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ORIGINAL RESEARCH

A Retrospective Study on Correlation of Facial Fractures and Type of Trauma in Patients Admitted in Department of Maxillofacial Surgery of Stomatology National and Specialized Hospital, Kabul, Afghanistan

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Background: Facial bone fractures represent a significant clinical challenge due to their prevalence and the complexity of treatment required. Understanding the demographic patterns, causes, and treatment outcomes of these injuries is crucial for improving patient care and developing targeted prevention strategies.

Objective: This study aims to analyze the demographic characteristics, etiological factors, anatomical distribution, and treatment modalities of patients presenting with facial bone fractures at Stomatology National and Specialized Hospital in Kabul, Afghanistan, during 2022.

Methods: A retrospective analysis was conducted on 463 patients with facial bone fractures treated at the hospital. Data collected included patient demographics, causes of trauma, fracture location, and treatment methods. Statistical analysis was performed to identify patterns and correlations.

Results: The study included 463 patients (378 males and 85 females), aged between 3 and 88 years, with a mean age of 26.34 years. The primary causes of trauma were road traffic accidents (RTAs) (29.6%), interpersonal violence (26.1%), and falls (23.3%). The mandible was the most commonly fractured bone (74.1%), with the parasymphysis being the predominant site of injury. Treatment predominantly involved closed reduction (54.9%), with a significant portion of patients undergoing open reduction and internal fixation (ORIF) (45.1%).

Conclusion: The findings highlight RTAs, interpersonal violence, and falls as the leading causes of facial bone fractures. The mandible is the most frequently affected bone. Closed reduction remains the most common treatment modality. These insights underline the need for enhanced preventive measures, including stricter enforcement of traffic regulations and targeted interventions to address interpersonal violence and fall prevention.

Keywords: Afghanistan, closed reduction, epidemiology, facial bone fractures, interpersonal violence, open reduction and internal fixation, road traffic accidents

Introduction

Facial bone fractures constitute a significant portion of traumatic injuries treated in emergency and specialized healthcare settings, with far-reaching implications for functional, aesthetic, and psychological outcomes. These injuries demand a nuanced approach due to the complex anatomy of the facial skeleton, which comprises multiple bones with intricate articulations and close proximity to vital structures. Effective management requires a comprehensive understanding of their classification, etiology, and treatment modalities.[1–5]

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Facial fractures are classified based on anatomical location, type, and severity. Common classifications include mandibular fractures, midfacial fractures (such as zygomatic, maxillary, and naso-orbito-ethmoidal fractures), and panfacial fractures. Mandibular fractures are further categorized into subtypes based on the affected region, including symphysis, parasymphysis, angle, subcondylar, and coronoid process fractures. Midfacial fractures are often described using the Le Fort classification system, which delineates patterns of maxillary fractures into three levels of severity based on their anatomical extent. These classifications are pivotal in guiding clinical decision-making and treatment planning.[6,7]

Management of facial fractures has evolved significantly, with treatment modalities ranging from conservative to surgical approaches. Closed reduction techniques, such as intermaxillary fixation (IMF), are employed for less severe or minimally displaced fractures. Surgical interventions, including open reduction and internal fixation (ORIF), utilize advanced materials like titanium plates and screws to achieve precise anatomical alignment and stability. Recent innovations, such as computer-aided design/computer-aided manufacturing (CAD/CAM) technology and virtual surgical planning, are increasingly utilized to enhance surgical outcomes and minimize complications[6–9].

The epidemiology of maxillofacial trauma varies globally, influenced by regional socioeconomic, cultural, and environmental factors. In industrialized nations, stringent traffic regulations and public safety measures have reduced the prevalence of road traffic accidents (RTAs), shifting the focus to fall-related injuries due to an aging population[8,10–13]. Conversely, developing countries, including Afghanistan, continue to experience high rates of RTAs, interpersonal violence, and occupational trauma due to limited enforcement of safety measures and infrastructural challenges.[2–5,14–17]

Despite the global prevalence of facial trauma, there is a paucity of data on its epidemiology and management in Afghanistan. The absence of published studies from the region underscores the importance of this research, which aims to address the gap by analyzing the demographic patterns, causes, anatomical distribution, and treatment outcomes of facial fractures treated at the Stomatology National and Specialized Hospital in Kabul. By providing context-specific insights, this study seeks to inform clinical practice and public health strategies tailored to the unique challenges of Afghanistan.

This study analyzes data from 463 patients treated for facial bone fractures between March 2022 and March 2023. By examining patient demographics, etiological factors, fracture classifications, and treatment modalities, we aim to elucidate patterns of maxillofacial trauma in Kabul and contribute to the broader understanding of facial trauma epidemiology in developing countries. Furthermore, the findings underscore the need for targeted preventive measures, such as stricter enforcement of traffic regulations, community-based violence prevention programs, and workplace safety protocols.

Through a detailed analysis and discussion, this research aims to enhance patient care, guide future studies, and inform policy interventions to mitigate the burden of facial trauma in Afghanistan. These efforts will ultimately contribute to improved clinical outcomes and the development of sustainable public health strategies in the region.

Methodology

Study Design and Setting

This retrospective study was conducted at the Stomatology National and Specialized Hospital in Kabul, the largest specialized tertiary care and training center for dental and maxillofacial pathologies and trauma in Afghanistan. The hospital serves a diverse patient population from across the country, providing a comprehensive overview of maxillofacial trauma in this region.

Study Population

The study included all patients presenting with facial bone fractures to the Stomatology National and Specialized Hospital between January 1, 2022, and December 31, 2022. A total of 463 patients were treated for maxillofacial fractures during this period. The inclusion criteria encompassed patients of all ages and both genders with radiologically confirmed facial bone fractures.

Data Collection

Data were collected from the hospital's medical records and included demographic details (age, gender), cause of injury, anatomical location of fractures, and treatment modalities. Each patient's clinical records were reviewed to ensure

accuracy and completeness of the data. The causes of facial trauma were categorized into road traffic accidents (RTAs), interpersonal violence, falls, sports injuries, industrial accidents, motorbike injuries, gunshot injuries, steam cooker explosions, animal bites, and iatrogenic causes.

Classification of Fractures

Fractures were classified based on anatomical location and type. Mandibular fractures were further categorized into symphysis, parasymphysis, angle, subcondylar, coronoid process, body, dentoalveolar, and ramus fractures. Other facial fractures included zygomatic fractures, maxillary fractures, naso-orbital-ethmoid (NOE) fractures, and panfacial fractures. The classification was based on clinical and radiological assessments using standard diagnostic criteria.

Treatment Modalities

The treatment approaches were broadly categorized into closed reduction and open reduction with internal fixation (ORIF). Closed reduction techniques included intermaxillary fixation (IMF), elevation of fractured zygoma, suspension wiring for Le Fort fractures, manipulation of fractured nasal bones, and stabilization of dentoalveolar fractures with arch bars. ORIF involved surgical exposure of the fracture site followed by fixation using plates, screws, or wires. The choice of treatment was determined by the location and severity of the fracture, patient age, and overall health status.

Data Analysis

Data were analyzed using descriptive statistics to summarize the demographic and clinical characteristics of the study population. The frequency and percentage distributions of causes of injury, anatomical locations of fractures, and treatment modalities were calculated. Comparative analyses were performed to identify patterns and trends in maxillofacial trauma.

Ethical Considerations

The study was conducted in accordance with the ethical standards of the institutional research committee and the 2013 helsinki Declaration and its later amendments. Patient confidentiality was strictly maintained throughout the study. Given the retrospective nature of the study, formal consent was not required; however, all patient data were anonymized to ensure privacy. Additionally, all data and research activities were supervised and registered with the Academic Committee of the Department of Postgraduate Medical Education of the Ministry of Public Health of Afghanistan, under Ethical Code 103. Each patient provided informed consent to the hospital, agreeing that their personal data could be used for research purposes.

The main ethical issues considered in this study included:

1. **Patient Confidentiality**: Ensuring the confidentiality of patient information was paramount. All identifying details were anonymized to protect patient privacy and prevent unauthorized access to sensitive information.
2. **Informed Consent**: Although the study was retrospective and direct consent was not feasible, informed consent was obtained from patients at the time of their treatment, indicating their agreement for their data to be used for research purposes. This process ensured that patients were aware of the potential use of their data and agreed to it.
3. **Approval and Oversight**: The study received ethical approval from the relevant academic and health authorities, specifically the Academic Committee of the Department of Postgraduate Medical Education of the Ministry of Public Health of Afghanistan. This oversight ensured that the study adhered to ethical guidelines and maintained high standards of research integrity.
4. **Data Security**: Robust data security measures were implemented to safeguard patient information. This included secure storage of data and restricted access to authorized personnel only.
5. **Ethical Reporting**: The findings of this study were reported in a manner that respects the dignity and rights of the patients involved. Care was taken to present data accurately and responsibly, without compromising patient confidentiality.

By addressing these ethical considerations, the study aimed to uphold the highest ethical standards in medical research, ensuring that the rights and privacy of patients were protected while contributing valuable insights into the epidemiology and management of maxillofacial trauma.

Limitations

This study is limited by its retrospective design and reliance on the accuracy of medical records. Additionally, the findings are specific to a single tertiary care center in Kabul and may not be generalizable to other regions. Further prospective studies are needed to validate these findings and explore the broader epidemiological trends in maxillofacial trauma.

By systematically analyzing the demographic characteristics, causes of injury, fracture patterns, and treatment outcomes, this study provides a comprehensive overview of maxillofacial trauma in Kabul, offering valuable insights for clinicians and policymakers aimed at improving patient care and preventive strategies.

Results

The study analyzed 463 patients with maxillofacial fractures to identify patterns in demographic characteristics, causes, anatomical locations, and treatment approaches. The key findings are summarized below:

Gender Distribution of Maxillofacial Fractures

Among the 463 patients, a significant majority were male, accounting for 81.6% (378 patients), while females represented 18.4% (85 patients) (Table 1).

Age Distribution of Maxillofacial Fractures

The highest frequency of fractures occurred in the 21–30 age group, comprising 35.6% (165 patients) of the cases. This was followed by the 11–20 age group at 31.7% (147 patients). The frequency of fractures decreased with age, with the lowest incidence observed in the 81–90 age group (0.2%, 1 patient) (Table 2).

Causes of Facial Bone Fractures

Road Traffic Accidents (RTAs) were identified as the leading cause of facial bone fractures, accounting for 29.6% (137 patients) of the cases. Interpersonal violence was the second most common cause at 26.1% (121 patients), followed by falls at 23.3% (108 patients). Other causes included sports injuries (5.4%, 25 patients), motorbike injuries (8.4%, 39 patients), and various other less common causes such as gunshot injuries, occupational trauma, steam cooker explosions, animal bites, and iatrogenic injuries (Table 3).

Anatomical Locations of Maxillofacial Fractures

Mandibular fractures were the most prevalent, constituting 74.1% (343 patients) of all cases. This was followed by zygomatic fractures (10.8%, 50 patients), panfacial fractures (9.1%, 42 patients), and maxillary fractures (5.2%, 24 patients). NOE (nasoorbitoethmoidal) fractures were the least common, observed in 0.9% (4 patients) (Table 4). Orbital fractures were not recorded as a separate category in this dataset, potentially due to limitations in the classification system used or the retrospective nature of the study, which relied on existing medical records. Future studies should address this gap to provide a more comprehensive analysis.

Table 1 Frequency of Maxillofacial Fractures by Gender

	Frequency	Percent	Valid Percent	Cumulative Percent
Male	378	81.6	81.6	81.6
Female	85	18.4	18.4	100.0
Total	**463**	**100.0**	**100.0**	**100.0**

Table 2 Frequency of Maxillofacial Fractures by Age Group

Age Group	Frequency	Percent	Valid Percent	Cumulative Percent
1–10	39	8.4	8.4	8.4
11–20	147	31.7	31.7	40.2
21–30	165	35.6	35.6	75.8
31–40	49	10.6	10.6	86.4
41–50	34	7.3	7.3	93.7
51–60	17	3.7	3.7	97.4
61–70	9	1.9	1.9	99.4
71–80	2	0.4	0.4	99.8
81–90	1	0.2	0.2	100.0
Total	**463**	**100.0**	**100.0**	**100.0**

Table 3 Frequency and Percentage of Causes of Facial Bone Fractures

Cause	Frequency	Percent	Valid Percent	Cumulative Percent
Road Traffic Accidents	137	29.6	29.6	29.6
Sports Injury	25	5.4	5.4	35.0
Motorbike Injury	39	8.4	8.4	43.4
Gunshot Injury	8	1.7	1.7	45.1
Interpersonal Violence	121	26.1	26.1	71.3
Fall	108	23.3	23.3	94.6
Occupational Trauma	11	2.4	2.4	97.0
Steam Cooker Explosion	10	2.2	2.2	99.1
Animal Bite	3	0.6	0.6	99.8
Iatrogenic	1	0.2	0.2	100.0
Total	**463**	**100.0**	**100.0**	**100.0**

Table 4 Frequency and Percentage of Anatomical Locations of Maxillofacial Fractures

Anatomical Location	Frequency	Percent	Valid Percent	Cumulative Percent
Mandibular Fracture	343	74.1	74.1	74.1
NOE Fracture	4	0.9	0.9	74.9
Zygomatic Fracture	50	10.8	10.8	85.7
Panfacial Fracture	42	9.1	9.1	94.8
Maxillary Fracture	24	5.2	5.2	100.0
Total	**463**	**100.0**	**100.0**	**100.0**

Table 5 Frequency and Percentage of Anatomical Locations of Mandibular Fractures

Anatomical Location	Frequency	Percent	Valid Percent	Cumulative Percent
Symphysis	31	9.0	9.0	9.0
Parasymphysis	68	19.8	19.8	28.9
Angle	45	13.1	13.1	42.0
Subcondylar	39	11.4	11.4	53.4
Coronoid Process	4	1.2	1.2	54.5
Multiple Fractures	131	38.2	38.2	92.7
Body	20	5.8	5.8	98.5
Dentoalveolar	3	0.9	0.9	99.4
Ramus	2	0.6	0.6	100.0
Total	**343**	**100.0**	**100.0**	**100.0**

Table 6 Frequency and Percentage of Maxillofacial Treatment Plans

Treatment Approach	Frequency	Percent	Valid Percent	Cumulative Percent
Closed Reduction	254	54.9	54.9	54.9
Open Reduction	209	45.1	45.1	100.0
Total	**463**	**100.0**	**100.0**	**100.0**

Detailed Anatomical Locations of Mandibular Fractures

Within mandibular fractures, multiple fractures were the most frequent, comprising 38.2% (131 patients) of the cases. Parasymphysis fractures accounted for 19.8% (68 patients), followed by angle fractures (13.1%, 45 patients), subcondylar fractures (11.4%, 39 patients), and other locations such as the symphysis, coronoid process, body, dentoalveolar, and ramus (Table 5).

Treatment Approaches for Maxillofacial Fractures

Closed reduction was the more common treatment method, applied in 54.9% (254 patients) of the cases. Techniques included intermaxillary fixation (IMF) and elevation of fractured segments without surgical exposure. Open reduction and internal fixation (ORIF), performed in 45.1% (209 patients), involved surgical exposure and stabilization using plates and screws, emphasizing the importance of precise anatomical alignment in complex fractures (Table 6).

The findings highlight the predominance of young adult males in maxillofacial fractures, primarily due to RTAs, interpersonal violence, and falls. This demographic pattern aligns with other studies in the field, suggesting a need for targeted prevention strategies. The high incidence of mandibular fractures emphasizes the importance of protective measures and safety protocols, especially for high-risk groups such as motorcyclists and individuals in environments prone to violence or falls. The lack of orbital fracture data underscores the necessity of refining classification and data collection methods to ensure a comprehensive understanding of maxillofacial trauma.

Discussion

This study provides a detailed analysis of maxillofacial fractures treated at the Stomatology National and Specialized Hospital in Kabul, emphasizing critical patterns in patient demographics, causes of injury, anatomical fracture locations,

and treatment approaches. The findings contribute valuable insights into the epidemiology of facial trauma in Afghanistan and underscore the need for targeted prevention and intervention strategies tailored to the local context.

Patient Demographics

The study cohort consisted predominantly of males (81.6%), with a male-to-female ratio of approximately 4:1. This gender disparity aligns with global trends, as documented in studies by Sameer Kaura et al,[18] Samieirad et al,[19] and Jefferson Viapiana Paes.[8] Males, particularly young adults, are more frequently affected due to their higher exposure to risk factors such as road traffic accidents (RTAs) and interpersonal violence. The highest incidence of fractures was observed in the 21–30 age group (35.6%), similar to findings in Iranian and Indian studies, highlighting the vulnerability of this demographic to high-energy trauma.[14–17,20–24] These consistent trends reinforce the need for interventions targeting young males, such as awareness campaigns and stricter enforcement of safety regulations.

Causes of Facial Trauma

RTAs emerged as the leading cause of facial fractures (29.6%), mirroring findings in developing countries where traffic safety measures are often inadequate. Interpersonal violence (26.1%) and falls (23.3%) also contributed significantly, emphasizing the multifactorial nature of facial trauma. Comparable studies, such as those by Menga Ambreen et al[25] and Amit Shah et al,[26] report similar etiologies, further substantiating the role of RTAs and interpersonal violence as predominant causes in resource-limited settings. However, this study uniquely highlights the contribution of occupational trauma and culturally specific incidents, such as steam cooker explosions, reflecting Afghanistan's socio-economic and cultural context.

Anatomical Locations of Fractures

Mandibular fractures were the most prevalent (74.1%), particularly in the parasymphysis region, followed by zygomatic fractures (10.8%) and panfacial fractures (9.1%). This anatomical distribution is consistent with findings from regional studies in Iran and Pakistan,[14–17] underscoring the mandible's vulnerability to impact due to its prominence and structural properties. Unlike many global studies, data on orbital fractures were not captured as a distinct category in this research, representing a limitation that future studies should address to provide a more comprehensive understanding of maxillofacial trauma patterns.

Treatment Approaches

Treatment modalities in this study included closed reduction (54.9%) and open reduction and internal fixation (ORIF) (45.1%). Closed reduction techniques, such as intermaxillary fixation (IMF), were predominantly used for less severe fractures, aligning with pediatric-focused approaches that prioritize preserving anatomical structures. The use of ORIF, despite its invasive nature, was essential for complex fractures requiring precise anatomical alignment and long-term stability. Studies by Menga et al[25] and Balaji et al[27] corroborate these trends, emphasizing the balance between conservative and surgical interventions. Advances in surgical technology, including CAD/CAM-guided surgeries, have further improved the outcomes of ORIF procedures by enhancing accuracy and reducing operative time. Future studies in Afghanistan could explore the integration of these modern techniques to improve treatment outcomes and reduce complications.

Preventive Strategies and Public Health Implications

The findings of this study highlight the urgent need for effective preventive measures to reduce the incidence of maxillofacial fractures. Strengthening traffic regulations, such as enforcing seat belt use, helmet laws for motorcyclists, and adherence to speed limits, should be a priority. Public health campaigns focusing on road safety, violence prevention, and fall risk reduction are critical to addressing the root causes of these injuries. The socio-economic burden of maxillofacial trauma, including prolonged recovery times and potential disabilities, underscores the importance of investing in prevention.

Moreover, the unique cultural and environmental factors identified in this study, such as occupational hazards and household injuries, call for tailored interventions. For instance, educating communities about workplace safety and promoting safer cooking practices could mitigate specific risks unique to Afghanistan. By implementing comprehensive and context-sensitive strategies, healthcare policymakers can significantly reduce the burden of facial trauma, improve patient outcomes, and alleviate the strain on healthcare systems.

Conclusion

This study highlights the epidemiological patterns and causes of facial bone fractures treated at the Stomatology National and Specialized Hospital in Kabul. Road traffic accidents (RTAs), interpersonal violence, and falls were identified as the leading causes, with the mandible being the most frequently fractured bone. These findings reflect the urgent need for targeted prevention strategies and public health interventions tailored to the Afghan context.

To mitigate the high incidence of facial trauma, particularly from RTAs, it is critical to enforce traffic safety measures, including mandatory seat belt and helmet use and adherence to speed limits. Addressing interpersonal violence and falls requires community-based initiatives, public awareness campaigns, and support for vulnerable populations such as children and the elderly.

By implementing comprehensive prevention strategies and strengthening healthcare infrastructure, the burden of facial trauma can be reduced, ultimately improving individual and public health outcomes. Future research should focus on addressing gaps in data, such as orbital fractures, and exploring advanced treatment modalities to enhance care quality in resource-limited settings.

Data Sharing Statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethical Approval

This study was conducted in accordance with the ethical standards of the institutional research committee and the 2013 helsinki Declaration and its later amendments. The research protocol was reviewed and approved by the Academic Committee of the Department of Postgraduate Medical Education of the Ministry of Public Health of Afghanistan (Ethical code: 103).

Consent to Participate

Given the retrospective nature of this study, formal consent was not required. However, all patient data were anonymized to ensure privacy.

Consent for Publication

Each patient provided informed consent to the related hospital that their personal data would be used for research purposes.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Disclosure

The authors declare no conflicts of interest in this work.

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