulation enforcement and road safety measures are still evolving **(Al Ahmed (2004), Fatu (2005)).** In contrast, studies from developed countries have reported interpersonal violence and assaults as leading causes**(Lee (2008), van den Bergh (2012)).** This variation underscores the importance of regional public health initiatives tailored to local risk factors.

Regarding the anatomical distribution, the condylar region was the most frequently fractured site in our study (n = 48, 30.9%), followed by the angle (n 35, 22.6%), body (n = 30, 19.4%), parasymphysis (n = 15, 9.7%), sub-condylar region (n =13, 8.4%), dentoalveolar fractures (n = 12, 7.7%), and ultimately symphysis (n = 2, 1.2%).

These findings are comparable to the results reported by **Ellis and Moos (1985) and Kim and Nam (2013)(Ellis (1985), Kim (2013).),** who noted the vulnerability of the condylar region to indirect trauma, particularly in cases of falls or chin impact. The Dingman and Natvig classification system was useful in standardizing the anatomical categorization and helped identify the most susceptible areas**(Dingman (1964).).**

The occurrence of multiple site fractures in over 30% of patients highlights the high-energy nature of many of these injuries. This pattern is common in RTA-related trauma and necessitates comprehensive radiographic evaluation and multidisciplinary management**(Alaeddini (2015).).**

In terms of treatment, open reduction and internal fixation (ORIF) was more frequently employed than closed reduction. This preference aligns with current trends favoring ORIF for displaced, unstable, or multiple fractures due to its benefits in restoring occlusion and enabling early mandibular function **(Bormann (2009), Kim (2013).).** However, closed reduction still remains a viable option in selected cases with minimal displacement, particularly in pediatric or medically compromised patients.

Overall, the results of this study are consistent with regional and international findings, reaffirming the need for improved trauma prevention strategies, especially in traffic safety and violence reduction. The implementation of educational programs, helmet use, and stricter traffic law enforcement may significantly reduce the incidence of such injuries.

Conclusion

The mandible plays a vital role in both the functional and esthetic aspects of the human face. Undiagnosed or improperly managed mandibular fractures can result in significant cosmetic, functional, and psychological complications for patients. While demographic data on mandibular fractures have been widely explored, this study aims to correlate certain contributing factors in cases reported to Department of Oral and Maxillofacial Surgery, King Fahad Hospital in Albaha province, KSA. Such correlation may assist oral and maxillofacial surgeons, as well as private dental practitioners—both at the institutional and private practice levels—in identifying underlying causes, especially when patient histories are incomplete or unclear. This can improve diagnostic precision, optimize treatment results, and ensure accurate medicolegal documentation.

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